

THE MAMMALS OF SURINAME

BY

A. M. HUSSON

Rijksmuseum van Natuurlijke Historie, Leiden

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To the memory of
Prof. Dr. H. BOSCHMA (1893-1976)
this book is dedicated

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CONCORDANCE OF ILLUSTRATIONS

The illustrations are placed as follows:

The 151 black and white plates (pls. 1-151) are placed at the end of the book.

Of the 10 coloured plates one is the frontispiece, the other 9 (pls. A-I) are placed in the text as follows: pls. A-H between pp. 446 and 447, pl. I opposite p. 518.

The 52 text-figures are placed on the following pages:

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Maps 1 to 3 are placed on pp. xxiii, xxv, and xxvii respectively.

PREFACE

A few remarks should be devoted here to the rather complicated history of the present work and to explain some its inconsistencies.

Soon after his appointment in 1950 as curator of the Division of Mammals of the Rijksmuseum van Natuurlijke Historie at Leiden, Dr. A. M. Husson became interested in the fauna of tropical America, well represented in the Museum collections. Especially the material of Suriname Mammalia is quite rich both in the old collections and in more recent acquisitions. Much excellent material was donated by Dr. D. C. Geijskes during the period (1938-1965) that he resided in Suriname, while also from other sources important additional material was received.

In 1957 Dr. Husson published his first contribution to the mammal fauna of Suriname, dealing with the primates of the country, a study mainly based on collections made during the 1948-1949 Suriname Expedition. This paper was followed by a few smaller publications, and, in 1962, by Dr. Husson's treatise on "The bats of Suriname" (*Zool. Verhand. Leiden*, no. 58), in which the Suriname Chiroptera were exhaustively dealt with: not only their taxonomy, but also aspects of nomenclature, biology and history being treated in detail. Soon after the publication of this book, Dr. Husson, together with his assistant Mr. P. Staffeleu, left for Suriname. There, during more than half a year (December 1962 to July 1963), they visited numerous localities and brought together an impressive collection of Suriname mammals. During his stay in Suriname Dr. Husson was approached by several people, especially by agriculturists, foresters and members of the Health Department, with the request to publish an easy guide to the mammals of Suriname, in order to facilitate the identification of several of the harmful species (like agricultural and horticultural pests, transmitters of diseases, etc.), as well as of the species that were either regularly seen around Paramaribo or observed elsewhere in Suriname. Even a simple check-list was considered very useful, as there still existed much uncertainty as to the number of species by which several of the well-known groups (e.g., monkeys, deer, pigs, cats, etc.) were represented in Suriname.

Of course no one realized the enormous amount of labour involved in the preparation of an "easy" guide or of a "simple" check-list. To examine Suriname material in Dutch and foreign museums, to gather and evaluate the records of Suriname mammals scattered in the literature, to find the true relation between the Suriname mammal populations and those of surrounding areas, and last but not least, to decide upon the proper nomenclature for the Suriname mammals, is more time consuming than it might seem at first sight. Even Dr. Husson himself, as well as the museum authorities, grossly underestimated the time needed for the project. The fact that Dr. Husson's health did not permit him to work as intensively as he would have liked to do, also was a factor of importance here.

In the course of Dr. Husson's work at his "guide" numerous interesting data came to light, which fully deserved publication, but were out of place in a "guide book". Therefore, after ample considerations, the original idea of producing a simple handbook with short general diagnoses of the species and brief accounts of biology and distribution, was abandoned in favour of a more basic monograph bringing together as much information concerning the Suriname mammals as would prove feasible. The emphasis of the book was placed on Suriname, i.e., the descriptions are based almost exclusively on Suriname specimens; observations on the biology as a rule are those made in Suriname; the general distribution of the species and/or subspecies is only briefly stated, but considerable attention is given to the occurrence of the species within Suriname, with mention of all the Suriname material examined. This change in the perspective of the book caused great delay as it necessitated rewriting of considerable portions of the text.

Dr. Geijskes, who in 1965 returned to Holland after his retirement as director of the Surinaams Museum at Paramaribo, suggested that descriptions and figures of skulls be included, especially of game animals. During his travels in the interior of Suriname, namely, Dr. Geijskes had often observed skulls of various mammals near or in native dwellings or serving as ornaments; these mammals evidently had been used as food. The identification of such skulls could contribute to a better understanding of the food habits and of the hunting by the natives. Dr. Husson accepted this suggestion and extended his manuscript in such a way that of every species a description and a figure of the skull is given. This too caused a further delay.

When in 1972 it became clear that the publication of the present book would not take place in the near future, Dr. Husson, in order to comply with the rather urgent requests from Suriname, drew up a check-list of all mammals species known at that time from Suriname, which list was published early in 1973.

In 1975 Dr. Husson's health deteriorated to such an extent that in October he was forced to retire and he left Leiden. During the last few months of his stay in Leiden he had worked feverishly to finish his manuscript, often starting at 4 o'clock in the morning. The result was that in October most of the text for all groups, with the exception of the Chiroptera, was written, and was brought up to the high standard that Dr. Husson had set himself; only in the Edentata the descriptions are less extensive than in the other groups.

At first it was thought acceptable to publish the book without the Chiroptera, but on further consideration this was thought inadvisable. The following solution was found: the editorial board, with the active help of Dr. Husson, compiled the text of the present chapter on the Chiroptera from Dr. Husson's 1962 monograph; the paragraphs giving the original description, type locality, references to published synonymies, vernacular names, distribution, and occurrence in Suriname, were adapted to be conform with the rest of the text. To the paragraph on the occurrence in Suriname an enumeration of the Suriname material received by the Museum

since 1962 was added and the information was brought up to date. Of each species, the description was taken almost verbatim from Dr. Husson's 1962 thesis, while the paragraph "Remarks" was greatly shortened: all remarks on the taxonomy and nomenclature of the species were omitted, but important data pertaining to Suriname representatives of the species were left in and new data added. Also the species discovered in Suriname after 1962 are included; the text dealing with these species, written by Dr. Husson or compiled from his notes, of necessity had to remain relatively short. In this way the chapter on Chiroptera has been brought entirely up to date, although regrettably it could not be made fully conform the rest of the text.

We are very grateful to the late Prof. Dr. H. Boschma, who read the entire text and made many extremely useful suggestions, grammatically and otherwise. Dr. D. C. Geijskes was so kind to provide us with numerous interesting details on the biology of various of the species, based on his own observations.

The Rijksmuseum van Natuurlijke Historie takes great pride in publishing this outstanding work, which is a tribute to the great knowledge, energy and perseverance of Dr. Husson.

Leiden, December 1975.

L. B. HOLTHUIS
M. BOESEMAN

INTRODUCTION

The knowledge of the fauna of Suriname is of essential importance in the study of the neotropical Mammalia. The first publications containing information on mammals of Suriname appeared very early in the history of European exploration of South America. Such publications were relatively numerous in the 17th and 18th centuries, when the Republic of the Seven United Netherlands was at the peak of its power, and Suriname was one of its richest colonies. At that time many animals, alive or preserved, were sent from Suriname to the Netherlands. The living specimens were kept in Dutch menageries, while skins and alcohol specimens found their way to private natural history collections ("cabinets of rarities") of which at that time there was an impressively great number in Holland (see Engel, 1947); several foreign collections received material via the Netherlands. In many instances the Dutch collections formed the basis for, or contributed considerably to, important zoological publications, like those by Albertus Seba (1665-1736), Petrus Artedi (1705-1735), Carolus Linnaeus (1707-1778) and Peter Simon Pallas (1741-1811). Linnaeus (1758), in his fundamental 10th edition of *Systema Naturae*, based many of his descriptions on Suriname material, either by directly studying this (when in Holland, 1735-1738, Linnaeus must have seen much Suriname material in Dutch collections, while Swedish naturalists like C. G. Dahlberg (1721-1781) and D. Rolander (1725-1793) sent Suriname specimens to Swedish collections), or by referring to previous publications like that by A. Seba. Thomas (1911: 124), when dealing with the type localities of the mammals described by Linnaeus in the 10th edition of his *Systema Naturae*, stated: "with regard to species named from the figures in Seba's 'Thesaurus', it would not be unjustifiable to suggest that in the case of all tropical South American animals, Surinam — the great source of all Dutch collections — should be accepted as the type locality . . .". No less than 24% of all species of mammals known from Suriname have Suriname as the type locality. It goes without saying that for a better understanding of the relation between the various species, and that between the various subspecies of a single species, it is essential to know the characters of the population of the type locality and of its variability. Therefore, in the present work I have tried to give of every species a description based exclusively on the Suriname material examined by myself (of course with the exception of discoloured, mutilated or abnormal specimens) and also to provide as many illustrations as feasible of such material. I hope, by giving this information, to enable students of the faunae of other parts of South America to obtain a better idea of the status of the Suriname populations.

The second object of the present book is to provide a reliable guide for the identification of the species of Suriname mammals, not only to professional zoologists, but also to agriculturists, ecologists and others who in their work in Suriname have

to deal with mammals, be it for their control or their protection; furthermore it is intended for anyone (e.g., hunters and naturalists) who just wants to know more about the fascinating creatures that inhabit this beautiful and interesting country. Therefore keys are provided to all the species. In most cases there are two sets of keys, one based exclusively on external characters, the other only on characters provided by the skull. The keys to the skulls are added because skulls and skull fragments of animals hunted or used as food are often found as offal in or near settlements in the interior or as signs of good luck fastened to the roofs of Amerindian and Bushnegro dwellings. In the keys I have tried to employ such characters as are normally still noticeable in the fragments that one usually finds. Another use for the keys to the skulls is to identify skull fragments of small mammals (especially Marsupialia and Rodentia) found in owl pellets or in stomach contents. In some groups the species are very difficult to distinguish on external characters alone, and then the skull characters may be decisive for a certain identification, this being especially true for some groups of Marsupialia, Chiroptera, Cricetidae and Muridae. Illustrations are added as a help with the keys. In using the keys one has to keep in mind (1) that they are based on characters of adult animals in which all molars are functional, and therefore not necessarily will give good results for juveniles, (2) that notwithstanding the long period in which the Suriname mammals have received the attention of zoologists, the Suriname mammal fauna still is far from well known (especially from the interior), and that there undoubtedly are several species which so far have not yet been reported from the country. Therefore a careful comparison with the description and illustrations is most advisable.

With few exceptions the order of the taxa treated in the present work, is the same as that adopted in the fundamental check-list of South American mammals by A. Cabrera (1958-1961).

Of all orders diagnoses are provided. Of the species the following information is given: (a) the scientific name; (b) a reference to the original publication of the name; (c) the type locality, and if this is restricted, how and by whom it has been restricted; (d) synonymies, viz., references to authors providing a good synonymy of the species or subspecies; (e) vernacular names in English (E), Dutch (N), and Sranan-tongo (S), the latter being the official Suriname language; here only the better known vernacular names are listed, a more complete account of them can be found in a paper by Staffeleu (1975); (f) distribution, giving the general distribution of the species, and, if pertinent, of the subspecies; (g) occurrence in Suriname, giving a general statement of the known ecological and geographical range of the species within Suriname, with a complete list of the examined Suriname material, and, if available, references to previous Suriname records of the species¹; (h) description,

¹ Many of the records of Suriname mammals published in the literature, and especially in popular literature, narratives, etc., are rather vague and it often is impossible to ascertain which species actually is meant, even when a scientific name is given. Also in many instances references are very general and do not give any new information. For these reasons I have refrained from

giving the description of the external characters of the Suriname specimens examined and a short account of the skull characters; (i) remarks, a paragraph containing miscellaneous information, e.g., whether or not the species is harmful or otherwise of direct interest to the economy or health, an account of what is known about the biology of the species, based mainly on Suriname sources, problems of nomenclature of the species, and scientific names under which it has been reported from Suriname.

Due to reasons explained in the preface the treatment of the Chiroptera is somewhat different from that of the rest of the Mammalia. Practically all descriptions of the Chiroptera are the same as those published by me in 1962, and often not exclusively based on Suriname material. Because the bats were extensively dealt with in my 1962 "The bats of Suriname", fewer details of taxonomic, nomenclatural and other aspects are given; for these, reference is given to my 1962 paper. All information on the Suriname Chiroptera obtained by me after 1962 is included in the present publication.

The preparation of the present paper showed time and again how incomplete our knowledge of the Suriname mammals still is. Of many species extremely few specimens are present in Museum collections, not only of the rarer species or those that are difficult to catch, but also many common species, and even well known game species. The preparation of scientific specimens of larger animals is cumbersome, while most hunters prefer to keep trophies themselves. It cannot be emphasized enough that material of most species is badly needed for study collections in order to permit scientists to obtain a good idea of the variation of the various characters of a species within a certain area, of its range within the country, and of its habitats. The fauna of large areas in Suriname is still completely unknown. A very good example of the situation is the case of *Sylvilagus brasiliensis*, which an expedition reported as having been used as food, and which in collections is only represented from Suriname by a very young specimen and some droppings.

The neighbouring countries do not fare much better. Of neither French Guyane nor of Guyana a comprehensive account of the Mammalia has been published, although considerable information is scattered over numerous scientific publications. The papers by Tate (1939) and Roth (1941) are of great value in this respect.

ILLUSTRATIONS

Of practically all species dealt with here illustrations are provided, if possible based on adult Suriname specimens. These illustrations are of various origin.

All the non-photographic illustrations were made by the staff-artists of the Rijksmuseum van Natuurlijke Historie. The coloured plates (A-I and frontispiece)

trying to list under each species all previous Suriname records known to me and only discussed the more important ones. Newspapers like "De West", "De Surinamer", etc., although they may contain interesting records of Suriname mammals, have only incidentally been cited, simply because these publications could not be consulted by me and the items that I do record are based on clippings and collections of clippings that I received from other people.

are by the hand of Mr. R. van Assen, who also made pls. 1-7, 43, 44, 46-50, 55, 58-60, 73, 74, 79, 90, 92, 104-113, 125, 126, 128, 129, 133-135, 137, 138, 142 and 143. Mr. J. J. A. M. Wessendorp is responsible for pls. 56, 68-71, and 75, which are based on published figures and actual material. Mr. Wessendorp also made the text-figures 1, 2, 6, 7, 38, 39, 41a, b, 44, 45, 48, and 49c, d. Mr. W. C. G. Gertenaar made text-figures 3, 4, 5, 10, 11, 15, 16, 21, 23, 25, 30, 33, 34, 37, 40, 41c, d, 42, 43, 46, 47, 49a, b, and 51. Mr. H. Heyn made text-figures 13, 17, 18, 22, 24, 29, 31 and 36, and also the reproductions of figs. 12, 14, 26, 28, and 35.

For the photographs I am much indebted to the following persons: Dr. D. C. Geijskes (pls. 57, 78, 93, 141, 144-149), Mr. J. Lindblad (pls. 45, 72, 80, 97), Mr. A. Reyne (pl. 150), Mr. P. Staffeleu (pl. 76), Mr. P. A. Teunissen (pl. 74A), Dr. P. Wagenaar Hummelinck (pl. 98).

The other photographs were made by the staff-photographers of the Leiden Museum. Mr. H. F. Roman is responsible for pls. 14-42, and for the photographic reproduction on pl. 13. The remaining photographs are by the late Mr. C. Hoorn (pls. 8-12, 51-54, 61-67, 77, 81-89, 91, 94, 95, 99-103, 114-124, 127, 131, 132, 136, 139, 140 and 151), the photographic reproductions of text-fig. 50 and pls. 96 and 130 were also made by him.

NOMENCLATURE

During the preparation of this work several nomenclatural problems were encountered, which are discussed under the species involved. There are, however, a few problems of more general interest, which may be discussed here.

In the present publication I have accepted the new names published in Etienne Geoffroy-Saint-Hilaire's (1803) "Catalogue des mammifères du Muséum National d'Histoire naturelle" as available names. The validity of this work is the subject of strong controversy among zoologists. An attempt to place this work on the "Official Index of Rejected and Invalid Works in Zoology", undertaken on the advice by J. R. Ellerman and T. C. S. Morrison-Scott (1954: 130-131; 1962: 287-288), and by W. E. China (1962: 289), was later abandoned by China (1963: 243), but the Commission has not yet expressed a definite opinion on whether or not this work is available. The arguments brought forward by L. B. Holthuis (1963: 242) to show that Geoffroy's Catalogue must be considered published, are fully shared by me, and I see no reason to reject Geoffroy's names, which are widely accepted in zoological literature; quite a number of authors (P. Hershkovitz, 1955c: 187-189; H. W. Setzer, 1952: 343; E. R. Hall, 1963: 245; J. Dorst, 1963: 245) do accept Geoffroy's Catalogue as available.

Although the full name is Etienne Geoffroy-Saint-Hilaire, I have followed the usage by French mammologists to cite that author's name as E. Geoffroy. Similarly, the name Isidore Geoffroy-Saint-Hilaire is cited by me as I. Geoffroy.

As P. Fermin (1765; 1769) did not consistently use binominal nomenclature in his books, his latin names cannot be used.

MATERIAL

Under the heading "Occurrence in Suriname" all the material examined by me is listed with the registered numbers of the specimens. A number given without other indications stands for a registered number of the Rijksmuseum van Natuurlijke Historie in Leiden (RMNH). The registered number of material from other institutions is preceded by the following abbreviations:

AMNH	American Museum of Natural History, New York, U.S.A.
BMNH	British Museum (Natural History), London, England.
CNHM	Field Museum (Natural History), Chicago, Illinois, U.S.A.
MNHN	Muséum National d'Histoire Naturelle, Paris, France.
SMN	Staatliches Museum für Naturkunde, Stuttgart, Federal Republic of Germany.
ZMA	Zoölogisch Museum (= Instituut voor Taxonomische Zoölogie), Amsterdam, Netherlands.
ZMB	Zoologisches Museum, Berlin, German Democratic Republic.
ZMH	Zoologisches Museum, Hamburg, Federal Republic of Germany.

In the enumeration of the material the samples are arranged more or less geographically; first by districts, roughly from west to east, in the order Nickerie, Coronie, Saramacca, Suriname, Para, Brokopondo, Commewijne and Marowijne Districts. Within the districts the arrangement as a rule is from north to south. If more than two samples originate from the same district, the name of the district as a rule is given with the first and the last sample only. Most of the localities mentioned can be found on maps 1-3; an index to the geographic names on the maps is given on pp. 551-553.

MEASUREMENTS

In most groups external and skull measurements are provided of all or of at least a representative part of the examined Suriname specimens. In some instances, however, the measurements of only a single adult male and a single adult female are given; such specimens are selected at random, being generally the most complete or the best preserved of the lot; in these cases the measurements given are neither minimum, maximum or average measurements, while differences between male and female measurements do not necessarily indicate a sexual dimorphism. The measurements are taken with vernier callipers to the nearest tenth of a millimetre. The measurements are given in millimetres (mm) unless indicated otherwise; the body weight in grams (gr) or kilograms (kg). Text-figures 1, 5-7, show the way in which the measurements used in this book were taken, and at the same time explain the terms used.

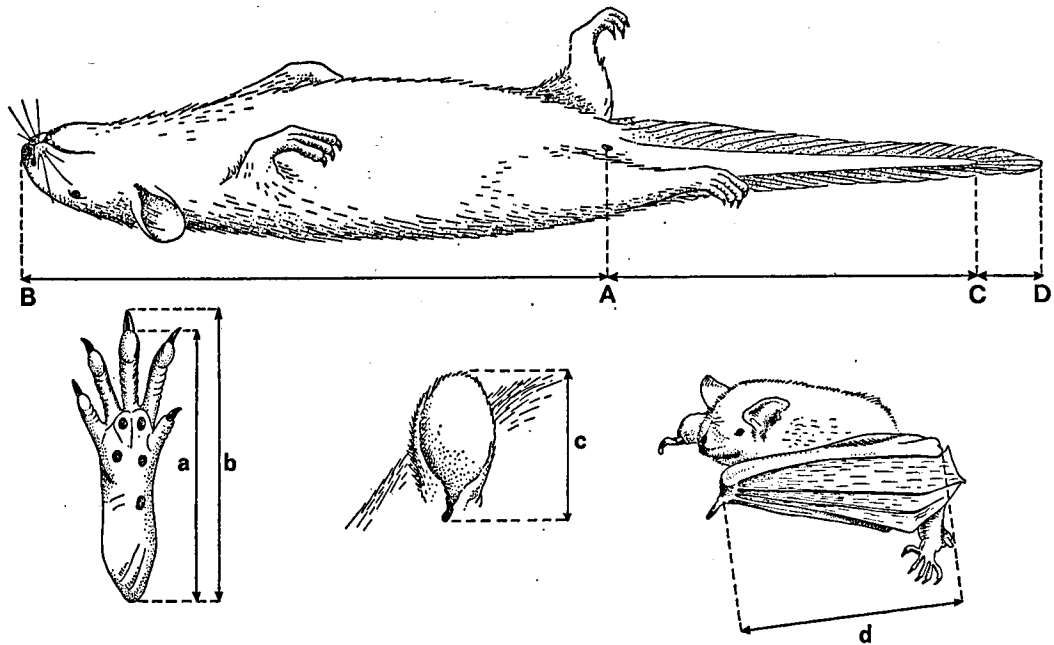
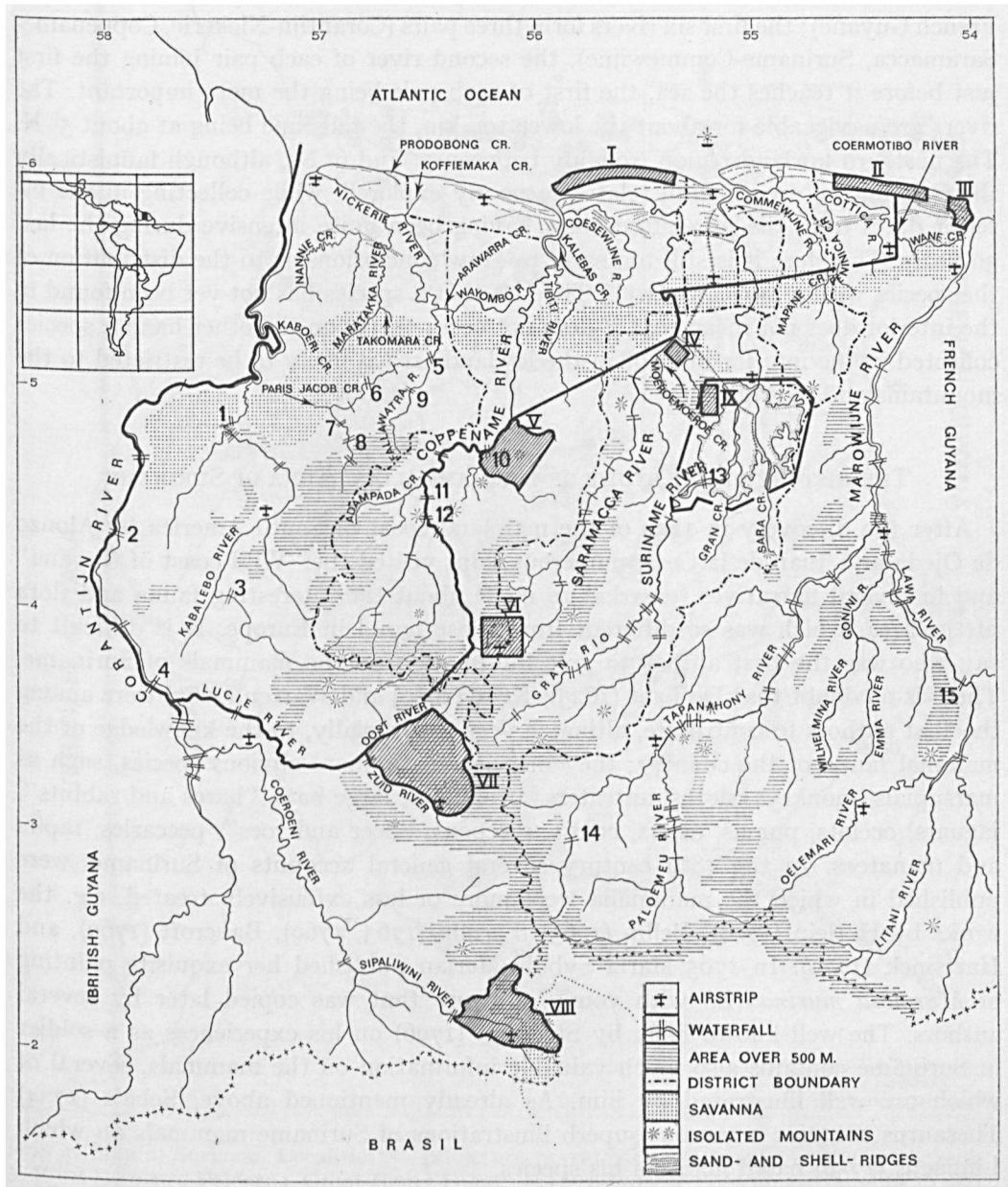


Fig. 1. Indication of the external measurements used in this publication. A, anus; B, tip of the snout; C, end of the tail; D, end of the tuft of the tail; A-B, head and body; A-C, tail without tuft; A-D, tail with tuft; a, hind foot without nails; b, hind foot with nails; c, ear; d, forearm (only used in Chiroptera).

ZOOGEOGRAPHY

Suriname, situated on the north coast of South America roughly between 2° and 6° N, and 54° and 58° W, belongs to the neotropical faunal province. Its mammal fauna is rich and varied, but, although from the earliest time the Suriname mammal fauna received the attention of travellers and naturalists, it is still quite insufficiently known. The fauna is typical for the northern part of the South American mainland, and most species known from Suriname are also found in Venezuela, Trinidad, the two other Guianas and the lower Amazon basin.

The country has a flat muddy coast with a few sandy beaches. Behind the coast are mangroves and swampy areas traversed in an east-west direction by elevated sand or shell ridges. Still farther inland are lowland savannas and gallery forests. South of these follow the foot hills and finally the higher mountains (with upland plateaus and highland savannas), which extend south to the border with Brazil; this border is formed by the watershed of the Amazon basin. The country is traversed in a roughly south-north direction by seven main rivers, which are from west to east: the Corantijn River (which forms the border with (formerly British) Guyana), the Nickerie River, the Coppename River, the Saramacca River, the Suriname River, the Commewijne River and the Marowijne River (which forms the border with



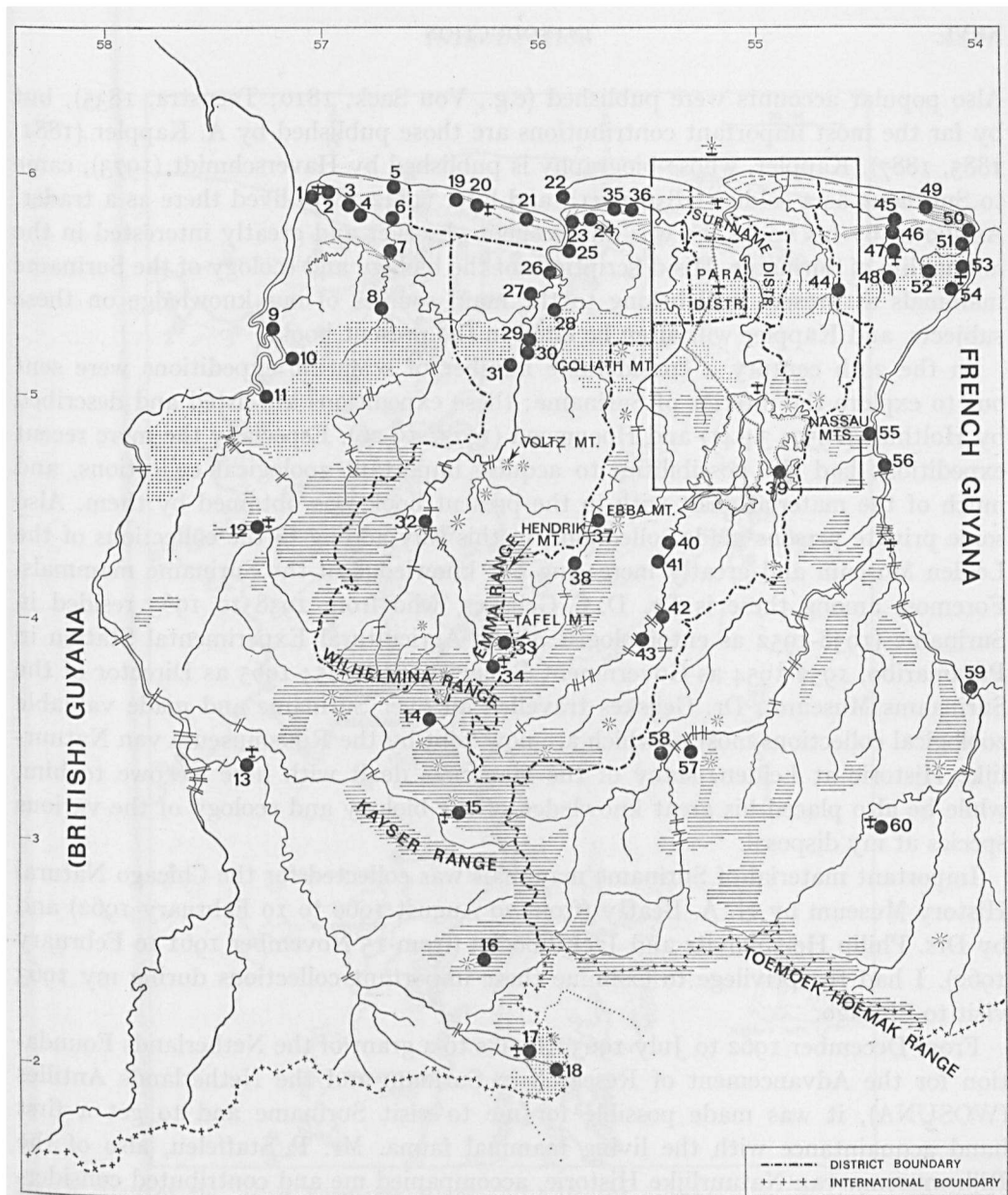
Map 1. Map of Surinam showing the rivers and creeks mentioned in the text, as well as the rapids and falls: 1, Avanavero Falls; 2, Wonotobo Falls; 3, Doublesteps Falls; 4, Frederik Willem IV Falls; 5, Stondansi Falls; 6, Lombok Falls; 7, Graniet Falls; 8, Blanche Marie Falls; 9, Cremer Falls; 10, Raleigh Falls; 11, Sidonkroetoe Falls; 12, Tonckens Falls; 13, Mamadam Falls; 14, Lada Falls; 15, Maripasoela. The shaded areas are nature reserves; I, Coppename-monding; II, Wia-Wia; III, Galibi; IV, Brinckheuvel; V, Raleighval-Voltzberg; VI, Tafelberg; VII, Eilerts de Haan Gebergte; VIII, Sipaliwini; IX, Brownsberg. The heavy line borders the north-western area covered by the Game Ordinance.

French Guyane); the first six rivers form three pairs (Corantijn-Nickerie, Coppename-Saramacca, Suriname-Commewijne), the second river of each pair joining the first just before it reaches the sea, the first of each pair being the more important. The rivers are navigable for about the lower 100 km, the falls line being at about 5° N. The northern lowland region (roughly between 5° and 6° N), although faunistically the best known area, is still relatively poorly explored, while collecting in the interior dates from the present century, having been quite intensive during the last 30 years. Therefore it is still too early to draw conclusions as to the distribution of the species within Suriname itself. The fact that a species has not yet been found in the interior does not mean that it does not occur there; on the other hand a species collected in the interior but not in the lowland area is likely to be restricted to the mountains and foothills.

THE HISTORY OF THE STUDY OF THE MAMMALIAN FAUNA OF SURINAME

After the discovery in 1499 of the mainland coast of South America by Alonzo de Ojeda and Juan de la Cosa, numerous ships visited the "Wild coast of Guyana" and in several narratives remarks are made about the interesting fauna and flora of the area, which was so different from those found in Europe. It is difficult to say who was the first author to give information on the mammals of Suriname. There is no doubt that De Laet (1625), Keye (1659) and Warren (1667) were among the first authors to contribute, although very superficially, to the knowledge of the mammal fauna of the country; they mentioned the more obvious species, such as marsupials, monkeys, sloths, anteaters, armadillos, large bats, "hares and rabbits", jaguars, ocelots, pumas, otters, coatis, raccoons, "deer and roes", peccaries, tapirs and manatees. In the 18th century several general accounts of Suriname were published in which the mammalia were more or less extensively treated, e.g. the works by Herlein (1718), Bellin (1763), Fermin (1765, 1769), Bancroft (1769), and Hartsinck (1770). In 1705 Maria Sybilla Merian published her exquisite painting of *Marmosa murina* (L.) with young, a figure that was copied later by several authors. The well known book by Stedman (1796) on his experiences as a soldier in Suriname contains also much valuable information on the mammals, several of which are well illustrated by him. As already mentioned above, Seba's (1734) Thesaurus contains numerous superb illustrations of Suriname mammals on which Linnaeus (1758) based many of his species.

In the 19th century several publications of greater or lesser importance dealing with Suriname mammals were published: a complete list of the then known species was the one by Lammens (1844); this list, although it contains a fair number of inaccuracies, is still of considerable importance. Temminck (1824-1841) dealt with some Suriname mammals, and so did Jentink (1887, 1888) in his catalogues of the mammal collections in the Leiden Museum; in a number of other scientific papers of that time (e.g. by W. Peters) information on Suriname mammals can be found.



Map 2. Map of Surinam. Localities: — (NICKERIE DISTRICT): 1, Stalweide; 2, Nieuw Nickerie; 3, Prins Bernhard Polder; 4, Groot-Henar Polder; 5, Hertenrits; 6, Wageningen (Samiha Creek); 7, Cupido; 8, Awarra savanna; 9, Wakay; 10, Washabo; 11, Matapi; 12, Kabalebo airstrip; 13, Coeroeni Island; 14, Lucie-kamp; 15, Kayserberg airstrip; 16, Alalapadoe; 17, Sipaliwini airstrip; 18, Vier Gebroeders (mountain); — (CORONIE DISTRICT): 19, Burnside; 20, Totness; 21, Coronieweg; — (SARAMACCA DISTRICT): 22, Coppename Punt; 23, Boskamp; 24, Karel François; 25, Kalebaskreek; 26, Goede Hoop; 27, Wayombo; 28, Sabana; 29, Heidoti; 30, Bitagron; 31, Kaaimanston; 32, Hebiweri; 33, Anton van Aerde cave (Tafel Mt.); 34, Rudi Kappel airstrip; 35, Calcutta; 36, Tijgerkreek; — (BROKOPONDO DISTRICT): 37, Posogroenoe; 38, Mambabasoe; 39, Dam; 40, Aurora; 41, Botopasi; 42, Djoemoe; 43, Ligolio; — (COMMEWIJNE DISTRICT): 44, Nengrekondre-pepre; — (MAROWIJNE DISTRICT): 45, Jerusalem; 46, Tamarin; 47, Moengo; 48, Patamacca; 49, Wiawia; 50, Galibi; 51, Langamankondre; 52, Moengotapoe; 53, Pierrekondre; 54, Albina; 55, Nason; 56, Lokalokatabbetje; 57, Magneetrots; 58, Vincent Fajks airstrip; 59, Maripasoela; 60, Oelemari airstrip. For localities in the Suriname and Para District, and adjacent areas, see map 3 (on p. xxvii).

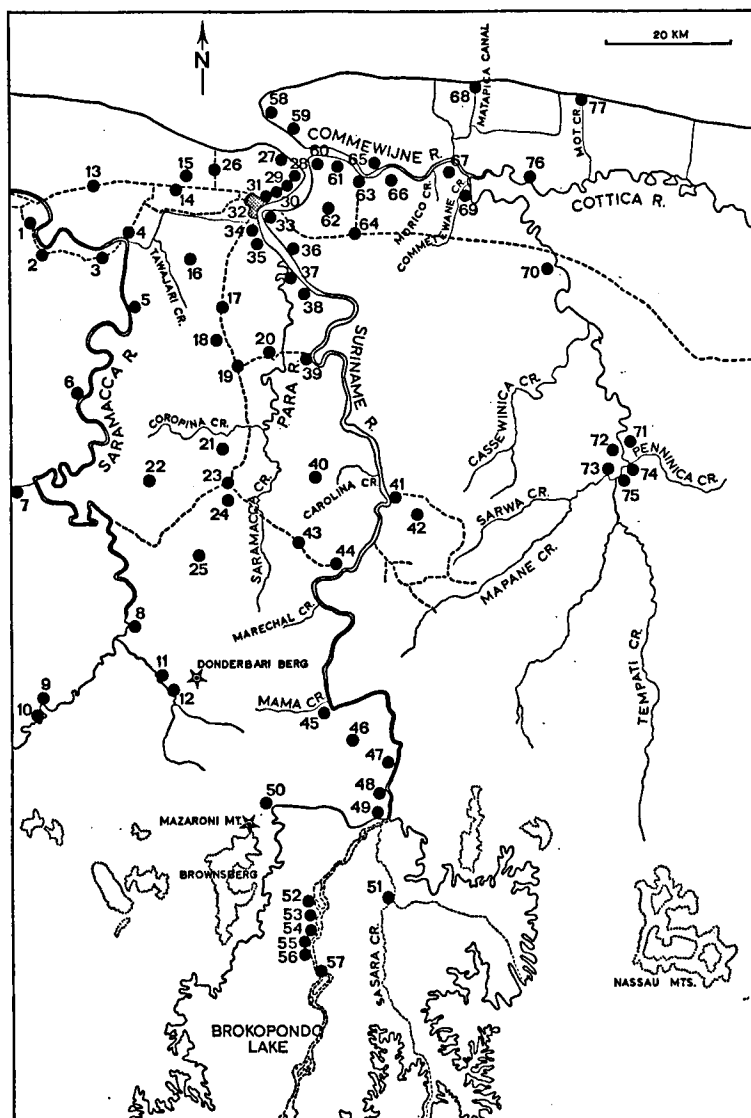
Also popular accounts were published (e.g., Von Sack, 1810; Teenstra, 1835), but by far the most important contributions are those published by A. Kappler (1881, 1885, 1887). Kappler, whose biography is published by Haverschmidt (1973), came to Suriname as a soldier (1836-1841), and later (1842-1879) lived there as a trader. As shown by his books, he was an excellent observer and greatly interested in the animal life of Suriname. His descriptions of the biology and ecology of the Suriname mammals at present still belong to the main sources of our knowledge on these subjects, and Kappler will often be cited in the present book.

In the 20th century a considerable number of scientific expeditions were sent out to explore the interior of Suriname; these expeditions are listed and described by Holthuis (1959: 34-41) and Hoogmoed (1973: 19-26). Especially the more recent expeditions had the possibilities to acquire important zoological collections, and much of the material dealt with in the present book was obtained by them. Also some private persons made collections, in this way adding to the collections of the Leiden Museum and greatly increasing our knowledge of the Suriname mammals. Foremost among these is Dr. D. C. Geijskes, who from 1938 to 1965 resided in Suriname (1938-1952 as entomologist of the Agricultural Experimental Station in Paramaribo, 1952-1954 as Government Biologist, and 1954-1965 as Director of the Surinaams Museum). Dr. Geijskes travelled all over Suriname and made valuable zoological collections most of which are now kept by the Rijksmuseum van Natuurlijke Historie at Leiden. Many of the mammals dealt with here we owe to him, while he also placed his great knowledge of the biology and ecology of the various species at my disposal.

Important material of Suriname mammals was collected for the Chicago Natural History Museum by H. A. Beatty (from 20 August 1960 to 10 February 1962) and by Drs. Philip Hershkovitz and Jack Fooden (from 15 November 1961 to February 1962). I had the privilege to examine these important collections during my 1963 visit to Chicago.

From December 1962 to July 1963, thanks to a grant of the Netherlands Foundation for the Advancement of Research in Surinam and the Netherlands Antilles (WOSUNA), it was made possible for me to visit Suriname and to get a first hand acquaintance with the living mammal fauna. Mr. P. Staffeleu, also of the Rijksmuseum van Natuurlijke Historie, accompanied me and contributed considerably to the success of our Suriname stay. Important collections were brought together and we received much most interesting and useful information concerning Suriname mammals. Later (1 November to 10 December 1972; after having also taken part in the 1971 N.W. Suriname Expedition) Mr. Staffeleu returned to Suriname in an effort to obtain material of species, that were still poorly represented in the available Suriname collections (even some common species were represented by a few mediocre specimens only). This more directed collecting proved to be most rewarding and successful.

Of many of the zoologists who collected in Suriname, biographical data and data



Map 3. Map of the lower Suriname River and adjacent regions. Localities: 1, Groningen; 2, Dirkshoop; 3, Kampongbaroe; 4, Uitkijk; 5, Santigron; 6, Tottiekamp (Toti-kampoe); 7, Bigi Poika; 8, Kwakoeigron; 9, Loksiehatti; 10, Finisanti; 11, Goudplacer; 12, Gros; 13, Garnizoenspad; 14, Pomona; 15, Kwatta; 16, Santo Boma; 17, Lelydorp; 18, Copieweg; 19, Onverwacht; 20, Onoribo; 21, Republiek; 22, Matta; 23, Zanderij; 24, Berlijn; 25, Sectie O; 26, Weg naar Zee; 27, Purmerend; 28, Leonsberg; 29, Clevia; 30, Morgenstond; 31, Ma Retraite; 32, Paramaribo; 33, Meerzorg; 34, Dijkveld; 35, Kasabaholo Creek; 36, Peperpot; 37, Houttuin; 38, Domburg; 39, Paranam; 40, Powakka; 41, Jodensavanne; 42, Blakkawatra; 43, Kraka; 44, Phedra; 45, Berg en Dal; 46, Baboenhol; 47, Brokopondo; 48, Brokobaka; 49, Afobaka; 50, Brownsweg; 51, Abontjima; 52, Kabel; 53, Njoenkondre; 54, Lombé; 55, Ganiakondre; 56, Gansee; 57, Bedoti; 58, Braamspunt; 59, Pomona; 60, Nieuw Amsterdam; 61, Marienburg; 62, Lust en Rust; 63, Alkmaar; 64, Tamanredjo; 65, Kroonenburg; 66, Wederzorg; 67, Alliance; 68, Matapica; 69, Slootwijk; 70, Potribo; 71, Nengrekondre-pepre (Ningripeprekondre); 72, Sapende; 73, Gododrai; 74, Peninika internaat; 75, Moomankondre; 76, Charlottenburg; 77, Bigisanti.

concerning their itineraries and collecting activities can be found in the above cited papers by Holthuis (1959) and Hoogmoed (1973).

In several scientific papers of this period (e.g., Tate, 1939; Sanborn, 1941; Sanderson, 1949) Suriname mammals are mentioned, while also a number of popular accounts provided interesting information. Sanderson's (1939) narrative of his 1938 visit to Suriname belongs in the latter category as does also Walsh & Gannon's (1967) account of the so-called "Operation Gwamba". "Operation Gwamba", which will be frequently referred to in the present work, was a project set up to save the animals inhabiting the area of about 1500 square km which became submerged after the completion in 1964 of the Afobaka Dam in the Suriname River. About ten thousand animals mostly found crowded on small islands or in tree tops were taken from the area and brought to uninhabited higher places near the lake. The authors provide a list of all animals taken and in this way an interesting picture is obtained of the composition of the fauna of the area and the sizes of the populations of the various species. Many species, usually considered rare, turned up in great numbers and proved to be quite common, but they evidently are of such secretive behaviour or living in such unusual or inaccessible habitats that usually they have been overlooked. Wherever in the text reference is made to "Operation Gwamba" the above publication is meant.

A very important, but too little known contribution to the knowledge of the Mammalia of Suriname was given by the brothers F. P. and A. P. Penard, and I want to end this chapter on the history of the research on Suriname mammals by giving special attention and paying a special tribute to these two remarkable pioneers in the present field. Frederik Paul Penard (26 January 1876 - 4 September 1909) and Arthur Philip Penard (6 April 1880 - 12 September 1932) were the sons of Frederik Paul Penard Sr., a well to do merchant of Paramaribo, and his wife Philippina Salomons. In 1889, when Frederik Jr. was 13 years old and Arthur 9, both showed symptoms of lepra and had to leave school. From then the two boys lived in isolation at their home in Paramaribo. Without outside help the older boy taught himself and his younger brother, while their mother encouraged the boys and assisted them to her best ability, kept the outside contacts for them and must have had a most stimulating influence. Their two other brothers Thomas Edward (7 May 1878 - 27 October 1936) and William A. Penard were not affected by the disease and both went at an early age to the United States. Thomas Edward arrived there in 1891, when he was 13, and got his education there; he became a prominent engineer, and was also well known as an amateur ornithologist (for a biography see Peters, 1937: 232-234). Both Frederik and Arthur developed a great interest in natural history and ethnology and around 1896 they started a natural history collection, mostly of birds and birds eggs. Since they could not leave home, all their material was obtained from hunters and fishermen, mostly Amerindians. In 1899 the two brothers decided to write a book on the ornithology of the Guianas. The actual writing of it was mainly, or exclusively, done by Frederik; Arthur maintained the

contact with the hunters and fishermen and for this purpose learned the languages of the Indians that brought them their specimens. In this way Arthur obtained much field information of the species, which information was used in their book. Arthur also supervised the preparation of the bird skins, and made the necessary notes on them to be used by Frederik in his text. By selling their collection of bird skins (to the Rothschild collection) they obtained the necessary funds to publish the first volume of their "De Vogels van Guyana" (in April 1908). Through the untiring efforts of Dr. F. A. Jentink, director of the Rijksmuseum van Natuurlijke Historie at Leiden, and his curator of birds Dr. E. D. van Oort, and with the financial aid of numerous Dutch amateur ornithologists, the second volume was published in 1910. The two brothers were also much interested in ethnology and Arthur's knowledge of the Indian languages made it possible for them to obtain very important information, which they published in a number of books and articles.

It was little known that the boys had also done their share in mammological research, and even planned the publication of a book on the "Mammals of Suriname". The history of this book, which unfortunately never was published as such, is the following. In 1905 and 1906 "De Surinamer" a "nieuws- en advertentieblad" (newspaper and advertiser), which was issued twice a week in Paramaribo, published a series of articles under the title "Grepn uit de Natuurkunde van Suriname. Bijeengebracht uit talrijke wetenschappelijke werken en lokaal-beschrijvingen van Jagers, Visschers enz. door X" (Some aspects of the natural history of Suriname. Brought together from numerous scientific publications and local descriptions by hunters, fishermen, etc. by X). The pseudonym X proved to stand for the brothers F. P and A. P. Penard. The articles are numbered 1 to 91 and the first 57 deal with Mammalia; in the remaining articles the reptiles are treated, but the reptile text is interrupted by a general description of the ecology of the country and of the influence of the seasons (articles 79 to 86). The series extended from 1 January 1905 to 9 December 1906, and appeared in vols. 12 and 13 of "De Surinamer". A complete collation with indication of the dates of publication of the various articles is given in the bibliography at the end of this book.

In a letter dated 5 November 1909 Mrs. Penard, who was widowed by then, approached Dr. E. D. van Oort, curator of birds of the Leiden Museum, asking whether there would be any possibility to have the "Grepn uit de Natuurkunde" published in book-form as 'it can be considered to be the most complete account so far written about Suriname zoology'¹ (the word "zoology" probably stands here for "mammalogy"). At that time Frederik had just died, and Van Oort and Jentink had succeeded to get the second volume of "De Vogels van Guyana" accepted for publication. Evidently Van Oort's answer to Mrs. Penard was positive as she wrote him (28 December 1909): 'It is with pleasure that I see from your letter of 1 December, that you will try to find a publisher for the zoological work

¹ This quotation is translated from the Dutch; here, and in the rest of the text, these translated quotations are placed in single quotation marks, straight quotations in double marks.

of my sons. Copies of "De Surinamer", the newspaper in which this work appeared in serial form, cannot be obtained anymore. However, the cuttings of these articles, which have been brought up to date and are now in shape to be published as a book, at present are in the possession of my son Thos. E. Penard, 32 Irvingstreet, Everett, Mass., U.S.A.; they will soon be sent to you. In case the work cannot be published, would you then be so kind to return the manuscript, as I do not have a duplicate'. The next item is a letter (in English) sent to Dr. van Oort by Thomas E. Penard and dated Everett, Feb. 15, 1910; its contents is as follows:

"Dear Sir. I am sending to you, registred under separate cover, the manuscript of 'De Zoogdieren van Guyana' [The mammals of Guyana], concerning which my brother [error for: mother] has already written you and for which you believe you may be able to find a publisher providing the material should warrant it.

In your letter of Dec. 1, 1909 addressed to my mother, you ask for the original papers in which portions of the subject have already appeared. These, however, have been used in the preparation of the manuscript and it is now impossible to obtain duplicates of them. We have no other copies in the family. I would ask you, therefore, to return the original manuscript to me in case you decide not to publish it. I would ask you, also, to return the manuscript to me in case you do publish it, if this request be not entirely unreasonable. My intense interest in my brothers' work leads me to make the above request; I should like to keep the original manuscript as a personal souvenir.

I have delayed in sending the manuscript to you directly upon receiving instructions to do so, because I wished to copy certain portions which appeared to me most valuable, to guard against possible loss through the mails. The manuscript has been carefully disinfected.

Kindly inform me what course you adopt, and let me know if I can render any further assistance. Yours respectfully, Thomas E. Penard"

Thereupon Drs. Jentink and Van Oort got in touch with at least two Dutch publishers: Martinus Nijhoff in The Hague (who had already published the bird book of the Penards), and W. Versluys in Amsterdam, a well known publisher of popular natural history literature of high quality. Nijhoff on 30 June 1910 wrote Dr. Jentink, informing him that as soon as the bird book of the Penards was published he would consider the possibility to publish the volume on mammals as a sequel to it, while Mrs. Penard in a letter to Dr. van Oort, dated 12 November 1910, wrote: 'Mr. Nijhoff informed me that he considers the publication of the manuscript concerning the mammals, in case the sale of the bird books is favourable'. Among the records of the Leiden Museum is a letter from the publishers W. Versluys to Dr. van Oort, dated Amsterdam 20 April 1910, stating that they would like to see the manuscript of the mammal book before giving any opinion as to the possibility of publishing it. However, as the subject of the book was of such a restricted interest, they were afraid that not much could be paid for it; perhaps a serial publication in their journal "De Levende Natuur" could be considered, after which the full text perhaps could be issued in book-form. No further correspondence on the subject can be found, but it seems likely that both publishers finally turned the manuscript down, as the book was never published. The manuscript was probably returned to either Thomas Edward or to Mrs. Penard; the latter died in Paramaribo on 24 December 1926, 76 years old. The manuscript was said to be kept by Arthur Penard and after

his death in 1932 went to the youngest of the four Penard brothers, William. This manuscript, which consists of a number of school exercise books, in which the cuttings are pasted in, was finally donated by William Penard to Frater Abbenhuis, a roman catholic priest, who deposited it in the library of the home of the roman catholic friars in Paramaribo. It was used by the teachers of the roman catholic schools in Paramaribo for their biology courses. When I was in Paramaribo in 1963, I consulted this manuscript and made two photocopies of it, both of which are now in the Rijksmuseum van Natuurlijke Historie, Leiden. There is also a bound photocopy in the Library of the Surinaams Museum, thanks to the good offices of Mr. F. Haverschmidt. A complete set of "De Surinamer" in the roman catholic episcopal archives in the Bisschopshuis, Gravenstraat, Paramaribo, made it possible for me to obtain all the bibliographic information of the various articles, given here in the bibliography (pp. 542, 543).

The articles by the brothers Penard are of varying quality and the information contained in them must be treated with some reserve, but much is very valuable, although often in need of verification. It is amazing that two young men in these extremely difficult circumstances, isolated from the rest of the world, with a sick body and no hope for a better future, still had the energy, interest, and strength of mind to undertake these extremely difficult projects and to succeed so well. Some of the casual remarks in the letters of Mrs. Penard show, better than an extensive description, the terrible and heart-rending situation in which they lived, e.g., in her letter of 12 November 1910 answering Dr. van Oort's request for material of bird skins. She wrote then: 'To my great regret I have to inform you that my son [i.e., Arthur; Frederik had died about a year ago] who should have to supervise the preparation of the skins requested by you, cannot do so anymore because of the loss of his eyesight'. Mrs. Penard, who did all the correspondence for her sons, must have been an exceptional woman, to whom, very deservedly, the two brothers dedicated their bird book.

In the present work I have rather freely cited from the Penards' articles referring to each with the date of publication. In order to make these citations less cumbersome, I have only given their free English translation (in single quotation marks) and refrained from citing the original Dutch text.

A biography of the brothers Penard was published by Haverschmidt (1949).

NATURE PROTECTION, HUNTING AND PEST CONTROL IN SURINAME

Until 1954 no official measures were taken in Suriname to protect its fauna. In that year an ordinance was published (*Gouvernementsblad van Suriname*, 1954 no. 25) regulating the protection, hunting and selling of animals and animal products. This ordinance is still in force at present. Article 1 indicates that in Suriname all feral mammals, birds and turtles are fully protected with the exception of two categories, viz., the 'game animals' and the 'predominantly harmful animals'.

Article 6 rules that the species belonging to these two categories will be indicated by decree. The first such decree was published in 1955 and it has been revised several times since. The latest decree, which is still in force today, is the one of 1 October 1970, published in the *Gouvernementsblad van Suriname*, 1970 no. 104. In Article 2 sub 1a it lists the following animals as 'game animals' in the meaning of Art. 1 of the Ordinance:

'Boshert or pranasai-dia or prasara-dia (*Mazama americana*);
 Haas or Hé (*Agouti paca*);
 Jaguar (*Panthera onca*);
 Kapasi or lontoetere or gordeldier (*Dasybus novemcinctus* and *Dasybus kappleri*);
 Kesi-kesi (*Cebus apella apella*);
 Klein boshert or koeriakoe or boesikrabita (*Mazama gouazoubira*);
 Konijn or koni-koni or agoeti (*Dasyprocta cayanus*);
 Pakira (*Tayassu tajacu*);
 Pingo (*Tayassu pecari*);
 Tapir or buffel (*Tapirus terrestris*);
 Waterhaas or kapoewa (*Hydrochaeris hydrochaeris*);
 Zeehert or savanna-hert (*Odocoileus virginianus*)'.

Article 2 sub 2a lists the following mammals as 'predominantly harmful species':

'Aira (*Eira barbara*);
 Awari or grote buidelrat (*Didelphis marsupialis*);
 Bloedzuigende vleermuis (*Desmodus rotundus*);
 Huismuus or moismoisi (*Mus musculus*);
 Huisrat (*Rattus rattus*);
 Mongoes or fret (*Herpestes auropunctatus*);
 Rioolrat (*Rattus norvegicus*);
 Stadsrat (*Rattus alexandrinus*)'.

The same decree indicates that hunting is permitted from 1 May to 31 December on all mammals of the category 'game animals', with the exception of the Jaguar (*Panthera onca*), which may be hunted throughout the year. Hunting for game animals and killing predominantly harmful animals is only allowed with a special government permit.

Article 5 of the decree of 1970 states that the Game Ordinance 1954 is in force only for the area in the northern part of Suriname shown on map 2. In the southern part of the country hunting is free.

Schultz (1971) extensively dealt with the Suriname nature reserves and nature parks.

ACKNOWLEDGEMENTS

I am most indebted to the directors and curators of the museums listed on p. xxi for allowing me to study mammal specimens, mainly from Suriname, present in the collections under their care. The study of this material not only contributed to a better understanding of the occurrence of various species in Suriname, but also made it possible to solve some problems in the fields of taxonomy and nomenclature. During my visit to the Field Museum at Chicago in 1963, I discussed several problems

with Dr. P. Hershkovitz, Research Curator of Mammals, who allowed me also to study the extensive material of Suriname mammals collected by him in 1961 and 1962 (Hershkovitz, 1962). Dr. P. J. H. van Bree, Curator of Mammals of the Zoological Museum in Amsterdam, kindly placed at my disposal the collections of Suriname mammals obtained by that museum in recent years, and was most helpful also in other respects.

Dr. D. C. Geijskes, formerly Director of the Surinaams Museum, provided the greater part of the material used in the present study. He was the one who stimulated my work on the Suriname mammals and without his insistence I would never even have begun the present project. Throughout my work he has given me advice and information, and urged me on.

Very important Suriname material was placed at my disposal by the following of my colleagues, who collected in Suriname during longer or shorter periods (indicated in parentheses behind their names); in many instances they provided me with most valuable specimens, several belonging to species not before reported from Suriname: Dr. M. Boeseman (13 November 1963 - 4 October 1964, 19 January - 26 April 1971), Dr. P. H. van Doesburg (April 1957 - April 1963, November - December 1968), Dr. M. S. Hoogmoed (24 April - 20 November 1968, 10 January - 18 February 1970, 26 September 1974 - 27 November 1975), Dr. G. F. Mees (8 March 1965 - 13 April 1966, 15 November 1971 - 15 November 1972). The important collections obtained by Mr. P. Staffeleu have already been mentioned on p. xxvi. Dr. F. Lukoschus of the University of Nijmegen, between July and October 1971 collected mammals in Suriname for his parasitological researches; his collection contained many interesting specimens, especially among the Chiroptera, his specimens are now in the Leiden Museum.

Mr. J. Schouten, chief of the technical staff of the Mammal Division of the Rijksmuseum van Natuurlijke Historie, is mainly responsible for the efficient and excellent way in which the collected material was made available for study; he helped me also in many other respects for which I am most grateful. I am likewise much indebted to Mr. D. G. Reeder, who not only, during his stay in Suriname, collected several of the specimens treated here, but also, after he joined the technical staff of the Mammal Division, took care of the preparation and administration of part of the Suriname material.

During my stay (1962-1963) in Suriname, which was made financially possible by a generous grant from the Netherlands Foundation for the Advancement of Research in Surinam and the Netherlands Antilles (WOSUNA) (later named Netherlands Foundation for the Advancement of Tropical Research, WOTRO), many people greatly facilitated my work there. Among these persons I should like to mention Ir. P. G. de Boer, Director of the "Stichting voor de Ontwikkeling van Machinale Landbouw in Suriname" (the so-called Wageningen rice-project); Mr. P. J. Bolwerk, Head of the Archeological Service, Surinaams Museum; the late Father A. Donicie, C.S.S.R., Director of the Peninika Boardingschool in the upper

Commewijne area; Mr. Jimmy Douglas, at the time District Commissioner of the Commewijne District; Dr. H. Kuil and Dr. E. Hooghiemstra, Directors of the Veterinary Service; Prof. Dr. E. van der Kuyp, Director of the Bureau for Public Health (B.O.G.); Ir. H. E. Lionarons, Director of the Fishery Service; Ir. J. Samson, formerly Director of the Agricultural Experimental Station, Paramaribo; Ir. G. P. Tiggelman, Director of Agriculture; Ir. P. J. D. Versteegh, Director of the Forestry Service; and the Direction of the Suriname Airlines Company (S.L.M.). It is impossible to mention all the others, who helped me in some way or other and made my stay in Suriname such a pleasant and successful one.

With utmost gratitude I mention here the stimulating collaboration generously and profusely rendered by my colleague, Prof. Dr. L. B. Holthuis, during the many years of preparing this publication. His patience and expert advice (especially though not exclusively on nomenclatorial matters), as well as his willingness to condense my 1962 thesis into the present chapter on Chiroptera, were crucial for the publication of this work in its present form.

I should like to end this chapter with expressing my deep gratitude to the late Prof. Dr. H. Boschma, to whom this book is dedicated, for his advice, moral support and guidance throughout this study and for critically reading the manuscript. Without his always freely given and stimulating help this book would never have been realized.

CLASS MAMMALIA

In the present publication the classification and the arrangement of the orders, families, genera and species mainly corresponds with the 1958 and 1961 check-lists of the South American mammals by Cabrera. According to Cabrera twelve mammalian orders occur in South America, eleven of which have representatives in the fauna of Suriname. The Insectivora, namely, do not occur in Suriname, as their distribution in South America is restricted to the north-easternmost part of the continent.

In some respect, however, Cabrera's classification needs emendation, partly in the light of more recent revisions of some groups, partly as a consequence of changed views. So Cabrera (1958: 228-306) and many other authors recognized two suborders of the Carnivora: the Fissipedia (adapted to terrestrial life) and the Pinnipedia (seals and walruses, adapted to aquatic life). The two suborders are now generally regarded as separate orders, the order Carnivora as equivalent to the former suborder Fissipedia, and the order Pinnipedia, equivalent to the former suborder of that name; the two groups not being considered closely related (see Anderson & Jones, 1967). To my knowledge there are no records of Pinnipedia from the coast or the nearby open sea of the Guianas.

It has also been customary to divide the order Cetacea (whales and dolphins) into two suborders, the Odontoceti (toothed whales) and the Mysticeti (baleen whales). Recent authors have defended the view that these suborders should be assigned the rank of full orders.

In previous classifications, the hares and rabbits were included as a suborder in the order Rodentia, under the name Duplicidentata (rodents with four upper incisors); the other suborder was the Simplicidentata (rodents with two upper incisors). In recent years it has become evident that the hares and rabbits must form a separate order, the Lagomorpha, distinct from the order Rodentia. This procedure was also followed by Cabrera (1961: 344, 353).

Each order comprises one or more families, genera and species, the number of which varies considerably, not only in the different parts of South America but also in Suriname.

In the following key to the Suriname mammalian orders, only those characters are used, which in my opinion can be easily observed. These characters are only of importance to separate the forms occurring in Suriname, so that the key must be used with some reserve if consulted for mammals from the other South American countries. The same applies to the other keys in the present work.

Key to the orders of the mammals of Suriname

- 1a. Front limbs modified for flying. Bones of hand and fingers greatly elongated; wing membranes attached to the sides of the body and the hind limbs (text-figs. 1d, 5a) Chiroptera (bats), p. 41
- b. Front limbs not modified for flying 2

- 2a. Front limbs modified to fin-like appendages; hind limbs lacking. Tail short, horizontally flattened (pl. 141). Animals exclusively aquatic 3
 b. Not as in 2a 4
- 3a. Tail with a rounded posterior margin (pl. 90) . . . Sirenia (manatees), p. 334
 b. Tail laterally expanded into two pointed flukes (pl. 141)
 Cetacea (whales and dolphins), p. 513
- 4a. Dorsal surface of head, body and tail covered with a bony carapace or armour (frontispiece, pl. 60) . Edentata, family Dasypodidae (armadillos), p. 236, 253
 b. Not as in 4a 5
- 5a. Upper and lower jaws wholly toothless (pls. 62, 63); mouth tubular with small terminal opening (pl. 55)
 Edentata, family Myrmecophagidae (anteaters), p. 236, 239
 b. Not as in 5a 6
- 6a. Upper incisors absent (pls. 64, 99-103) 7
 b. Upper incisors present 8
- 7a. Pelage long and crisp; hind foot with three long claws (pls. 58, 59)
 Edentata, family Bradypodidae (sloths), p. 236, 247
 b. Pelage short; hind foot (and forefoot) with hoofs
 Artiodactyla, family Cervidae (deer), p. 345, 356
- 8a. Canines absent; incisors strongly enlarged and chisel-like (text-fig. 40) 9
 b. Canines present, longer than the incisors (text-fig. 2) 10
- 9a. Number of incisors of the upper jaw 4, the second pair much reduced, directly behind the first pair. Hind foot densely haired, with three toes (pl. 106 fig. 5)
 Lagomorpha (hares and rabbits), p. 369
 b. Number of incisors in the upper jaw 2. If the hind foot has three toes, it is not densely haired Rodentia (rodents), p. 372
- 10a. Tail reduced, very short. 11
 b. Tail distinct and long, or short and densely haired 12
- 11a. Pig-like animals. Hind limbs with three toes. Length of head and body up to about 90 cm Artiodactyla, family Dicotylidae (peccaries), p. 345, 347
 b. Upper lip and nostrils elongated into a short muscular proboscis (pl. 92). Length of head and body up to about 180 cm
 Perissodactyla, family Tapiridae (tapirs), p. 340
- 12a. Rat- or mouse-like animals. Total number of the small upper incisors 10, that of the lower incisors 8 (text-fig. 2c) Marsupialia (marsupials), p. 4
 b. Animals not rat- or mouse-like 13
- 13a. Total number of upper as well as lower incisors 4 (text-fig. 2a). Front limbs and hind limbs elongated Primates (monkeys), p. 206
 b. Total number of upper as well as lower incisors 6 (text-fig. 2b); the outer incisors are largest, the inner smallest, at least in the upper jaw
 Carnivora (carnivores), p. 267

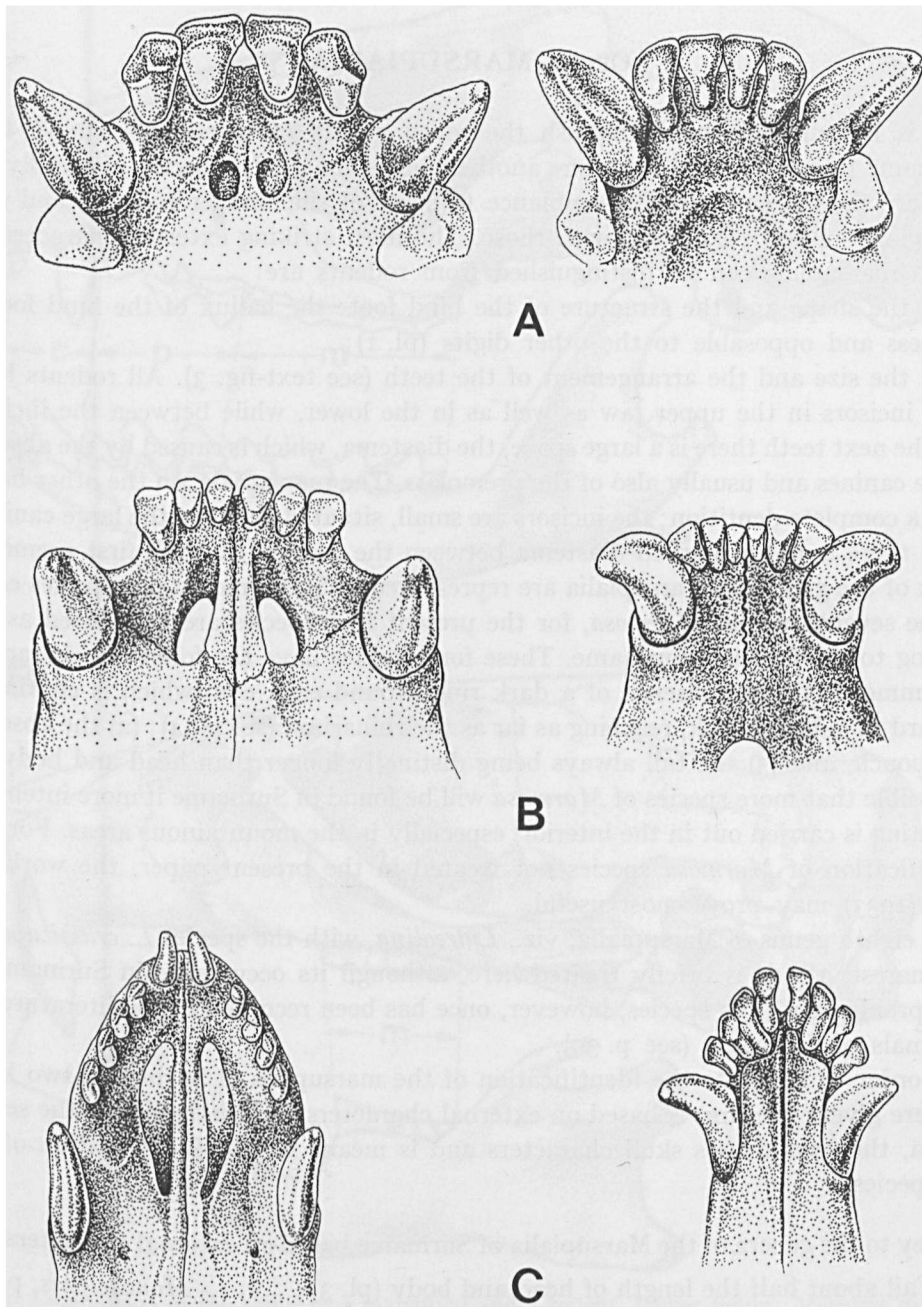


Fig. 2. Incisors and canines in upper (left figures) and lower (right figures) jaws in Primates, Carnivores and Marsupials. A, *Cebus apella apella* (Linnaeus); B, *Leopardus pardalis melanurus* (Ball); C, *Metachirops opossum opossum* (Linnaeus).

ORDER MARSUPIALIA

It is not difficult to distinguish the seven genera of marsupials known from Suriname (see plates 2-7) from one another, but some of the species, especially the smaller, show a superficial resemblance to some of the smaller rodents, and at a first glance may be confused with those. The most striking external characters in which marsupials can be distinguished from rodents are:

(1) the shape and the structure of the hind foot: the hallux of the hind foot is clawless and opposable to the other digits (pl. 1);

(2) the size and the arrangement of the teeth (see text-fig. 3). All rodents have large incisors in the upper jaw as well as in the lower, while between the incisors and the next teeth there is a large space, the diastema, which is caused by the absence of the canines and usually also of the premolars. The marsupials, on the other hand, have a complete dentition; the incisors are small, situated between the large canines, while there is not a marked diastema between the canines and the first premolar.

Six of the genera of Marsupialia are represented in Suriname by one species each. Of the seventh genus, *Marmosa*, for the present four species are recognized as belonging to the fauna of Suriname. These four species have the following characters in common: (1) the presence of a dark ring around each eye, which is continued forward as a dark streak, reaching as far as the rhinarium (see pl. 4); (2) the absence of a pouch, and (3) the tail always being distinctly longer than head and body. It is possible that more species of *Marmosa* will be found in Suriname if more intensive collecting is carried out in the interior, especially in the mountainous areas. For the identification of *Marmosa* species not treated in the present paper, the work by Tate (1933) may prove most useful.

An eighth genus of Marsupialia, viz., *Lutreolina*, with the species *L. crassicaudata* (Desmarest, 1804), is briefly treated here, although its occurrence in Suriname is very problematic; the species, however, once has been recorded in the literature on mammals of Suriname (see p. 39).

In order to facilitate the identification of the marsupials of Suriname, two keys are here given: the first is based on external characters and distinguishes the seven genera, the second uses skull characters and is meant for the identification of all the species.

Key to the genera of the Marsupialia of Suriname based on external characters

- 1a. Tail about half the length of head and body (pl. 3) *Monodelphis*, p. 11
- b. Tail equal to, slightly shorter, or distinctly longer than head and body 2
- 2a. Fur of the back with large dark and light areas. Toes of hind feet webbed (pl. 7)
Chironectes, p. 36
- b. Fur of the back of a uniform colour. Toes of hind feet not webbed 3

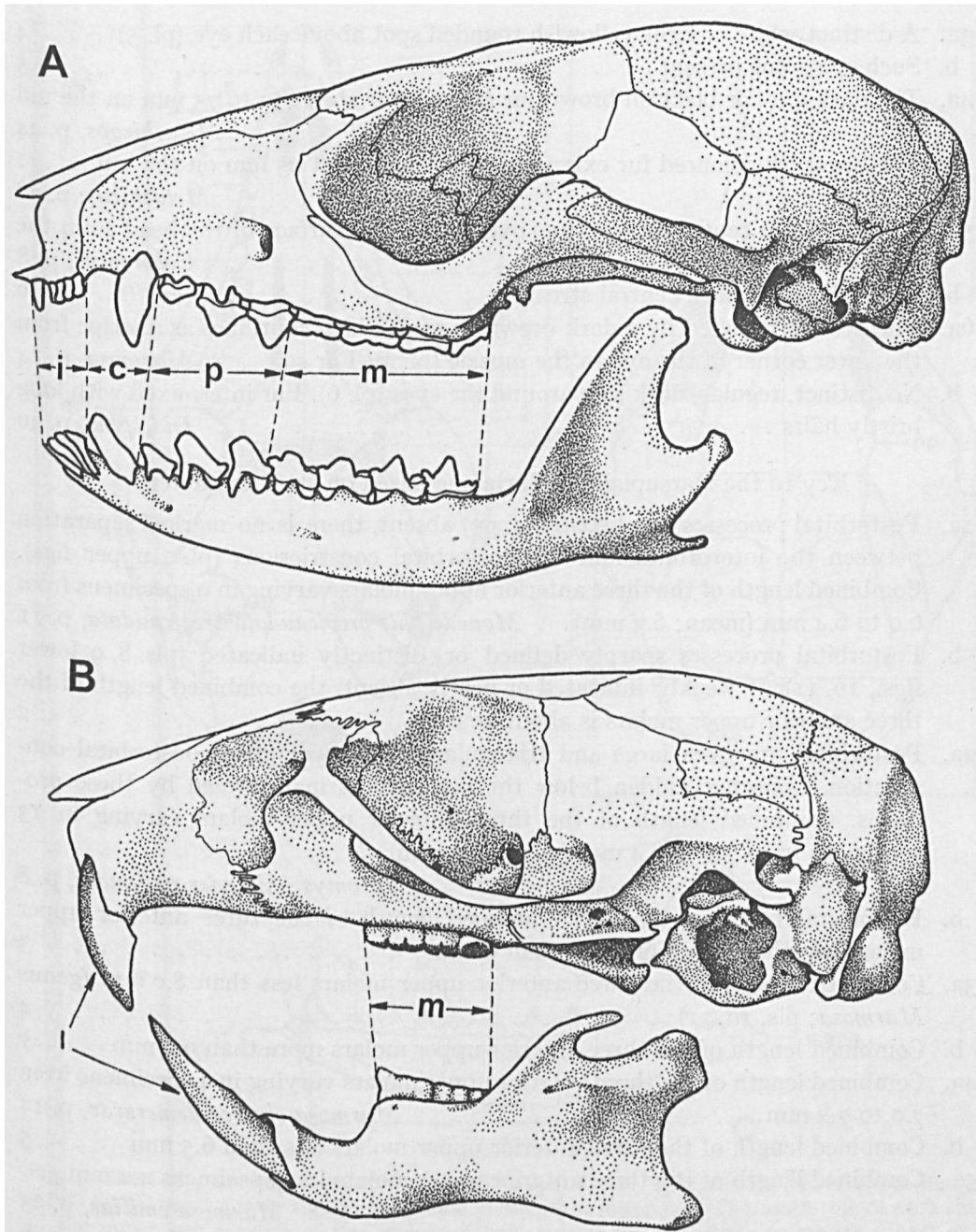


Fig. 3. Comparison of the skulls of a marsupial and a rodent. Upper figure: *Marmosa murina murina* (Linnaeus); lower figure: *Zygodontomys brevicauda microtinus* (Thomas). Both figures in left side view; c, canine; i, incisors; m, molars; p, premolars.

- 3a. A distinct white or light yellowish rounded spot above each eye (pl. 5) . . . 4
 b. Such spots not present 5
- 4a. The dark grey or blackish brown fur extends for about 50 to 75 mm on the tail
Metachirops, p. 24
 b. The brownish coloured fur extends at most for about 25 mm on the tail . . .
Metachirus, p. 28
- 5a. A dark brown central streak runs over the dorsal surface of the head from the
 muzzle to between the ears (pl. 2) *Caluromys*, p. 8
 b. Face without a dark central streak 6
- 6a. The eyes surrounded by a dark brownish ring, which continues as a stripe from
 the lower corner of the eye to the muzzle (pl. 4). Fur soft . . *Marmosa*, p. 14
 b. No distinct, regular, dark ring around the eyes (pl. 6). Fur intermixed with long
 bristly hairs *Didelphis*, p. 30

Key to the Marsupialia of Suriname based on skull characters

- 1a. Postorbital processes (see text-fig. 4, pp) absent, there is no marked separation
 between the interorbital and the postorbital constrictions (pl. 9 upper figs).
 Combined length of the three anterior upper molars varying in 9 specimens from
 6.0 to 6.4 mm (mean: 6.3 mm) . . *Monodelphis brevicaudata brevicaudata*, p. 11
 b. Postorbital processes sharply defined or distinctly indicated (pls. 8, 9 lower
 figs., 10, 11); if weakly indicated or nearly absent, the combined length of the
 three anterior upper molars is about 10 mm 2
- 2a. Postorbital processes large and triangular (pl. 8 lower figs.); postorbital con-
 striction somewhat hidden below the posterior carinae formed by these pro-
 cesses. Combined length of the three anterior upper molars varying in 13
 specimens from 7.8 to 8.4 mm (mean: 8.1 mm)
Caluromys philander philander, p. 8
 b. Postorbital processes smaller. Combined length of the three anterior upper
 molars less than 8 mm or more than 9 mm 3
- 3a. Combined length of the three anterior upper molars less than 8.0 mm (genus
Marmosa; pls. 10, 11) 4
 b. Combined length of the three anterior upper molars more than 9.0 mm . . . 7
- 4a. Combined length of the three anterior upper molars varying in 4 specimens from
 7.0 to 7.2 mm. *Marmosa cinerea demerarae*, p. 14
 b. Combined length of the three anterior upper molars less than 6.5 mm . . . 5
- 5a. Combined length of the three anterior upper molars in 2 specimens 4.2 mm . .
Marmosa emiliae, p. 23
 b. Combined length of the three anterior upper molars more than 4.5 mm . . . 6
- 6a. Combined length of the three anterior upper molars varying in 16 specimens
 from 5.2 to 6.1 mm (mean: 5.6 mm) *Marmosa murina murina*, p. 18
 b. Combined length of the three anterior upper molars varying in 5 specimens from
 4.7 to 5.2 mm (mean: 5.0 mm) *Marmosa lepida*, p. 16

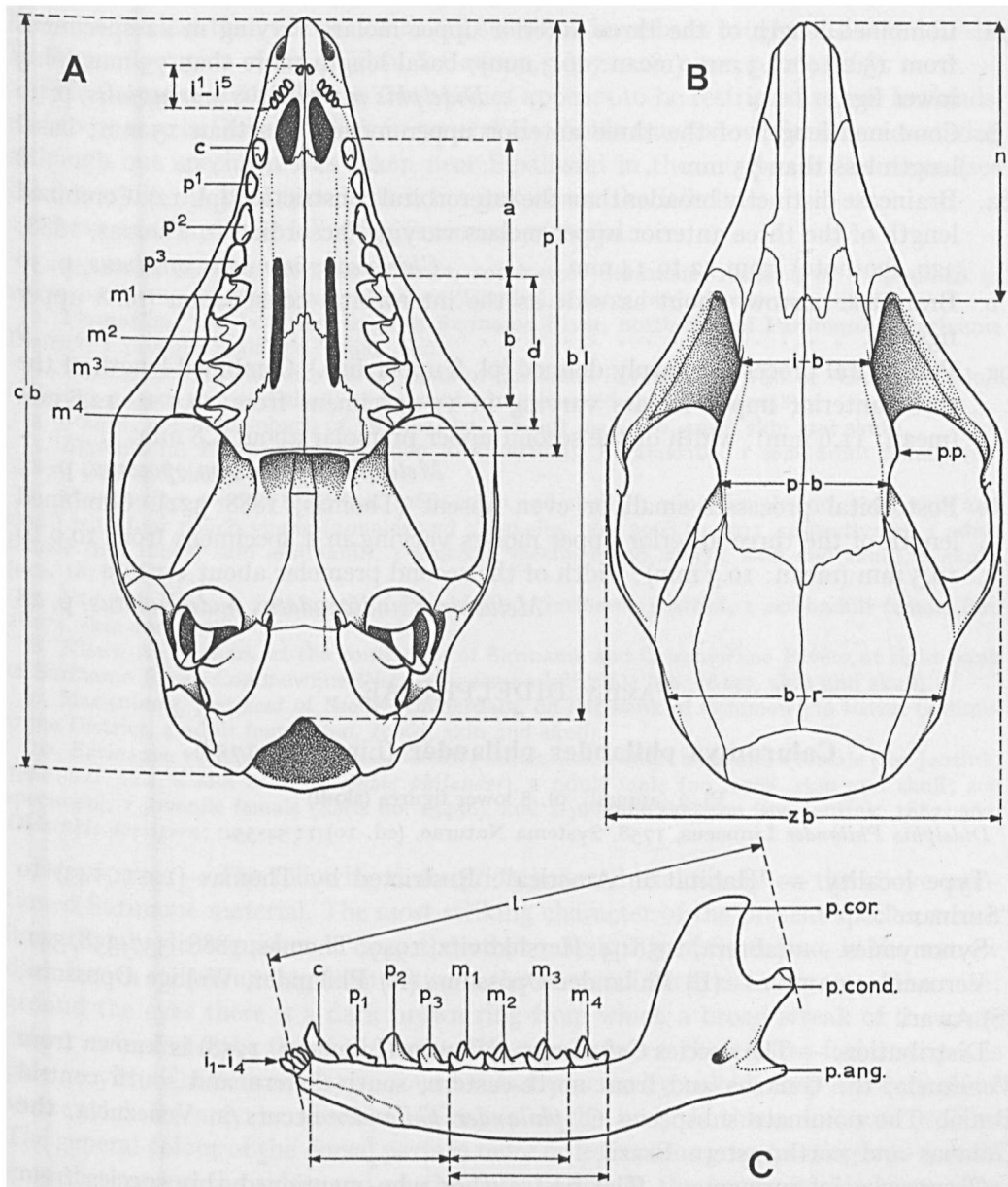


Fig. 4. Skull of a marsupial (*Marmosa* spec.). Upper figure, left: ventral view; upper figure, right: dorsal view. Lower figure: inner side of the right lower jaw. The tooth-row of each side of the upper jaw consists of five incisors (i^1 - i^5), one canine (c), three premolars (p^1 - p^3) and four molars (m^1 - m^4); that of the lower jaw has four incisors, one canine, three premolars and four molars, respectively. — a, distance between the anterior border of the alveole of the canine to the posterior border of the third premolar; b, length of the first three molars together; bl, basal length; br, breadth of braincase; cb, condylobasal length; d, length of the four molars together; ib, interorbital constriction; l, length of mandible; n, length of nasals; p. ang., processus angularis; pb, postorbital breadth; p. cond., processus condylicus (= proc. articularis); p. cor., processus coronoideus (= proc. muscularis); pl, palatal length; pp, processus postorbitalis; zb, zygomatic breadth.

- 7a. Combined length of the three anterior upper molars varying in 22 specimens from 15.2 to 17.3 mm (mean: 16.3 mm); basal length more than 75 mm (pl. 9 lower figs.) *Didelphis marsupialis marsupialis*, p. 30
- b. Combined length of the three anterior upper molars less than 15 mm; basal length less than 75 mm 8
- 8a. Braincase distinctly broader than the interorbital constriction (pl. 12). Combined length of the three anterior upper molars varying (according to Thomas, 1888: 320, footnote) from 12 to 14 mm *Chironectes minimus minimus*, p. 36
- b. Braincase narrow, about as wide as the interorbital constriction (pl. 8 upper figs.) 9
- 9a. Postorbital processes sharply defined (pl. 8 upper figs.). Combined length of the three anterior upper molars varying in 17 specimens from 10.5 to 12.8 mm (mean: 11.6 mm); width of the second upper premolar about 1.8 mm *Metachirops opossum opossum*, p. 24
- b. Postorbital processes small or even absent (Thomas, 1888: 321). Combined length of the three anterior upper molars varying in 4 specimens from 10.0 to 10.5 mm (mean: 10.3 mm); width of the second premolar about 1.1 mm *Metachirus nudicaudatus nudicaudatus*, p. 28

FAMILY DIDELPHIDAE

Caluromys philander philander (Linnaeus, 1758)

Pl. 2 (animal), pl. 8 lower figures (skull)

Didelphis Philander Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 54-55.

Type locality. — "Habitat in America". Restricted by Thomas (1911: 143) to "Surinam".

Synonymies. — Cabrera, 1958: 4; Hershkovitz, 1949; Thomas, 1888: 337-338, 341.

Vernacular names. — (E) Philander Opossum; (N) Philander, Wollige Opossum; (S) Awari.

Distribution. — The species *Caluromys philander* (Linnaeus, 1758) is known from Venezuela, the Guianas and from north-eastern, south-eastern and south central Brazil. The nominate subspecies *C. philander philander* occurs in Venezuela, the Guianas and north-eastern Brazil.

Occurrence in Suriname. — The first author who mentioned this species from Suriname was Fermin (1765: 26), who reported it under the name "Rat de Bois, nommé *Mus major agrestis capite grandi*". Temminck (1824 (1): 43-46) based his description of *Didelphis philander* exclusively on Suriname material. Lammens (1844: 95) mentioned the occurrence of the species in Suriname, but stated: "Man sieht dieses Thier selten". Thomas (1888: 338) dealt with a Suriname specimen of which the exact locality is not known. The Penard brothers ("De Surinamer", 11 January 1906) indicated the species as quite rare in Suriname. During the Operation Gwamba,

however, no less than 28 specimens are stated to have been caught and saved in the Brokopondo region alone (Walsh & Gannon, 1967: 218, also pp. 167, 168).

Tate (1939: 163) noted that "the species appears to be restricted to the lowlands, and to be rare in Guiana". This in general also holds true for our Suriname material, although one specimen was taken near Sipaliwini in the interior of Suriname (see below), while the Brokopondo area lies just above the falls line.

I have examined the following Suriname material:

1. Sipaliwini airstrip, Nickerie District, south-west Suriname, remains of a specimen in stomach contents of *Morphnus guianensis* (Daudin), a large bird of prey (no. 19646).
2. Plantation "Clevia", west bank of Suriname River, north-east of Paramaribo, Suriname District, 1 juvenile male (no. 22084, skin).
3. Plantation "Ma Retraite", west bank of Suriname River, south-west of "Clevia", 1 adult male (no. 10790, skin and skull) and 1 semi-adult unsexed skull (no. 17258).
4. Combé, northern suburb of Paramaribo, 1 adult male (no. 3916, skin and skull).
5. Agricultural Experimental Station (Cultuurtuin), Paramaribo, 1 semi-adult female (no. 18173, skin and skull).
6. Paramaribo, 1 adult male (no. 12866, skin and skull), 1 adult female (no. 3967, skin and skull) with four pouch young (2 males and 2 females, nos. 3968 to 3971, respectively), 1 adult female (no. 18025, skin and skull), 1 unsexed specimen (no. 22573, skin and skull), 2 skulls (nos. 18171, 18172).
7. Pad van Wanica, just south of Paramaribo, Suriname District, 1 semi-adult female (no. 18174, skin and skull).
8. Nieuw-Amsterdam, at the confluence of Suriname and Commewijne Rivers, at right bank of Suriname River, Commewijne District, 1 semi-adult male (no. 16227, skin and skull).
9. Marienburg, just east of Nieuw-Amsterdam, on left bank of Commewijne River, Commewijne District, 1 adult female (no. 20664, skin and skull).
10. Suriname, without more precise locality indication, 1 adult male and 1 female (see Jentink, 1888: 221, nos. a and b of *Didelphis philander*), 1 adult male (no. 1768, skin and skull; zoo specimen), 1 juvenile female (ZMA no. 15456), and 1 juvenile skeleton (see Jentink, 1887: 302, *Didelphis dorsigera*; no. 12871).

Description. — The following description is based exclusively on the above mentioned Suriname material. The most striking character of the present species, which immediately distinguishes it from the other marsupials of Suriname, is the narrow dark brown stripe running from between the ears and the eyes to the tip of the nose; around the eyes there is a dark brown ring from which a broad streak of the same colour extends to the tip of the nose. The area between these three facial stripes is pale greyish. The ears are large, rounded and practically naked, only few very short scattered hairs may be observed. The fur of the body is thick, soft and woolly. The general colour of the dorsal parts is more or less rufous grey, passing into a more greyish tinge on the sides, and on the dorsal parts of the front and hind legs. The ventral surface of the body is yellowish or orange yellowish, sometimes with a shade of grey, the line of demarcation on the sides being more or less obsolete. The woolly fur of the body extends on the tail for about 50 to 70 mm; this hairy part ends abruptly. The rest of the tail is naked; proximally this naked part is of a dark brown colour, farther on it shows a mottling of white and dark brown spots, while terminally the tail is whitish or light yellowish. The tail is always longer than the head and body together.

Dental formula: $I \frac{5}{4}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{4}{4}$. The first upper premolar is very small and placed directly behind or almost against the canine, usually it does not reach the level of the cingulum of the second premolar; a distinct diastema is present between the first premolar and the much larger second premolar. The third premolar is a little smaller than the second. The skull of this species may easily be distinguished from those of the other Suriname marsupials by the strongly developed post orbital processes, which are triangular with a truncated tip, and which posteriorly continue in a blunt carina extending above the postorbital constriction; the latter thereby is not distinctly visible in dorsal view (pl. 8 lower figs.). Like in all other Suriname marsupials the nasalia are rather narrow in front, widening rather strongly in the posterior third to become narrow again farther back. The mandible of all Suriname marsupials shows the same general shape: the processus coronoidea is very high and broad, and reaches far beyond the processus condylicus; the anterior part of the mandible is low and of about the same height throughout.

The following measurements are those of two adult females of which all upper molars are present and functional, viz. no. 20664 from Marienburg and no. 18025 from Paramaribo, respectively: head and body, 245, 258; tail, 362, 317; hind foot, 39, 42; ear, 35, 37 mm; weight, unknown, 350 grams. In Table 1 skull measurements of 10 adult specimens with complete dentition are noted; the length of the mandible as given there is the distance between the anteriormost point of the mandible to the posteriormost point of the processus condylicus. In 13 specimens the length of the first three molars varies from 7.8 to 8.4 mm (mean: 8.1 mm).

TABLE I

Skull measurements of ten specimens of *Caluromys philander philander* (Linnaeus) from Suriname in the Leiden Museum.

Reg. number	20664	18025	3967	12866	3916	16227	10790	18172	18171	22753
Sex	♀	♀	♀	♂	♂	♂	♂	-	-	-
Condylbasal length	56.0	58.6	58.9	54.0	54.3	56.9	58.1	55.5	57.9	58.7
Basal length	52.0	55.8	55.9	50.5	50.6	53.9	54.9	52.0	54.5	55.2
Palatal length	30.1	32.0	-	28.5	29.4	30.5	31.8	29.8	30.4	31.5
Zygomatic breadth	31.1	32.3	33.4	33.2	31.4	32.7	33.3	33.0	32.9	33.5
Interorbital constriction	9.2	8.5	-	9.5	8.9	8.7	9.0	9.4	9.1	9.3
Postorbital constriction	9.0	7.8	8.4	8.6	9.0	8.5	9.0	8.6	8.7	8.3
Breadth across canines	11.8	11.7	12.5	11.2	11.2	11.6	12.3	11.4	11.4	11.8
Greatest width across postorb. proc.	16.0	15.5	16.7	16.0	15.8	18.6	19.2	19.0	17.0	17.0
Breadth of braincase	19.1	18.8	19.8	19.6	19.5	19.0	20.0	19.2	19.7	19.8
Length of upper tooth-row, $c^1 - m^4$	19.8	21.2	21.2	19.8	19.6	20.0	21.2	20.0	20.5	20.7
Length of upper three molars, $m^1 - m^3$	8.4	8.1	8.3	8.0	8.0	8.2	8.1	8.3	7.8	8.4
Length of mandible	41.5	43.1	43.5	40.6	40.1	42.7	43.1	40.4	43.5	43.7
Length of lower tooth-row, $c_1 - m_4$	21.9	22.5	23.0	21.5	21.1	22.2	22.8	21.4	22.0	22.4
Length of lower three molars, $m_1 - m_3$	8.8	8.2	8.5	8.3	8.4	9.4	8.5	8.5	8.2	8.6

Remarks. — The Philander Opossum is arboreal and lives in forested areas; it is mainly active from nightfall to early morning. This may explain why the animal is difficult to obtain. It is a good climber, for an adult mummified specimen was found by Dr. D. C. Geijskes on 6 April 1963 high up in a telegraph post between Paramaribo

and *Clevia*. The species is omnivorous, its food consists of vegetables, fruits, small birds and reptiles. Already Temminck (1824: 46) remarked: "On a trouvé des débris d'oiseaux dans les individus que j'ai fait tirer de l'esprit-de-vin". The species occasionally causes some damage to bananas in native gardens; in January 1963 I found a semi-adult specimen in a fallen banana tree in Paramaribo. One of the natural enemies of the Philander Opossum is the Crested Eagle, *Morphnus guianensis* (Daudin, 1800): in the stomach contents of a specimen of this bird shot in February 1970 near Sipaliwini airstrip, I found remains of *Caluromys*, viz., part of the skeleton without the skull, and the tail.

In the literature the names *Didelphis philander* and *Philander philander* are commonly used for the present species (see also Hershkovitz, 1949).

***Monodelphis brevicaudata brevicaudata* (Erxleben, 1777)**

Pl. 3 (animal), pl. 9 upper figure (skull), pl. 1 fig. 1 (hindfoot)

Didelphis brevicaudata Erxleben, 1777, Systema Regni Animalis, 1: 80.

Type locality. — "Habitat in Americae australis silvis". Restricted by Matschie (1916: 271) to "Surinam".

Synonymies. — Cabrera, 1958: 7-8 (and probably p. 10 under *Monodelphis touan* (Shaw)); Thomas, 1888: 356-358 (under *Didelphys*).

Vernacular names. — (E) Short-tailed Opossum, Red-sided Opossum; (N) Kortstaart Opossum; (S) Moismoisi-awari.

Distribution. — The species *Monodelphis brevicaudata* (Erxleben, 1777) is known from Venezuela, the Guianas and the Amazon basin in Brazil. The nominate subspecies *M. brevicaudata brevicaudata* occurs in the Guianas and the Amazon basin.

Occurrence in Suriname. — In Suriname the species so far is only known from the coastal area and the foothills, up to an altitude of 475 m (Brownsberg). Its range may be wider, but so far only relatively few specimens have been collected. The first author who mentioned this species from Suriname was Fermin (1765: 44; 1769: 116), at least his "Souris de Bois... [qui ont] le museau [fort] pointu, les oreilles grandes & assez larges & le corps couvert de poils d'un bai-rouge clair" hardly can be a different species. Lammens (1844: 96) described the colour of this species (his no. 131) as follows: "Die Färbung ist sehr schön, caffeebraunes Roth, auf dem Rücken mit Grau und Schwarz überpudert, die Seiten schön dunkelroth, ins caffeebraune". Kappler (1881: 164; 1887: 66) mentioned the species under the name *Didelphis brachiura*. Also the brothers Penard ("De Surinamer", 14 January 1906) dealt with this species from Suriname. The first author to mention the species from a more exact locality within Suriname was Sanderson (1949: 788), who collected a male in a trap "on damp forest floor by creek in tall rain forest bordering open wet savannahs at Zanderij".

The following specimens were examined by me:

1. Banana plantation "Jarikaba" near Uitkijk on Saramacca River, west of Paramaribo, Suriname District, 1 adult male (no. 20672, skin).
2. Agricultural Experimental Station (Cultuurtuin), Paramaribo, 1 adult female (no. 18076, skin and skull).
3. Plantation "De Morgenstond", north-east of Paramaribo, left bank of Suriname River, 1 juvenile female (no. 17223, skin and skull).
4. Plantation "Clevia", north-east of "De Morgenstond", Suriname District, 1 adult female (no. 17292, skin and skull) and 1 adult male (no. 21654, skin and skull).
5. Republiek on highway from Paramaribo to Zanderij, about 35 km S. of Paramaribo, Para District, 1 adult unsexed specimen (no. 12851, skin and skull), and 1 juvenile (no. 12850, skin and skull).
6. Brokopondo, left bank of Suriname River, about 100 km south of Paramaribo, Brokopondo District, 1 semi-adult female (no. 17907, skin and skull).
7. Brownsberg, near north-western corner of Brokopondo Lake, Brokopondo District, altitude 475 m, 2 adult females (nos. 23403 and 23404, skins and skulls).
8. Langamankondre, north of Albina on left bank of Marowijne River, Marowijne District, 1 adult female (no. 18227, skin and skull).

Description. — The character distinguishing this species from all other Suriname marsupials is the shortness of the tail, which is about half as long as head and body combined.

The following description is based exclusively on the above Suriname specimens. The back of the animals usually is blackish or dark brown, heavily sprinkled with whitish. This dark dorsal area extends forward almost as far as the eyes, narrowing anteriorly. Posteriorly it usually does not reach the base of the tail. Laterally the body is uniformly ferruginous or rufous, without white sprinkling, usually sharply set off from the dark dorsal colour. This lateral reddish brown colour extends to the tip of the snout. The snout itself is either uniformly rufous or ferruginous, or shows a median stripe which may be paler than the surrounding area, or darker, in the latter case it looks like a continuation of the dorsal colour. This stripe is often very indistinct or entirely absent. The ears are rather small but very distinct, rounded, with scattered short hairs, which are so small and few that to the naked eye the ears seem to be naked. The outer surface of the legs, the rump and the upper surface of the tail have the same rufous colour as the sides. The lower surface of the body is much paler than the dorsal surface, but very variable in colour. This colour ranges from pale cream, or greyish cream to pale brownish or brownish grey. Usually this colour is sharply demarcated from that of the sides, but in some specimens, especially in the juveniles, the line of demarcation is vague. Usually the inner sides of the legs are paler, less greyish than the venter, this pale colour in some specimens also is observed in the posterior ventral part, between the hind legs. The chin and the larger part of the throat are always ferruginous, although backwards the extent of this ferruginous area varies in the available individuals, in some the entire throat is of this colour, in some only the anterior part. The proximal part of the lower surface of the tail and a narrow area before it are also ferruginous brown, the distal part of the lower surface of the tail is naked. The variation in the colour of the

ventral surface of the body is very great. In all the larger specimens (nos. 18076, 20672, 21654, 23403, 23404) the colour is rather light with the venter greyish and the inner surface of the legs more cream. In the 3 smaller adult females (nos. 17223, 17292, 18227) and a large semi-adult female (no. 17907) the lower surface is much darker than in the larger specimens, being brownish grey sprinkled with cream (nos. 17223, 18227), greyish brown (no. 17292) or dark grey (no. 17907), with the inner sides of the legs not or hardly lighter than the venter; the demarcation of the colour of the ventral and lateral surfaces in these specimens is still well visible, although less distinct than in the larger specimens. In the two juveniles the ventral colour is brown (no. 12850) or dark slate grey (no. 17242), without any clear demarcation, neither from the sides nor from the throat or tail.

Dental formula: $I \frac{5}{4}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{4}{4}$. The three premolars are placed behind the incisor and show no diastema. The first is much the smaller, being about half as high as the second, which is slightly longer than, but as high as the third. The processus postorbitalis of the skull is entirely lacking (pl. 9 upper fig.).

The external and skull measurements of 8 Suriname specimens are given in Table 2.

TABLE 2

External and skull measurements of eight specimens of *Monodelphis breviceaudata breviceaudata* (Erxleben) from Suriname in the Leiden Museum.

Reg. number	17223	17292	18227	18076	23404	23403	21654	12851
Sex	♀	♀	♀	♀	♀	♀	♂	-
Head and body	110	-	105	118	125	155	131	-
Length of tail	63	-	63	67	75	78	78	-
Hind foot	19	-	19.5	19.5	19	20	21.5	-
Ear	-	-	16	18	17	18	16	-
Weight, grams	-	-	-	-	67	95	-	-
Condylbasal length	31.5	32.0	32.3	35.3	35.5	38.3	35.9	33.1
Basal length	29.3	29.5	30.2	33.2	33.4	36.3	33.7	31.0
Palatal length	17.4	17.8	17.5	18.6	19.1	21.1	19.8	17.4
Zygomatic breadth	16.9	16.4	17.4	19.4	18.3	20.0	18.0	18.3
Interorbital constriction	6.0	6.6	6.3	6.3	5.8	6.0	6.3	5.8
Breadth across canines	5.0	5.2	5.0	6.0	5.5	6.7	5.8	5.5
Breadth of braincase	11.6	12.2	11.7	13.0	12.3	13.3	12.6	11.8
Length of upper tooth-row, $c - m^4$	13.7	13.8	13.7	14.2	13.9	15.3	14.5	13.8
Length of upper three molars, $m^1 - m^3$	6.4	6.4	6.3	6.0	6.3	6.3	6.2	6.1
Length of mandible	23.1	23.2	24.5	26.7	26.1	28.7	26.7	24.9
Length of lower tooth-row, $c_1 - m_4$	15.0	14.5	14.7	15.4	14.5	16.4	16.0	14.8
Length of lower three molars, $m_1 - m_3$	6.7	6.5	6.3	6.0	6.2	6.4	6.2	6.2

Remarks. — According to Fermin (1765, 1769) the litter of this species consists of 6 young. Walker (1964 (1): 16), however, noted that in *Monodelphis* the number of young varies from 8 to 14. The food of this species is said to consist of insects and probably young birds (Kappler, 1885: 598; 1887: 66) or 'is of both vegetable and animal origin. It is interesting that the animals often attack birds, lizards and even iguanas, which are much larger than they are themselves' (brothers Penard, "De Surinamer", 14 January 1906). The species is nocturnal, as already pointed out by

Kappler (1887: 66). The specimen from Republiek (no. 12851) was caught by Dr. Geijskes after nightfall at 8 p.m., in a savanna forest.

According to several authors two species of *Monodelphis* occur in the Guianas, and in Cabrera's checklist these species are indicated by the names *M. b. brevicaudata* (Erxleben, 1777), of which the restricted type locality is Suriname, and *M. t. touan* (Shaw, 1800), originally described from Cayenne, French Guiana. The main differences between these two species are said to be found in the colour and colour pattern: *M. brevicaudata* is stated to be bicoloured: reddish brown above, pale beneath, while in *M. touan* the body is tricoloured: the dorsal parts are described as blackish brown, the sides as rufous and the ventral surface as white or whitish.

In the material of *Monodelphis* at my disposal, which consists of the above mentioned eleven specimens from Suriname, it proved impossible to distinguish the two above mentioned "species". As shown above, the variation in the coat colour and in the colour pattern is such that all intermediates between the typical *touan* and the typical *brevicaudata* forms were found, while furthermore the colour of the underparts varies from almost pure white through creamy to slate grey. The skulls of these specimens did not show any significant differences. Therefore, on the basis of this material, I can only conclude that a single species of this genus occurs in Suriname, for which species the oldest specific name, *brevicaudata*, is adopted. A study of larger series remains highly desirable to definitely solve this question. On the basis of other material, Thomas (1888: 356-358) also arrived at the conclusion that the two forms are synonymous; Cabrera (1919: 42) originally was of the same opinion as Thomas but later changed his views.

Marmosa cinerea demerarae Thomas, 1905

Pl. 10 lower figures (skull)

Marmosa cinerea demerarae Thomas, 1905, Annals Magazine Nat. Hist., (7) 16: 313-314.

Type locality. — "Comackka, 80 miles up Demerara River, British Guiana".

Synonymies. — Cabrera, 1958: 13; Tate, 1933: 62-63, pl. 1 fig. 4 (skull, dorsal view), pl. 14 fig. 126 (skull, ventral view), table 1, section 1 (measurements), under *M. demerarae demerarae*.

Vernacular names. — (E) Ashy Opossum; (S) Moismoisi-awari.

Distribution. — The species *Marmosa cinerea* (Temminck, 1824) is known from Venezuela, the Guianas, Brazil and Paraguay. The subspecies *M. cinerea demerarae* occurs in the north-eastern part of Venezuela and in the Guianas.

Occurrence in Suriname. — Little is known of the distribution of the present species in Suriname. Tate (1933: 62) mentioned an adult female with two young from "Surinam" (without a more exact locality indication) preserved in the Stuttgart Museum (no. 288/141 1/2); Sanderson (1949: 788, under *Marmosa cinerea*) dealt with a specimen from near Zanderij. I myself examined the following material from Suriname:

1. Plantation "Mary's Hope", just east of Totness, Coronie District, 1 adult female (no. 17219, skin and skull).
2. Raleigh Falls, Coppename River at about 4°40'N, Saramacca District, 1 juvenile female (ZMA no. 16820, skin and skull).
3. Onverwacht, on highway from Paramaribo to Zanderij at about 25 km S. of Paramaribo, Para District, 1 adult male (no. 18069, skin and skull).
4. Langamankondre, north of Albina, mouth of Marowijne River, Marowijne District, 1 adult female (no. 18228, skin and skull), 1 juvenile male (no. 18230, skin and skull).

Description. — The coat colour of the dorsal parts is greyish, heavily lined with yellowish buff, caused by the fact that the basal two-thirds of the hairs are slaty, the tips yellowish brown. The sides are somewhat lighter. There is a distinct dark ring around the eyes and a dark streak extends from either of the eyes to the rhinarium; the area between these two streaks is somewhat lighter and more yellowish buff than the posterior part of the head. The sides of the face are yellowish buff. The line of demarcation between the flanks and the ventral part of the body is not sharply defined. The hairs of the chin, throat, the inner surface of the forelegs and hind legs, the groins, and usually of a narrow median ventral stripe are uniformly cream coloured. The bases of the hairs of the belly are light greyish brown, so that here the creamy colour is washed with grey. The fur extends on to the tail, both dorsally and ventrally, for about 30 to 35 mm. The almost naked tail is always distinctly longer than head and body combined; its colour is brown, occasionally the hairs have a somewhat lighter tip. My full-grown specimens dorsally are of a more brownish grey colour than the young, which are of a more slate grey colour.

Dental formula: $I \frac{5}{4}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{4}{4}$. The skull characters are essentially the same as those of *M. lepida*. The processus postorbitalis is distinct but short and widely triangular, posteriorly it ends in a ridge which overhangs the postorbital constriction. The three premolars are placed rather close together, the diastemata at either side of the first are small and of equal width. The posterior premolars touch each other; they are of the same size, being distinctly longer and higher than the small first premolar. In 4 specimens from Suriname the length of the upper three molars combined varies between 7.0 and 7.2 mm.

In Table 3 the external and skull measurements of the above three adult Suriname specimens are provided; to these are added the measurements of the skull of the holotype of the subspecies, taken by me in the British Museum (Natural History).

Remarks. — The Suriname material of this species examined by me confirms Tate's (1933: 63) remark, that this form "is typically from the lowlands of the Guianas".

Marmosa cinerea demerarae is the largest of the four known Suriname murine opossums. It is not difficult to distinguish fully grown specimens of *M. c. demerarae* from *M. murina* (see below), not only because the former species is much longer, but also because the base of its tail is furred above and beneath for about 30 to 35 mm (about 10 mm in the other species). With the few specimens at hand, however, I could not find external characters by which the not fully grown individuals

TABLE 3

External and skull measurements of three specimens of *Marmosa cinerea demerarae* Thomas from Suriname (first three columns) and of the holotype from Guyana (last column).

Museum	RMNH	RMNH	RMNH	BMNH
Sex	♀	♀	♂	♀
Reg. number	18228	17219	18069	5.11.1.25
Head and body	151	134	183	166
Tail	220	206	234	250
Hind foot	23	23	26	24
Ear	-	-	25	-
Condylbasal length skull	42.9	-	-	40.1
Basal length	41.5	-	-	37.2
Palatal length	23.8	-	-	22.1
Zygomatic breadth	24.7	-	-	23.0
Interorbital constriction	7.2	-	-	7.1
Breadth across frontals	8.6	-	-	-
Length of upper tooth-row, c - m ⁴	14.3	-	-	14.5
Length of m ¹ - m ³	16.6	-	16.5	16.5
Length of mandible	7.1	-	7.2	7.1
Length of lower tooth-row, c - m ₄	32.0	29.7	33.4	31.5
Length of m ₁ - m ₃	17.9	16.7	17.7	16.6
	6.9	6.5	7.0	6.7

can be recognized with certainty; in these circumstances it is necessary to examine the skulls, which provide a number of characters allowing an almost infallible identification. One of these characters is the combined length of the three anterior upper molars, which in the four specimens of *M. c. demerarae* examined by me varies from 7.0 to 7.2 mm, and in sixteen specimens of *M. murina* from 5.2 to 6.1 mm.

Marmosa lepida (Thomas, 1888)

Pl. 11 upper figures (skull)

Didelphys (Micoureus) lepida Thomas, 1888a, Annals Magazine Nat. Hist., (6) 1: 158.

Type locality. — "Peruvian Amazonas". In his 1888 Catalogue, Thomas noted on page 348 that the (holo)type originated from "Santa Cruz, Huallaga R., Peruvian Amazons".

Synonymies. — Cabrera, 1958: 18; Tate, 1933: 204-206, pl. 11 fig. 103 (skull, dorsal view), pl. 24 fig. 225 (skull, ventral view), table 1, section 8 (measurements); Thomas, 1888: 347-348, pl. 3 fig. 1 (col. pl., animal), pl. 27 fig. 3 (skull, dorsal view).

Distribution. — "Known from the lowlands adjoining the eastern foothills of the Andes in Ecuador, Peru, Bolivia, Dutch Guiana" (Tate, 1933: 206).

Occurrence in Suriname. — The first mention from Suriname of the present species is the one by Thomas (1888: 347), who did not provide a more exact locality. Tate (1933: 205) mentioned specimens from "San Alouatta" and from Paramaribo. Tate's adult female from "San Alouatta" formed part of the collection of the Stuttgart Museum where it was preserved in alcohol, it clearly is the same specimen that Thomas (1888) mentioned from Suriname. I have been unable to find a locality

"San Alouatta" on any of the Suriname maps at my disposal, and am inclined to doubt the correctness of the orthography of this name, if indeed a geographic locality is meant with it.

Jentink (1887: 302, under *Didelphis murina*, no. a) listed a juvenile skull of the present species from Suriname.

I have examined the following Suriname material of the species:

1. Neighbourhood of Paramaribo, Suriname District, 2 juvenile females (nos. 18275a, 18275c, skulls), 1 juvenile male (no. 18275b, skull).
2. Gansee on Suriname River south of Paramaribo, in the area which now is covered by the Brokopondo Lake, Brokopondo District, 1 adult male (no. 18081, skin and skull).
3. Eastern north coast of Suriname near Wiawia Bank, about 54°23'W, Marowijne District, 1 unsexed juvenile skull (no. 18084).
4. Nassau Mountains, west of Marowijne River, at about 4°45'N, Marowijne District, 1 juvenile female (no. 18082, skin and skull).
5. Suriname (without more precise locality indication), 1 juvenile skull (no. 18085, the specimen mentioned by Jentink, 1887 as *Didelphis murina* no. a), 1 adult male (no. 12867, skin and skull, leg. D. G. J. Bolten, probably from near Paramaribo).

Description. — The adult male specimen (no. 18081) from Gansee agrees very well with the descriptions found in the literature. The dorsal parts are deep reddish brown, the basal three-fourth of the hairs being blackish, the tips reddish brown. The strongly marked black ring around the eyes extends onto the rhinarium; the area of the face between these dark markings is pinkish. The sides are somewhat lighter than the back. Without a distinct line of demarcation, the reddish brown colour of the flanks passes into the dirty white or ivory colour of the ventral surface, which shows a more or less clearly marked pinkish tinge. This pinkish tinge lacks entirely in a longitudinal area along the middle of the belly and the abdomen. The ears are small, having a length of about 12 to 15 mm. The brownish coloured tail, which is about one and a half times as long as the head and body combined, is slightly furred at its base. The dorsal surface of the juvenile (no. 18082) from the Nassau Mountains is dark greyish brown, its ventral surface is whitish.

Dental formula: $I \frac{5}{4}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{4}{4}$. In five specimens from Suriname the length of the upper molars, m^1 - m^3 , varies from 4.7 to 5.2 mm.

The external measurements of the adult male from Gansee (no. 18081) and those noted by Tate (1933) for a specimen from Paramaribo are, respectively: head and body 108, 100; tail, 152, 150; hind foot, 18, 18; ear, —, 15 mm.

Some skull measurements of the adult males no. 18081 and 12867 are, respectively: condylobasal length, —, 28.6; basal length, —, 26.4; palatal length, 15.9, 16.3; zygomatic breadth, 16.2, 15.6; interorbital constriction, 4.8, 4.7; breadth across canines, 4.1, 4.0; breadth across frontals 7.0, 6.9; breadth of braincase, 11.2, 11.4; length of upper tooth-row, c - m^4 , 11.3, 11.3; length of upper tooth-row, m^1 - m^3 , 5.0, 5.0; length of mandible, 20.3, 20.3; length of lower tooth-row, c - m^4 , 11.9, 12.1; length of lower tooth-row, m^1 - m^3 , 5.4, 5.3 mm.

Remarks. — Concerning the discontinuous distributional area of *Marmosa lepida*, Tate (1933: 206) remarked: "The seemingly broken distribution suggests that *lepida*

has a very wide range. Its rarity in collections may be due to peculiar habits requiring special methods of trapping". The few Suriname specimens examined by me evidently give an incomplete picture of its actual distribution in that country. Unfortunately nothing is known about the habitat of the collected specimens.

Tate (1931: 12) described a new subspecies of *Marmosa lepida* from "Buenavista, Santa Cruz, Bolivia", which he named *M. lepida grandis* (see also Tate, 1933: 207). Cabrera (1958: 18), however, considered Tate's subspecies to be identical with the nominate form, and gave as his opinion that it is possible that in the Guianas a form occurs which is subspecifically distinct from the typical *M. lepida*, known from Peru, Bolivia and Ecuador. To solve this question the examination of large series from various localities within the range of distribution of the species is necessary. For the time being, I follow Cabrera who considered *Marmosa lepida* to be a species without well-defined geographical races.

***Marmosa murina murina* (Linnaeus, 1758)**

Text-fig. 3a (skull), pl. 4 (animal), pl. 10 upper figures (skull), pl. 1 fig. 2 (hind foot)

Didelphis murina Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 55.

Type locality. — "Habitat in Asia, America". Restricted by Thomas (1911: 144) to "Surinam". See also under Remarks.

Synonymies. — Cabrera, 1958: 19-20; Tate, 1933: 92-96 (under *M. murina murina*, pl. 3 figs. 22, 23, 24 (skull, dorsal view), pl. 16 figs. 144, 145, 146 (skull, ventral view), table 1, section 2 (measurements)), and pp. 96-97 (under *M. murina muscula*), pl. 3 figs. 25, 26 (skull, dorsal view), pl. 16 figs. 147, 148 (skull, ventral view), table 1, section 3 (measurements).

Vernacular names. — (E) Murine Opossum, Mouse Opossum; (S) Boesi-mois-moisi.

Distribution. — Tate (1933: 92, fig. 12) recorded the following distribution for the species *Marmosa murina* (Linnaeus, 1758): "Southern half of the Orinoco basin southward as far as a line passing through Pernambuco, the northern edge of Matto Grosso, and the Rio Marañón; westward to the subtropics of the Andes, with an extension over on to the eastern subtropical slopes of the Magdalena Valley which continues northward into Venezuela". According to Cabrera (1958: 20) the nominate subspecies *M. murina murina* occurs in the Guianas and north-eastern Brazil (see further under Remarks).

Occurrence in Surinam. — The first record of the species from Suriname is that by Merian (1719: 66, pl. 66), who gave a figure of the female carrying six young on the back, with their tails holding on to that of the mother. Seba (1734: 49, pl. 31 fig. 5) figured another female specimen of the species from Suriname, but the artist added to the figure of the animal 6 young on the back, which young are exactly copied from Merian, except for the tails which are in a different position. The adult animal of Seba was figured after an actual specimen, which now is in the British Museum and is selected here as the lectotype of *Didelphis dorsigera* L. (see below).

Bellin (1763: 155, pl. 1) under the name "Zak-Rot ou Rat de Surinam" mentioned this species from Suriname (basing himself on Merian's account) and gave a figure, which is different from both that by Seba and the one by Merian, but probably inspired on the latter. The other authors of the 18th century dealing with Suriname mammals, do not give descriptions which might be assigned with certainty to *Marmosa murina* (e.g., Fermin (1769: 113) mentioned a *Mus scalopes* which might be this species). Stedman (1796 (2): 145) did not believe in the species: "Madam Merion mentions one kind of them [opossum species], which, in time of danger, carries its young ones upon its back: but this animal, I confess, I never heard of in Surinam, and am persuaded of its non-existence". Von Sack (1821 (2): 203), however, confirmed Merian's observation, describing a specimen with 5 young seen by him; Von Sack's description, however, is not too clear and might also pertain to *Metachirops opossum* or another opossum. Temminck (1824 (1): 50) described under the name *Didelphis dorsigera* material from Suriname, which clearly belongs here; Temminck evidently did not see any material of what he considered *Didelphis murina*. Lammens (1844: 95, 96) mentioned both "*D. dorsigera*" and *D. murina*, basing himself mostly on the literature. Kappler (1887) did not deal with either species. The Penard brothers ("De Surinamer", 11 January 1906) gave an account of the habits of *Didelphis dorsigera* and also recognized *D. murina*; it is impossible from their account to conclude whether or not *D. murina* is correctly identified by them. Jentink (1888: 221) in the catalogue of the Leiden Museum listed both "species" from Suriname, both collected by H. H. Dieperink between 1824 and 1836, but all these specimens prove to belong to the present species. Thomas (1888: 346) and Tate (1933: 94) reported upon a specimen from Suriname without a more precise locality indication; Tate (1933: 97), moreover, mentioned *M. murina muscula* specimens from Berg en Dal (Suriname River about 70 km S. of Paramaribo), and from "Maroni" (= Marowijne Rivier). On the whole there is a great confusion about the status of the present species in the popular literature, while in scientific publications, this confusion is far less great.

I have examined the following Suriname material of this species:

1. Forest on the western slope of Vier Gebroeders Mountain, Sipaliwini savanna, near Sipaliwini airstrip, upper Corantijn basin near Brazilian border, Nickerie District, S.W. Suriname, 1 male (no. 20636, skin and skull).
2. In cabin in bushnegro settlement of Bitagron, on right bank of Coppename River about 75 km from the coast, Saramacca District, 1 male (no. 18075, skin and skull).
3. East bank of upper Coppename River near Raleigh Falls, 1 male (no. 19893, skin and skull).
4. Near Adampada Creek, west branch of Linker Coppename River, south-west of Raleigh Falls, Saramacca District, 1 female (no. 18070, skin and skull).
5. Banana plantation "Jarikaba", west of Paramaribo on highway to Uitkijk, Suriname District, 1 female (no. 21655, skin and skull).
6. Plantation "Clevia", on Suriname River north-east of Paramaribo, 1 male (no. 21665, skin and skull).
7. Plantation "Morgenstond", on Suriname River north-east of Paramaribo (south-west of Clevia), 1 male (no. 17240, skin and skull), 2 females (nos. 17243, 17250, skins and skulls).

8. Agricultural Experimental Station (Cultuurtuin), Paramaribo, 1 female (no. 18282, skin and skull).
9. Paramaribo, various localities in and close near the town, 2 males (no. 16052, skull; no. 18198, skin and skull), 1 female (no. 24287, skull).
10. Plantation "Peperpot", on east bank of Suriname River, south-east of Paramaribo, 3 females (nos. 18071-18073, skins and skulls).
11. Lelydorp about 15 km south of Paramaribo, Suriname District, 1 male (no. 22130, skin and skull), 2 females (nos. 22131, 22574, skins and skulls).
12. Small forest in savanna near Zanderij, 40 km south of Paramaribo, Para District, 1 specimen (no. 18283, skin and skull).
13. Shell ridge at 3.8 km north of Moengo, Marowijne District, north-eastern Suriname, 1 female (no. 12868, skin and skull).
14. Suriname without more accurate locality indication, 1 male (no. 24307, skin and skull), 4 females (no. 18086, skull; nos. 19617, 24305, 24306, skins and skulls), 1 unsexed specimen (no. 22351, skin and skull).

Description. — The dorsal coat colour is greyish brown, becoming lighter brown laterally. The basal parts of the hairs are slate grey, the tips straw coloured. The head is characterized by a dark, blackish ring around the eye, the black colour extending towards the tip of the snout in a narrowing triangular patch. Posteriorly the black area stops either immediately behind the eye or is produced in a short point which reaches slightly obliquely upward. Between the two black areas the dorso-median region of the head is pale buff, gradually or more abruptly changing into the greyish brown colour of the vertex, which is the same as that of the back of the animal; on the vertex this greyish colour occupies the area between the ears and the posterior part of the black mask. The cheeks are of a light colour, almost similar to that of the lower surface of the body; this pale cheek colour extends almost to the base of the ears. The ears are large, rounded, rather dark, and covered with very few, short, scattered hairs, being naked to the naked eye. The outer surface of the legs is of the same colour as the dorsal surface of the body, except for the hind feet which are whitish dorsally. The entire ventral surface is whitish or cream, from the tip of the lower jaw to the base of the tail, including the inside of the legs. The demarcation with the colour of the lateral surface usually is well marked. The fur extends on to the tail for a short distance, not more than 10 mm; the colour of this fur is almost the same dorsally and ventrally, being greyish brown dorsally (like the rest of the dorsal colour), slightly more brownish ventrally. In many old illustrations (Merian, 1719: pl. 66; Seba, 1734: pl. 31 figs. 2, 3, 4) the tail is figured as being irregularly spotted with dark brown. In my preserved specimens such a colour pattern is not or not distinctly visible; here the ventral surface is slightly paler than the dorsal

Marmosa murina closely resembles *M. cinerea demerarae* in the coat colour; the dorsal parts, however, are slightly more mixed with brown or fuscous brown. The colour of the ventral surface of the two species is very similar. The base of the tail in *M. murina* is furred over a shorter distance, 10 mm, than in *M. cinerea demerarae* (30 to 35 mm). The former species furthermore is smaller than the latter.

Dental formula: $I \frac{5}{4}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{4}{4}$. Of the three premolars, the first is half as high and less than half as long as the second, from which it is separated by a short diastema, the first premolar is placed against the canine; the second and third are of the same size and touch each other. The processus postorbitalis is short and wide and continues posteriorly in a carina which obscures the postorbital constriction.

The external measurements of an adult male from Clevia (no. 21665) and an adult male from Bitagron (no. 18075) are respectively: head and body, 127, 123; tail, 173, 174; hind foot 21, 22; ear, 20, 23 mm. Some skull measurements of the Clevia specimen are: condylobasal length, 34.9; zygomatic breadth, 19.3; combined length of the first three upper molars, 6.1 mm. In sixteen specimens of the present species the last mentioned measurement (length of three upper molars) varies from 5.2 to 6.1 mm. As also clearly illustrated by the skull measurements, *M. murina* is much smaller than *M. cinerea demerarae*.

Remarks.— According to data in the literature on Suriname marsupials, the present species produces 4 to 7 young per litter. Merian (1719) shows 6 young and mentioned 5 or 6. Jentink (1888) listed a specimen with 4 and one with 7 young, and the brothers Penard ("De Surinamer", 11 January 1906) gave the number of young as 6. The Murine Opossum is a nocturnal animal. The Penard brothers comment on the fact that it is a good climber and is often found in bamboo growths, where the smooth bamboo stalks cause no difficulty to their climbing activities. These opossums make their nests in hollow trees and other protected places; the three specimens from plantation "Peperpot" (nos. 18071-18073) were found in a hollow old cocoa fruit (pl. 4), in which a nest of dead leaves had been made. Mr. K. van Deursen of Paramaribo informed me (in litt., 12 Dec. 1974) that he had observed an opossum, most likely of this species, which in the evening collected dead leaves of *Thunbergia alata*, carried these first in its mouth and then transferred them to its tail, and, carrying the leaves with its tail, climbed up to the roof of the house, probably to its nest.

The fact that the young of this species are carried by the mother on her back and grasp their mother's tail with their own little tails, has often been discussed and figured (e.g., by Merian in 1719, by Seba in 1734, and by Bellin in 1763). Although some authors cast doubt on the correctness of this observation, it has been sufficiently substantiated by reliable observers.

The above-mentioned series of 16 specimens from different areas in Suriname is too small to decide the question whether or not more than one subspecies of *Marmosa murina* occurs in this region. According to Tate (1933: 94-95) the nominate form, *M. murina murina*, occurs "from at least as far south as Pernambuco north-west to Brazilian Guiana, and probably along the narrow coastal strip between the sea and the heavy rain forest as far as British Guiana". In the rain forest this form is said to be replaced by *M. murina muscula* (Cabanis, 1848). Cabrera (1958: 20), however, was of the opinion that the subspecies *muscula* can not be distinguished from the typical *M. murina murina*. To solve this question it is necessary that large series of *Marmosa murina* be collected in different biotopes of the coastal plain as

well as in the interior of the country. In the material at hand I can not find any significant differences between the specimens from the coastal plain and those from the interior. Therefore, for the time being, I follow Cabrera and accept that the nominate subspecies of *Marmosa murina* is the only form occurring in Suriname.

The present species was described by Linnaeus (1758: 55) under two different names, viz., *Didelphis murina* and *D. dorsigera*. Under *Didelphis murina*, Linnaeus referred to "Amoenit. acad. l. 279" and to Seba's Thesaurus, vol. 1, p. 48, "t. 31. f. 12, 36". The reference to the Amoenitates (evidently vol. 1, p. 279 is meant) might be an error. This part of the Amoenitates (vol. 1, pp. 277-326, pls. 13, 14), namely, deals with "Museum Adolpho-Fridericianum" and on p. 279 "Didelphis mammae intra abdomen" is described; the references and description given here pertain for the greatest part to *Didelphis marsupialis* and partly to *Metachirops opossum*. Linnaeus (1758: 54) gave the same reference ("Amoen. acad. 1. p. 279") under *Didelphis marsupialis*, where it is more correctly placed than under *D. murina*.

Linnaeus's second reference under *Didelphis murina* evidently contains a lapsus "t. 31. f. 12, 36" should read "t. 31. f. 1, 2, 3, 6", as there are no more than 10 numbered figures on pl. 31 of Seba's Thesaurus vol. 1. Figures 1, 2, and 3 indeed represent what is now generally considered *Marmosa murina*; fig. 6, however, shows *Monodelphis brevicaudata*.

Linnaeus's *Didelphis murina* thus is a composite species, and in order to prevent any confusion I now select as the lectotype of this species the female figured by Seba on pl. 31 fig. 2, which at present is preserved in the British Museum (Nat. Hist.) under no. 67.4.12.542 (see Thomas, 1892: 314).

Under *Didelphis dorsigera*, Linnaeus (1758: 55) referred to "Seba. mus. 1 p. 49. t. 31. f. 5, 4 & 2. p. 90. t. 84. f. 4" and also to "Merian surin.". Seba (1734, Thesaurus, vol. 1, p. 49, pl. 31 figs. 4 and 5) and (1736, Thesaurus, vol. 2, p. 90, pl. 84 fig. 4) as well as Merian (1719, Over de Voortteeling en Wonderbaerlyke Veranderingen der Surinaemsche Insecten: 66, pl. 66) showed clearly what is at present considered *Marmosa murina*. As lectotype I now select the adult female specimen figured by Seba on pl. 31 fig. 5 (this figure is composite, the adult specimen obviously is made after an actual specimen, the juveniles on the back of this specimen are in exactly the same position as in Merian's (1719) drawing and clearly are copied). This lectotype specimen is now in the British Museum (Nat. Hist.) under no. 67.4.12.546 (see Thomas, 1892: 314). The type locality for *Didelphis murina* is "Habitat in Asia, America" and for *D. dorsigera* "Habitat in America"; they both are restricted by Thomas (1911: 144) to "Surinam".

As the synonymous names *Didelphis murina* L., 1758 and *D. dorsigera* L., 1758, date from the same day, their relative priority is decided by the first reviser. The first author, who considered the two names synonymous and used one of these in preference to the other is, as far as I can make out, Lydekker (1887: 282) who used the name "*Didelphis murina*" and remarked that *D. dorsigera* "is apparently identical". Thomas (1888: 343-347) confirmed this synonymy.

Marmosa emiliae Thomas, 1909

Pl. 11 lower figures (skull)

Marmosa emiliae Thomas, 1909, Annals Magazine Nat. Hist., (8) 3: 379-380.

Type locality. — "Para" (= Belém), north-eastern Brazil.

Synonymies. — Cabrera, 1958: 30; Tate, 1933: 189, pl. 10 fig. 89 (skull, dorsal view), pl. 23 fig. 210 (skull, ventral view), table 1 (section 7, measurements of the holotype only).

Distribution. — Known from the type locality and now also reported from Suriname.

Occurrence in Suriname. — In August 1965 Mr. B. Malkin collected a juvenile male specimen near Langamankondre, north of Albina, mouth of the Marowijne River. In this specimen the first and second molars are in function, the third is not fully developed and does not attain the height of the second molar, while the fourth is still lacking. The specimen is preserved in the Leiden Museum under no. 18231 (skin and skull)

Description. — I compared the Langamankondre specimen with the holotype, preserved in the British Museum (Natural History) (no. 9.3.9.10). My specimen shows all essential characters of *Marmosa emiliae*, of which Tate (1933: 189) remarked that "the unusual feature in *emiliae* is the very long tail", which "is nearly twice length of head and body". Also the other characters discussed by Thomas, in the original description of the species, and by Tate, are shown by the Suriname specimen. The colour of the hairs of the dorsal surface is of a dull chestnut-brown tinge, caused by the fact that about the basal three-fourths of the hairs are slaty, followed by a light yellowish part, while the tips are brown. The black ring around the eyes is well marked, and is continued by a black stripe to the rhinarium. The area between these two stripes is somewhat lighter than the back. The line of demarcation is rather distinct. The colour of the ventral surface is cream, the hairs being unicoloured to the roots. The fur extends on the base of the tail for about 5 millimetres.

The measurements of the Suriname specimen (with between brackets those of the holotype as noted by Thomas) are the following: head and body 60 (75), tail, 112 (142); hind foot, 12 (13); ear, 14 (16) mm. — Skull: greatest length 21.2 (23.5); basal length, 18.4 (21); palatal length, 11.2 (12.2); zygomatic breadth, 11.8 (13); interorbital breadth, 3.9 (4.2); combined length of the three anterior upper molars, 4.2 (4.2) mm.

Remarks. — The present species seems to be extremely rare; Tate (1933: 189) remarked that no specimens were known to him apart from the holotype, collected in February 1909. In the literature seen by me I have not found any additional records of it either, so that the Suriname specimen seems to be the second known of *Marmosa emiliae*.

Metachirops opossum opossum (Linnaeus, 1758)

Text-fig. 2c (incisors and canines), pl. 5 (animal), pl. 8 upper figures (skull), pl. 1 fig. 3 (hind foot)

Didelphis Opossum Linnaeus, 1758, *Systema Naturae*, (ed. 10) 1: 55.

Type locality. — "Habitat in America". Linnaeus's (1758) description is based exclusively on Seba's (1734: 56, 57) "Philander, Opossum, sive Carigueja, brasiliensis; mas" (pl. 36 fig. 1) and "Philander, Americanus, seu, Carigueja, cum catulis, saccum ventris intrantibus; foemina" (pl. 36 fig. 2). Seba gave as definite localities for his specimens Brazil (for the male) and Suriname (for the female). J. A. Allen (1900: 195) restricted the type locality to "Surinam" (as Thomas, 1911: 143, also did), and Matschie (1916: 268) restricted it further to "Paramaribo, Surinam". Hershkovitz (1976: 297) selected as the lectotype of *Didelphis opossum* L., the female figured by Seba (1734: 57) on his pl. 36 fig. 2. This selection is in agreement with the type locality restrictions, as the selection of the other specimen (the male) would have necessitated to change the type locality to Brazil.

Synonymies. — Cabrera, 1958: 36 (under *Philander o.*); Hershkovitz, 1949: 11; Pine, 1973: 391; Thomas, 1888: 329-332, 341 (under *Didelphys o.*).

Vernacular names. — (E) Four-eyed Opossum, Quica Opossum; (N) Opossum, Vieroog-opossum; (S) Fo-ai Awari.

Distribution. — The species *Metachirops opossum* (Linnaeus, 1758) ranges from north-eastern Mexico southward through Central America into South America, where it is known from Colombia, Ecuador, Peru, Bolivia, northern Argentina, Paraguay, Brazil and the Guianas. The nominate subspecies *M. opossum opossum* occurs in the Guianas and the lower Amazon area.

Occurrence in Suriname. — *Metachirops opossum* is very common in the coastal area of Suriname, where it often has been found near and even in human settlements. There are a few records from the foothills (Avanavero Falls; Brokopondo area), but so far the species has not been found in the interior of the country. Seba (1734) was the first author who mentioned that the species occurs in Suriname (see under type locality). Under the name "Mouse-Opossum" Stedman (1796 (2): 144, pl. 57 upper fig.) very clearly described and figured the present species, which he obtained at the Perica Creek, a side creek of the Cottica River, south of Jerusalem. The next Suriname record of the species was by Von Sack (1821 (2): 203), who described it as the smallest of the Suriname opossums, being as large as a new born squirrel, and of a steel gray colour with 2 white spots over the eyes; the ears, tip of the nose and tail were reddish; possibly Von Sack's animal was young. Also Lammens (1844: 94) gave a recognizable description of the species. The Penard brothers ("De Surinamer", 11 January 1906) mentioned this species and distinguished it from *Metachirus nudicaudatus*. Sanderson (1949: 787) found the species to be very common in Suriname, he obtained several specimens near Paramaribo and one at Zanderij. During the "Operation Gwamba" (Walsh & Gannon, 1967: 218) "85 Four-eyed opossum *Metachirus nudicaudatus*"

were reported to have been taken; it is not clear whether these specimens belong to the present species or are a mixture of the present and the next species. The illustration (a coloured plate opposite p. 160) provided by Walsh & Gannon of the "Four-eyed opossum" clearly shows *Metachirops opossum*.

I have examined the following material of the present species:

1. Avanavero Falls in Kabalebo River, lower Corantijn basin, Nickerie District, skull fragments (no. 21843).
2. Upper Nickerie River, Nickerie District, 1 female (no. 12841, skull).
3. Rijweg naar Kwatta, highway 9 km west of Paramaribo, Suriname District, 1 skull (no. 21840).
4. Plantation "Clevia" on Suriname River north-east of Paramaribo, 11 males (nos. 17753, 17794, 17806, 22101, skulls; nos. 21727, 22093, 22096, 22098, 22104, 22106, 22107, skins and skulls), 11 females (nos. 17795, 22109-22112, skulls; nos. 22099, 22100, 22102, 22103, 22105, 22108, skins and skulls).
5. Agricultural Experimental Station (Cultuurtuin), Paramaribo, 3 males (nos. 17247, 21938, 22091, skins and skulls), 5 females (nos. 17248, 17249, 22092, 22094, 22095, skins and skulls).
6. Paramaribo, various localities in and near the town, 3 males (nos. 1694, 12838, 16081, skins and skulls), 3 females (nos. 16080, 16082, 18197, skins and skulls).
7. Lelydorp, about 15 km south of Paramaribo on highway to Zanderij, 4 males (nos. 22085, 22086, 22088, 22089, skins and skulls), 2 females (nos. 22087, 22090, skins and skulls).
8. Near Para River on highway to Domburg, about 10 km south-east of Paramaribo, Suriname District, 1 male (no. 22097, skin and skull).
9. Near Commewijne River, Commewijne District, 1 male (no. 3959, skin and skull).
10. Albina on Lower Marowijne River, Marowijne District, 1 male (no. 23947, skin and skull).
11. Suriname (without more precise locality indication), 5 males (nos. 12836, 12837, 12843, 12845, 12847, skins and skulls), 3 females (nos. 7253, 12834, 12844, skins and skulls), 2 unsexed specimens (nos. 7252, 12842, skins and skulls).

Description. — This description is based on all Suriname material listed above. The most striking characters of this species are the presence of a distinct sharply defined white spot above the eye (like in *Metachirus nudicaudatus*) and the bicoloured tail which has the dark basal part sharply separated from the white distal part (like in *Didelphis marsupialis*). The fur is short, soft and woolly. On the back it is dark grey, grizzled with white, usually the central part is distinctly darker than the sides. The colour is more blackish and less brownish than in *Metachirus*. The hairs are of two types, the soft underfur is thin, greyish with a dark brown to black top, the larger somewhat more bristle-like hairs likewise have a thin, greyish base, and the distal part is dark brown or almost black, usually with a white ring of variable width slightly below the dark tip. The fur of the head is of the same dark blackish brown colour as the median part of the back or even slightly darker; as here the bristle-like hairs do not show the white bands, the dark colour is of an even nature and is not grizzled with white. As already stated above there is a distinct sharply marked white spot over each eye. This spot may be rounded, oval, triangular or crescent-shaped. Another striking pale spot is present in front of the base of the ears. This spot differs from the one above the eyes in that it is larger, less well defined, more irregular in shape and less purely white, more cream coloured. The cheeks also are of a striking whitish or creamish colour; of the three pale spots on each half of the dorsal surface

of the head, that of the cheek is largest. The ears are large and rounded, they are whitish with a broad black rim; scattered, short and inconspicuous pale hairs are visible on both the outer and the inner surface of the ear. The sides of the body are more grizzled with white or cream than the dorsal surface and consequently are of a paler grey colour. The outer surface of the legs is of the same pale grey colour. The ventral surface is cream coloured over its full length, from the chin to the base of the tail, washed with light grey on the throat, the middle of the belly and between the hind legs. These greyish areas are more distinct in some specimens than in others, and occupy a surface of variable size, but usually they are very faint. Also the inner surface of the legs has the same cream colour. The tail is about as long as head and body combined (usually it is somewhat shorter, but in some individuals it is a fraction longer). The fur on the base of the tail, which is of the same colour as that of the dorsal surface, extends on it for 50-75 mm and occupies about $\frac{1}{4}$ to $\frac{1}{5}$ of the entire length of the tail. This hairy part ends rather abruptly, the rest of the tail is scaly with scattered very short stiff hairs. The basal half of the scaly tail is of a black colour, the distal half is white, the two parts being sharply defined. The short hairs in the blackish part are entirely black, those of the white part entirely whitish.

Juvenile specimens have the dorsal fur relatively longer, darker and less grizzled: the back is almost uniformly blackish, the sides are grizzled with white and resemble in colour the back of the adults. The white spots above the eyes are far less distinct, and less purely white, the white hairs being mixed with grey, also the spots before the ears and on the cheeks are less distinct. The legs are black both on the inside and out and the ventral surface varies from pale grey to grey. The tail is sharply two-toned.

Dental formula: $I \frac{5}{4}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{4}{4}$. The first premolar is more than half as high as the second, it is placed against the canine and separated from the second premolar by a quite small diastema. The second premolar is somewhat larger than the third, but of equal height. The postorbital processes are small, but rather distinct and triangular; they do not end in carinae; the postorbital constriction, which is situated far behind the processes is distinct. The sagittal crest is low, but very distinct, and anteriorly forms two divergent crests which are still lower and extend about to the base of the postorbital processes. The braincase is relatively narrow.

The external measurements of an adult female from the Cultuurtuin at Paramaribo and of an adult female from "Clevia" are, respectively: head and body, 335, 308; tail, 278, 262; hind foot, with claw, 42, 42; ear, 40, 38 mm; weight, 420,—, grams. — Skull: condylobasal length, 73.0, 71.9; zygomatic breadth, 35.0, 35.6; combined length of the three anterior upper molars, 11.0, 12.0 mm. In 17 specimens this combined molar length varies from 10.5 to 12.8 mm (mean: 11.6 mm). The shape of the skull is shown in pl. 8 (upper figures).

Remarks. — Little is known concerning the biology of the present species in Suriname. On 3 January 1963 we found a nest with a female and 7 juveniles under a tree near Lelydorp. The adult female and one juvenile escaped. Of the six remaining

juveniles, of which the length of head and body was about 150 millimetres, four were males and two females. In March and April of the same year we found six females with pouch young; two of these females had two young each, the four other females had one, three, four and five young, respectively. These data are rather well in agreement with those given by Phillips & Jones (1969) for specimens of *Metachirops opossum* from Nicaragua.

In the stomach of a Garden Tree Boa, *Corallus enydris enydris* (Linnaeus), caught at Paramaribo, I found remains of the present species. It is not known whether or not this snake feeds regularly on opossums.

According to Seba (1734: 56) the food of this species consists of fruit, leaves, bark, sugar cane, birds and poultry. The brothers Penard ("De Suinamer", 11 January 1906) indicate that they are found mostly in cane fields, and grassland, where they burrow in the ground, but they also occur in forests. Their food consists of fruit, insects, birds, crabs, etc. Sanderson (1949: 787) mentioned the species as common in gardens on the outskirts of Paramaribo and remarked that it is "almost entirely terrestrial and as active in the day as in the night". Sanderson, however, also found specimens in trees (mostly fruit bearing mangoes). My own observations confirm Sanderson's; once we found some of these opossums under the floor of a house at Lelydorp.

Hershkovitz (1949) suggested that the generic name *Philander* Tiedemann, 1808, should be used for the present genus rather than *Metachirops*. Pine (1973) opposed Hershkovitz's contention and thought *Metachirops* the correct name. I agree with Pine, be it for different reasons. Hershkovitz's account is very clear and he is correct in considering *Philander virginianus* Tiedemann, 1808, to be the type species of the genus *Philander* Tiedemann, 1808. However, Hershkovitz (1949, 1976) made the mistake to consider the name *Philander virginianus* Tiedemann, 1808, a replacement for *Didelphis opossum* Linnaeus, 1758. It is true that Linnaeus's name is given as a synonym in Tiedemann's account, but there is no indication that it should be treated differently from the other references given under *Philander virginianus*. In fact *Philander virginianus* Tiedemann is a composite species based in part on *Didelphis opossum* Linnaeus (reference to Linnaeus, and possibly also part of the references to Buffon and Schreber), partly on *Metachirus nudicaudatus* (E. Geoffroy, 1803) (again possibly part of the references to Buffon and Schreber, as well as the description provided by Tiedemann himself) and partly on *Didelphis marsupialis* Linnaeus, 1758 (part of the references to Buffon and Schreber, the references to Tyson (1698) and Cowper (1704), and the mention of Virginia as one of the type localities; also the fact that the name *virginianus* is used points in this direction). So far as I know no lectotype has ever been designated for *Philander virginianus* Tiedemann, 1808, and therefore I now select as such the female specimen from Virginia discussed by Tyson (1698). In this way *Philander virginianus* Tiedemann, 1808, becomes a junior synonym of *Didelphis virginiana* Kerr (1792: 193), and the generic name *Philander* Tiedemann, 1808, disappears in the synonymy of *Didelphis* Linnaeus, 1758. In this

way the solution by Pine (1973) is attained without intervention by the International Commission on Zoological Nomenclature.

The type species of the genus *Metachirops* Matschie, 1916, is *Didelphis quica*, described by Temminck (1824: 36-38) from Brazil. Pine (1973: 398) stated: "I have been unable to find a formal proposal of a species to be regarded as the type-species of *Metachirops*", but as Hershkovitz (1967: 300) correctly pointed out, in the original publication of the generic name *Metachirops*, Matschie (1916: 268) in the enumeration of the species of his new genus clearly gave the indication "Typus" after *Metachirops quica*. Therefore *Didelphis quica* Temminck, 1824, is the type of *Metachirops* Matschie, 1916, by original designation. Hershkovitz (1949: 12) was in error when indicating *Didelphis opossum* Linnaeus, 1758, as the type of Matschie's genus. In a later publication Hershkovitz (1976) showed the true state of affairs in regard to the type species of *Metachirops*.

The generic names *Didelphys*, *Metachirus* and *Philander* have been commonly used for the Four-eyed Opossum.

***Metachirus nudicaudatus nudicaudatus* (E. Geoffroy, 1803)**

Didelphis nudicaudata E. Geoffroy, 1803, Catalogue Mammifères Muséum National Hist. nat. Paris: 142.

Type locality. — "Cayenne". Geoffroy (1803) mentioned "Patrie. L'Amérique méridionale" and stated that the single type specimen was sent by "M. Martin, botaniste du gouvernement à Cayenne". The holotype is still in the Paris Museum (coll. no. 434) and is labelled "Cayenne Martin".

Synonymies. — Cabrera, 1958: 38; Krumbiegel, 1941b: 194-199; Thomas, 1888: 332-334, 341 (under *Didelphys*).

Vernacular names. — (E) Rat-tailed Opossum, Brown (Four-eyed) Opossum, Brown-masked Opossum; (N) Bruine Opossum; (S) Froktu-awari.

Distribution. — *Metachirus nudicaudatus* (E. Geoffroy, 1803) occurs "from Nicaragua southeastward to Brazil, Paraguay, and northeastern Argentina" (Walker, 1964 (1): 22); the nominate subspecies *M. nudicaudatus nudicaudatus* is known from the Guianas and from Brazil north of the Amazon.

Occurrence in Suriname. — The Suriname records of this species in the literature are few and usually unreliable, because of the confusion with other species. The only reliable record is that by the Penard brothers ("De Surinamer", 11 January 1906), who clearly described the present species, but give no details about occurrence or biology. So far *Metachirus nudicaudatus* is only known from the area of Zanderij and Republiek about 35-40 km S. of Paramaribo; this region consists mostly of savannas and gallery forests. A young female specimen, trapped on 23 February 1963 at about 9 p.m. in the gallery-forest along the Coropina Kreek near Republiek, is now preserved in the Leiden Museum (no. 18074). In the collection of the British Museum (Natural History), London, there is an adult female (no. 52.1222), which was trapped by I. T. Sanderson alongside a small creek near Zanderij on 19 August

1935. In the stomach of an owl belonging to the species *Asio clamator clamator* (Vieillot), which was shot on 10 November 1963 near Zanderij, I found fragments of the skull of the Rat-tailed Opossum, indicating that this owl is one of the predators of the present species.

Description. — The description is made from the specimen no. 18074. As in *Metachirops opossum*, there is a white or creamy white spot over each eye. The upper parts of the animal are greyish brown sprinkled with yellowish brown. The head has a striking colour pattern. A dark band extends from the tip of the snout through the eyes, along the base of the ears to a point midway between the ears. This dark colour forms a ring around the eyes. Above each eye there is a clear, well demarcated oval, white or creamy white spot. In the median area of the head, between the two dark bands, the colour of the fur is greyish brown, slightly darker in the middle, and gradually becoming darker posteriorly. A clear rufous brown spot is present behind the base of each ear. Between these two spots the dark colour of the head narrows in a posteriorly directed point. The lower part of the face, viz., the part below the dark line, is white or whitish; this white area is sharply defined, dorsally by the dark line, posteriorly (some distance before the ear) by an almost vertical line which separates it from the brownish grey colour of the posterior part of the cheek and the side of the neck. There is no light spot before the ears (as found in *Metachirops*). The ears are large and rounded, of a dark colour, and covered with rather sparse, short hairs. The outer surface of the legs is of the same colour as the back. The feet are whitish. The flanks are paler and more greyish, less brownish than the back. Their colour is rather sharply set off from the white or creamy white colour of the ventral surface. The entire ventral surface, from the chin to the tail including the inner side of the legs, is of a uniform almost pure white or slightly creamy white colour.

The tail is always longer than head and body combined. The fur extends only about 5 to at most 25 mm over the base of the tail (against 50 to 75 mm in *Metachirops*). The rest of the tail is scaly with a short appressed pubescence. The colour of the tail is irregular: the tip is white, the basal part darker, but the colours are nowhere sharply separated as in *Metachirops*; white spots occur near the base and dark spots up to near the tip. As a rule the lower surface of the tail is lighter than the upper.

In this species the pouch is absent (Pine, 1973: 392).

Dental formula: $I \frac{5}{4}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{4}{4}$. The skull of the present species closely resembles that of *Metachirops opossum*, in size as well as in shape. In addition to the two females from Suriname listed above, I examined the holotype specimen of *Didelphis nudicaudata* from Cayenne, preserved in the Paris Museum, and the two syntypes of *Didelphis myosurus* Temminck, 1824, from Brazil, preserved in the Leiden Museum. All three specimens belong to the present species. The following measurements are based on the total material examined; unfortunately the skulls of the three types are rather badly damaged. The combined length of the upper three molars varies from 10.0 to 10.5 mm. The width of the second premolar is 1.1 mm (it

is 1.8 mm in *Metachirops opossum*). The processus postorbitalis is absent in the present species. The braincase is relatively wide. I agree with Thomas (1888: 333) that the teeth of the present species as a whole are "lighter and more delicate" than in *Metachirops opossum*, and that "the upper premolars especially are markedly thinner transversely than in that species".

The adult female from Zanderij in the British Museum, according to the data noted on the label, has the following measurements: head and body, 245; tail, 290; hind foot, 41 mm. In the young female from Coropina Kreek these measurements are 176, 227 and 35 mm, respectively.

Remarks. — In several popular publications on Suriname the Dutch name "Kaalstaart" (= naked tail) has indiscriminately been used for any marsupial with a long tail in which the hairs are so short as to be practically invisible to the naked eye. The first author to do so was Pistorius (1763: 58). The fact that the Dutch word "kaalstaart" and the latin epithet *nudicaudatus* have the same meaning, may be the reason that in Suriname the name *nudicaudatus* is often incorrectly applied. Because *Metachirus nudicaudatus* and *Metachirops opossum* show a strong superficial resemblance to each other, they are easily confused and the more familiar name is often used for the wrong species, namely the more common of the two. *Metachirops opossum*, namely, occurs frequently near Paramaribo and is easily obtainable, while *Metachirus nudicaudatus* is only known from the savanna area farther in the interior, is very elusive, and is rarely trapped, even by professional collectors. From Suriname I have received twice a specimen of *M. opossum* that was provisionally identified by its collector as *M. nudicaudatus*. In some medical and general papers on mammals of Suriname the name *M. nudicaudatus* is used, e.g., in a paper on histoplasmosis in Suriname mammals by Collier & Winckel (1952: 351); it is unlikely, however, that this rare species is the one used for anatomical and parasitological purposes. Walsh & Gannon (1967: 218) reported 85 "Four-eyed opossum, *Metachirus nudicaudatus*" as having been saved during the "Operation Gwamba" in the flooded Brokopondo region, while *Metachirops opossum* was not listed by them at all; their coloured illustration (plate opposite p. 160) of a "Four-eyed opossum", however, shows a specimen of *Metachirops opossum*, so that it is evident that part or all of the material identified by them as *Metachirus nudicaudatus* does not belong to that species, but to *Metachirops opossum*. This clearly illustrates that the use in previous Suriname literature of the epithet *nudicaudatus* by non-professional taxonomists should be regarded with a great deal of reserve.

Didelphis marsupialis marsupialis Linnaeus, 1758

Pl. 6 (animal), pl. 9 lower figures (skull), pl. 1 fig. 4 (hind foot)

Didelphis marsupialis Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 54.

Type locality. — "Habitat in America". Restricted by Thomas (1911: 143) to "Surinam".

Synonymies. — Cabrera, 1958: 42-43; Krumbiegel, 1941a: 32-37, 42-47; Thomas, 1888: 323-328, 341.

Vernacular names. — (E) Common Opossum; (N) Gewone Opossum, Grote Buidelrat; (S) Awari, Dagoe-awari.

Distribution. — The species *Didelphis marsupialis* Linnaeus, 1758, ranges from Tamaulipas, Mexico (see Gardner, 1973: 69 and fig. 14) into South America southward as far as Bolivia, northern Argentina and eastern Brazil (see Hershkovitz, 1969: 54, 55). The nominate subspecies *D. marsupialis marsupialis* has been reported from Colombia, Venezuela, Trinidad, the Guianas and from there as far south as northern Brazil, Ecuador and northern Peru.

Occurrence in Suriname. — *Didelphis marsupialis* is one of the most common mammals of the coastal region of Suriname to be found near human habitations. In Paramaribo it is still present in considerable numbers, although in recent years it occurs there less frequently than before; especially the old males, called "Dagoe-awari", have become rare. Little is known about the occurrence of the species in the forests of the more interior parts of Suriname.

In the early Suriname literature animals are mentioned that probably are *Didelphis marsupialis*, but the descriptions are usually rather superficial. So Herlein (1718: 172) described the 'Seiwoy, also called Cerigons, this is white, black and gray, resembling a cat; it has also a tail. It usually gives birth to six young, and has a pouch in its belly with an aperture of about 10 cm, behind the aperture there is some skin so that the belly is not open; in the pouch there are tits. The animal carries the young in the pouch; the young enter and leave the pouch, and stay there until they are independant'. Merian (1719: 66) mentioned the occurrence in Suriname of the 'so-called Bag- or Purse-Rat which always carries its young in its body; the young come out for feeding, but afterwards crawl back into the belly of the mother'. The "Boschrotten" mentioned by Hartsinck (1770: 98) probably also belong here. The first author who gave a recognizable account of the present species from Surinam, so far as I can ascertain, is Stedman (1796 (2): 325-327). Stedman, who indicated the species with the name "Philander, or Mexican opossum", reported it from the Cassipora camp, situated at the confluence of the Cottica River and the Cassipoery Creek (north-eastern Suriname). Von Sack (1821 (2): 202) used the name "Zwartoorige-Opossum" (= black eared opossum) for it and described a juvenile specimen from Suriname. Also Lammens (1844: 94 no. 125) listed the species for Suriname. Kappler (1886: 66) mentioned the species under the incorrect name *Didelphis dorsigera*. The Penard brothers ("De Surinamer", 11 January 1906) gave an extensive account of the species and stated that the animals are especially common near inhabited areas and are even numerous "in de stad" (= in town, i.e., in Paramaribo). The picture of the occurrence of this species in Suriname as given by Sanderson (1949: 786) still holds true: "It was encountered in all types of forest and even in the coastal mangroves . . . it is very prevalent in the town of Paramaribo. Here it infests the houses, drains, holes in the banks of tidal ditches and the heads of the

Royal Palms that carry many dead leaves. At night they may be seen scavenging in the streets under the large of shop lights. . . . In the forest they are more truly arboreal but none the less bold and omnipresent. We are informed that they are often killed on coastal schooners sailing out of Paramaribo for the Caribbean". During the "Operation Gwamba", 151 specimens were reported to have been saved in the Brokopondo region (Walsh & Gannon, 1967: 218, plate opp. p. 161). I myself examined the following Suriname material:

1. Wageningen, Nickerie District, north-western Suriname, 1 male (no. 22553, skull only).
2. Lucie River, branch of the Corantijn River, 2 males (nos. 18012, skin and skull; 18175, skin), 1 female (no. 18176, skin).
3. Sipaliwini airstrip near Brazilian border, extreme south-eastern Nickerie District, 1 skull (no. 17750).
4. Totness, garden of government resthouse, Coronie District, 1 juvenile male (no. 22118, skin and skull).
5. Groningen, on Saramacca River, Saramacca District, 1 female (no. 12855, skin and skull).
6. Plantation "Clevia", on Suriname River, north-east of Paramaribo, Suriname District, 2 skulls (nos. 22126, 22127).
7. Combé, northern suburb of Paramaribo, on Suriname River, 1 male (no. 17763, skin and skull).
8. Cultuurtuin (Agricultural Experimental Station), Paramaribo, 2 males (nos. 17802 and 22119, skins and skulls), 3 females (nos. 17762, 17791, 22116, skins and skulls).
9. Paramaribo, various localities in town, 9 males (nos. 10789, 12856, 17775, 17803, 17805, 22114, 22115, 22121, 22124, skins and skulls), 1 female (no. 17747, skin and skull), 2 specimens, sex unknown (nos. 12852, 12858, skins and skulls), 6 skulls (nos. 21726, 22125, 24025 (mandible only), 24026, 24027, 24028).
10. Plantation "Meerzorg", eastbank of Suriname River, opposite Paramaribo, 1 male (no. 22122, skin and skull).
11. Leiding 5, canal west of Paramaribo on road from Paramaribo to Uitkijk, 1 male (no. 17744, skin and skull), 1 female (no. 17746, skin and skull).
12. Kasabaholo Creek, 7 km south-west of Paramaribo, Suriname District, 2 females (nos. 16164, 16165, skins and skulls).
13. Copieweg between Paramaribo and Zanderij, about 4 km south of Lelydorp, Para District, 2 males (nos. 22113, 22117, skins and skulls), 1 female (no. 17782, skin and skull).
14. Nieuw Amsterdam, at confluence of Suriname and Commewijne Rivers, Commewijne District, 1 female (no. 22123, skin and skull).
15. Commewijne District, 1 female (no. 3957, skull only).
16. Bigisanti, Wia-Wia nature reserve on the coast, west of Wia-Wia, Marowijne District, north-eastern Suriname, 1 male (no. 23955, skin and skull).
17. Oelemarie airstrip on Oelemarie River, upper Marowijne basin, south-eastern Suriname, Marowijne District, 1 skull (no. 22120).
18. Suriname (without more precise locality data), 2 males (nos. 12854, 12857; skins and skulls), 2 females (nos. 12853, 24292, skins and skulls), 6 specimens, sex unknown (nos. 12859, 12860, 12861, skins and skulls; nos. 22128, 22129, 23961, skulls).

Description. — The following description is based on the above listed Suriname specimens. The species is characterized by its large size, black ears and long, scaly bicoloured tail. The fur of the body is formed by three kinds of hairs. The soft woolly underfur consists of cream coloured hairs which are thin and wavy and which sometimes show a darker tip. The second type of hairs consists of thin stiff bristles, which end in a sharp point; these are cream coloured at the base and dark, almost

black in the distal part. The third type is formed by more heavy bristles, which broaden at the top and are split there into three or more points. These heavy bristles usually are black for the greater part of their length, the base being cream coloured. In most specimens the two types of bristles are not very dense, so that the cream coloured underfur shows very clearly and gives the impression that the animal is cream coloured, lightly or intensely streaked with black. In some specimens, part or all of the hairs of the third type are cream coloured throughout and these specimens give the impression of dirty white animals. Usually the dark colour of the body is concentrated along the middle of the back, so that often a narrower or wider longitudinal irregular dark median dorsal band is visible. The head shows the first two types of hairs, the heavy more-topped bristles are few and usually restricted to the posterior part of the head. The hairs of the head thereby are softer and shorter than those of the body, but here too the cream coloured woolly underfur shows plainly and is interspersed with the dark more bristly second type of hairs. A definite colour pattern lacks, but usually an irregular median dark line of variable length is visible; the area around the eyes is somewhat darker than the rest of the face, this darker area is variable in size and intensity but is always present. A paler area may be visible between the median area and the eyes, being most conspicuous above the eyes, but the area is neither sharply defined nor constant in presence. The ears are large, rounded and always intensely black; they are sparsely haired with short black hairs. In all specimens both the front and hind legs are very dark, contrasting with the colour of the body; only the hairs of the first two types are present here, but here they are black with just the basal part cream coloured. The ventral surface of the body lacks the third type of hairs and thereby the fur is softer than that of the back. The colour usually is predominantly cream suffused with grey. The grey colour is caused by the second type of hairs which have the distal part black; sometimes also the hairs of the underfur show black tips. The paler colour of the underside extends onto the head and even on the inner part of the legs. The extent and intensity of the dark colour of the fur of the animal both dorsally and ventrally is subject to a great variation. The tail is slightly shorter or somewhat longer than head and body combined. For the larger part of its length it is scaly with very few soft short hairs, only the basal $\frac{1}{5}$ to $\frac{1}{8}$ shows the same fur as the rest of the body. The tail has a characteristic colour: the distal part being whitish, sharply separated from the blackish basal part. The ratio of the length of the black and white parts varies considerably: the white part is as long as to almost twice as long as the black part.

Dental formula: $I \frac{3}{3}, C \frac{1}{1}, P \frac{3}{3}, M \frac{4}{4}$. The first premolar is small, but distinct and rather well developed; it is placed immediately behind the canine and separated from the much larger second premolar by a wide diastema. The second and third premolars are of about the same size. The skull of this species is characterized by (1) the narrow postorbital constriction which is less than half as wide as the interorbital constriction and is situated far behind the postorbital processes, (2) the shape of

the latter, which are blunt, wide and rather inconspicuous, (3) the braincase, which is very small, (4) the well developed and high sagittal and lambdoidal crests.

There is a considerable difference in the size of the adult animals in which all four upper molars are functional. Some cases are given here.

An adult female, caught on 23 January 1963, in a garden at Paramaribo, had four naked pouch young of which the length of head and body was about 50 mm and that of the tail about 25 mm; the external measurements of the female are: head and body, 410; tail, 425; hind foot, with claw, 62; ear, 50 mm; weight, 1600 grams. — Skull: condylobasal length, 95.9; zygomatic breadth, 51.5; combined length of the three anterior upper molars, 15.7 mm.

An adult female, caught on 1 February 1963, near Uitkijk, has as external measurements: head and body, 485; tail, 460; hind foot, with claw, 60; ear, 61 mm; weight, 2250 grams. — Skull: condylobasal length, 107.0; zygomatic breadth, 57.6; combined length of the three anterior upper molars, 16.7 mm.

An adult male, road victim on 11 February 1963, at Paramaribo, has as external measurements: head and body, 455; tail, 505; hind foot, with claw, 74; ear, 56 mm; weight, 3000 grams. — Skull: condylobasal length, 108.3; zygomatic breadth, 66.6; combined length of the three anterior upper molars, 15.8 mm.

Skull measurements of an unsexed animal from the Cultuurtuin at Paramaribo: condylobasal length, 115.5; zygomatic breadth, 69.7; combined length of the three anterior upper molars, 16.4 mm. In 22 specimens this combined molar length varies from 15.2 to 17.3 mm (mean: 16.3 mm).

Remarks. — In the Game Ordinance 1954, as revised in 1970, the Common Opossum is placed on the list of predominantly harmful animals under the names "Awari of grote buidelrat (*Didelphis marsupialis*)". The animal is still so common near human habitations that it can cause much damage to fruit trees and poultry. Although Geijskes (1954) did not mention the Common Opossum as being used for food by the Bush-negroes and Amerindians, the Penard brothers ("De Surinamer", 6 January 1906) remarked that the meat is eaten by some of the poorer people in Suriname. It is known that in some parts of South America the species is considered a delicacy; the meat is said to have a taste similar to that of Pingos and Pakiras.

The species carries 4, 5, or 6 young. Stedman (1796 (2): 326), who observed a female with young on 1 January 1777, mentioned that the number of young was 5 or 6. Walsh & Gannon (1967: 166) reported on 4 pouch young in this species. In my own material four of the females carried young in the pouch: two had 4 and two had 5 young. Three of these females were caught in February 1963, and one in January 1963. The remark by the brothers Penard ("De Surinamer", 11 January 1906) that the female gives birth to between 12 and 16 young needs confirmation. The few data provided by my own material and the information given by Stedman seems to indicate that the young mainly occur in the winter months (January, February), but Sanderson (1949: 786) remarked that "the pouches of almost every

female taken throughout the year were crammed with young, even those of less than half grown individuals”.

The food of the Common Opossum consists of birds, small mammals, insects, crabs and fruit, and the species can cause great damage to poultry. Stedman (1796 (2): 326) already regarded the species as a “dreadful destroyer of poultry”, while Kappler (1886: 166) gave the following account: “Kann sie in einen Hühnerstall kommen, so richtet sie eine grosse Verheerung an, hauptsächlich um das Blut zu saufen, denn von dem Fleische frisst sie wenig. Ein einziges Awari bringt oft ein Dutzend Hühner um”. The brothers Penard (“De Surinamer”, 6 and 11 January 1906) confirm this and furthermore state that plants also form part of the diet of the species, which can do considerable harm to orchards; the animals thereby avoid fruit with a leathery skin, like oranges. The Penards furthermore mention that crabs are eaten by the opossum (see also Holthuis, 1959: 45, 46).

Most authors have very little good to say about the Suriname opossum. Kappler (1886: 166) called them “ekelhafte, unheimliche Tiere”, and most other evaluations are in the same vein. The kindest description is that by Sanderson (1939: 206): “The beast is rapacious and sometimes — amazing as it is for an animal — actually dirty and smelly. Nevertheless it is a beautiful animal in a vicious, angry sort of way”. The irregular black and dirty white colour of the coat gives the opossum a kind of scabby outlook. Furthermore it has a highly unpleasant smell (“its smell was very offensive”, Stedman, 1796 (2): 326; “de Awarie heeft een hoogst onaangename reuk die zelfs spreekwoordelijk is, vooral geldt dit voor wijfjes met jongen”, the brothers Penard, “De Surinamer”, 11 January 1906; “this possum smell was something else: awful — a combination of tear gas and liquid nausea”, Walsh & Gannon, 1967: 166). Dr. Geijskes (pers. comm.) mentioned that this smell is produced in defense when the animal feels itself threatened. The presence or former presence of an opossum in the house can readily be detected by this loathsome musk-like odour.

The species can be very aggressive, not only to poultry, but also to man as vividly described by Walsh & Gannon (1967: 166), who gave an account of an opossum, which after freeing itself (by biting) from the grip of its captor, attacked instead of fleeing. Sanderson (1949: 786) stated that they “are constantly molesting cats, which appear to stand in great fear of them”.

The feigning of death, the “playing possum”, so well known of the North American Opossum, *Didelphis virginiana* Kerr, 1792, also has been reported for the present species (the brothers Penard, “De Surinamer”, 11 January 1906).

The species is very tough and difficult to kill: Kappler (1886: 66) remarked that it “wehrt sich noch, wenn schon Hirn und Eingeweide herausgenommen sind”, while the Penard brothers (“De Surinamer”, 11 January 1906) remarked that ‘it easily survives a heavy caning that would kill a dog’. Dr. Geijskes (pers. comm.) recalled that in his garden in Paramaribo his dog, a fox-terrier, often caught these opossums in the evening. The dog bit the opossum badly and shook it so fiercely

that one could hear the bones crack. After that the severely mauled opossum was left for dead on the ground, but usually it recovered and had disappeared by the next morning.

The Common Opossum makes a kind of nest consisting of dry leaves, pieces of cloth, etc., in hollow trees or other hiding places. Here it passes most of the day, coming out at nightfall. It is mainly nocturnal, and many of these opossums are killed at night on the highways of Suriname by the traffic: three of the above listed specimens (nos. 17775, 22114, 22115) are road victims found along the highway in the early morning.

It is a good climber and uses its tail as a prehensile organ.

The variation in the coat colour and the size of this species is the cause that the Suriname population recognizes several kinds of "Awari", like the "Foto Awari" (= town opossum), "Boesi Awari" (= forest opossum), "Mangro Awari" (= mangrove opossum), and "Heigron Awari" (= highland opossum). As shown by the brothers Penard ("De Surinamer", 6 January 1906) and Sanderson (1949) all those kinds belong to the present species, although the "Foto Awari" are larger and vary less than the others (Sanderson, 1949: 786).

In several handbooks on North American mammals (Miller & Kellogg, 1955: 1-4; Hall & Kelson, 1959: 5-8) the North American Opossum, *Didelphis virginiana* Kerr, is considered a subspecies of *D. marsupialis*. A recent study by Gardner (1973) again treated the two forms as distinct species.

***Chironectes minimus minimus* (Zimmermann, 1780)**

Pl. 7 (animal), pl. 12 (skull)

Lutra [error pro *Lutra*] *minima* Zimmermann, 1780, Geographische Geschichte des Menschen, und der vierfüßigen Thiere, 2: 317.

Type locality. — "Gujana". To be restricted to Cayenne (Guyane), because Zimmermann based his description on Buffon's (1776, Hist. Nat. (ed. 1), Suppl. 3: 159, pl. 22) "petite loutre d'eau douce de Cayenne".

Synonymies. — Cabrera, 1958: 43-44; Krumbiegel, 1940b; Thomas, 1888: 368-370, 341.

Vernacular names. — (E) Yapok, Water Opossum; (N) Water Opossum, Zwem-mende Buidelrat; (S) Watra-stonawari, Watra-alata.

Distribution. — The species *Chironectes minimus* (Zimmermann, 1780) occurs from Honduras eastward through Panama to South America, where it is known from Venezuela, Colombia, Ecuador, Peru, the Guianas, Brazil, Paraguay and north-eastern Argentina. The nominate subspecies *C. minimus minimus* has been reported from the Orinoco through the Guianas to southern Brazil, Paraguay and north-eastern Argentina.

Occurrence in Suriname. — No exact localities within Suriname are known to me for this species. According to the brothers Penard ("De Surinamer", 14 January 1906) the Yapok occurs "langs waterkanten en op begroeide zwampachtige plaatsen"

(along the water and in swampy areas with vegetation). Tate (1939: 160) remarked that the animal "is present in the coastal strip and probably . . . all through the Guiana lowlands". I have examined a single Suriname specimen only, viz., a juvenile female (skin and complete skeleton) of which a more exact locality is unknown. This specimen is held by the Rijksmuseum van Natuurlijke Historie at Leiden (no. 24289) and in 1860 was obtained by the museum from the Zeeuwsch Genootschap van Wetenschappen (= Zeeland Society of Sciences); this same specimen was listed by Jentink (1887: 302, specimen no. a; 1888: 222, specimen no. c). The museum possesses two more skins of this species, one semi-adult male without a locality indication (obtained in 1875 from the dealer G. A. Frank) and one sent from Caracas, Venezuela (coll. R. F. Van Lansberge, 1859; for the locality, see Boeseman, 1972: 314), of neither the skull is present. Furthermore there is a single skull, without locality indication, obtained in 1888 from Frank.

Description. — This striking species cannot easily be confused with any other Suriname mammal. Its peculiar colour pattern and webbed hind feet make it unique among all other marsupials. The following description is based on the specimens in the Leiden Museum, which are very similar in their colour pattern, although in the specimens from Suriname and from "Caracas" the colour evidently is somewhat bleached. The fur is very soft and woolly. The colour of the unbleached specimen is dorsally of a pale grey with a faint brownish tinge, overlaid by a most conspicuous dark warm brown colour pattern. In the bleached skins the general colour is more yellowish brown and less grey. The dark pattern consists of a narrow median line (8 mm or less wide) which extends over the full length of the back, from the head to the beginning of the naked part of the tail. Perpendicular to this narrow median line there are 4 broad transverse bands, about 10 to 50 mm wide. The anteriormost of these bands extends over the shoulders and reaches down along the full length of the outer surface of the front legs. The second band is slightly wider (in an anterior-posterior direction), but reaches much less far sideways, ending at about halfway down the sides, in a broad rounded top. The third band runs over the rump and ends in a rather sharp point just before the basis of the hind legs. The fourth band is the narrowest and is placed just before the basis of the tail, it extends sideways over the posterior part of the outer surface of the hind legs. The dorsal surface of the head is of the same dark colour as the transverse bands of the body. Above each eye there is a distinct pale greyish spot which is connected to a similar spot before the base of the ear. The four spots sometimes form a transverse pale band which is inconspicuously interrupted in the middle. Around the mouth and on the lower part of the cheeks the colour of the fur is whitish or pale grey. The ears are distinct, but in all three specimens the margins are heavily damaged. The ventral surface of the body from the tip of the chin to the base of the tail, including the inside of the legs is of a white or whitish colour. The front legs have the toes dark; between them, and especially between the second and third and between the third and fourth toes, there are very small webs. In the hind feet the webs are very distinct and reach

to or slightly beyond the base of the nails, they are conspicuous between all the toes (first to fifth). The tail is always longer than head and body combined; it is scaly with appressed hairs over the greater part of its length, being practically naked to the naked eye. The fur of the body extends only over the basal 1/5 of the tail or less; this fur is greyish, both dorsally and ventrally, with a dark dorsal line. The naked part of the tail is rather uniform in colour dorsally and ventrally; in the unbleached specimen the distal fifth is distinctly paler than the rest, but this peculiarity is not clearly noticeable in the other specimens.

Dental formula: $I \frac{5}{4}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{4}{4}$. The first upper premolar is slightly smaller than the second, it is placed against the canine, and is separated from the second upper premolar by a distinct but narrow diastema. The third premolar is of the same size as the second, or slightly larger. The processus postorbitalis is small, but distinct, triangular with a blunt tip. The postorbital constriction is narrower than the interorbital constriction. The sagittal crest is distinct and sharp but not very high, it forks anteriorly ending in the postorbital processes. The braincase is relatively broad.

Thomas (1888: 369) noted the following external measurements for an adult female from Brazil: head and body, 325; tail, 395; hind foot, 72 mm.

The following skull measurements of an adult male are taken from Thomas (1888: 341): basal length, 67; zygomatic breadth, 42.3; m^1 - m^3 , 14 mm. The skull measurements of the adult male from unknown locality (no. 181331) are: palatal length, 44.3; interorbital constriction, 13.6; postorbital constriction, 9.1; breadth of braincase, 24.2; length of upper tooth-row, c - m^4 , 32.5, m^1 - m^3 , 13.4 mm.

Remarks. — The fact that only one Suriname specimen of the present species (and that without a precise locality indication) is found in collections, and that there is hardly any information in the literature on the occurrence of the species in that country, indicates that *Chironectes minimus* must be considered very rare in Suriname. People interested in mammals who lived for many years in Suriname informed me that they had never seen the animal. On the other hand, the species has a vernacular name in various of the Suriname languages, which indicates that it is known to the local population and distinguished from the other mammals. It is possible therefore that, rather than rare, the species is very elusive or lives in an inaccessible habitat, or in a habitat that is neglected by collectors. The animal is nocturnal and aquatic. The Penard brothers ("De Surinamer", 14 January 1906) remark that they dive well and can walk under water; their food is said to consist of small fish, insects, crabs, etc. They also remarked that 'for a considerable period the mother carries its young in her well developed pouch, later the young climb on the back of the mother and with their tails hold on to hers'. The biology of the species was elaborately dealt with by Mondolfi & Medina Padilla (1957) and Walker (1964). Krumbiegel (1940b) gave a revision of the genus *Chironectes*, while Augustiny (1943) dealt with the morphology of the Water Opossum, especially in connection with its adaptation for swimming.

Lutreolina crassicaudata turneri (Günther, 1879)

Didelphis Turneri Günther, 1879, Annals Magazine Nat. Hist., (5) 4: 108.

Type locality. — “Demerara”; Thomas (1888: 336) noted that the type came from “Better Hope, Demerara” (Guyana).

Synonymies. — Cabrera, 1958: 40-41; Thomas, 1888: 334-336, 341.

Vernacular names. — (E) Thick-tailed Opossum; (N) Dikstaart Opossum.

Occurrence in Suriname. — With some reserve I mention the Thick-tailed Opossum here, because I have not been able to trace any specimen from Suriname. The brothers Penard, however, gave (in Dutch) the following information on the species in “De Surinamer” of 11 January 1906, the free translation of which reads as follows: ‘The following two species have no white spots above the eyes. The first species, the Thick-tailed Opossum, *D. crassicaudata*, is somewhat smaller with a tail that is conspicuously thicker, being furred over far more than half its length. The ears are relatively smaller than those of the other Opossums and the head and legs are short. The fur consists of straight, thick, soft hairs of a yellow-brown colour; the eyes and the muzzle are brownish, while the tail has a black colour with a white tip. The pouch is practically lacking; there are only teats. This Opossum, which in the Suriname language and in that of Amerindians has the same name as the two foregoing species [*Didelphis opossum* and *D. nudicaudata*] is not frequent, but it still is far less rare than the second species, the Woolly Opossum *D. philander*’.

There cannot be the least doubt that the brothers Penard really dealt with *Lutreolina*, while their vivid description suggests that they did see the animal. However, their statement that “*D. philander*” is rarer than the Thick-tailed Opossum is not in accordance with our knowledge, since the former species is quite well represented in museum collections, while of the latter no specimens from Suriname are known.

Remarks. — *Lutreolina* seems to be rare in Guyana; in this connection Tate (1939: 162) noted: “The Guiana race must be excessively rare, since but one specimen seems to have been captured since Turner obtained the type in 1879”. Cabrera (1958: 41) remarked: “Es muy posible que esta subespecie se encuentre en las otras Guayanas y en el nordeste del Brasil; en todo caso, se trata de un animal sumamente raro, o acaso extinguido ya, siendo el holotipo el único ejemplar conocido hasta el momento de redactar estas lineas’.

A revision of the genus *Lutreolina* was given by Krumbiegel (1941b: 190-194, fig. 1), while Walker (1964 (1): 23) gave a short account of its biology.

ORDER INSECTIVORA

FAMILY SORICIDAE

"Blarina pyrrhonota Jentink, 1910"

Blarina pyrrhonota Jentink, 1910, Notes Leyden Museum, 32: 167-168.

Type locality. — "Surinam".

Remarks. — Jentink (1888: 131) mentioned in his "Catalogue systématique" a new species of shrew from Suriname, which he named *Blarina pyrrhonota* without giving, however, a description of the "Individu adulte monté, type de l'espèce". The description of his new species was given by Jentink in 1910. After examination of the holotype (no. 17214) Husson (1963: 35-37, pl. 1) came to the conclusion that Jentink's new species was incorrectly labelled as to the locality, for it strongly resembles *Sorex araneus* Linnaeus, 1758, from Europe. Considering the distribution of insectivores in South America (see Cabrera, 1958: 46-48), it is unlikely that a shrew actually would occur in Suriname.

ORDER CHIROPTERA

The order Chiroptera is one of the best characterized mammalian orders. All its species have a well developed membrane which extends between the hind and front legs and between the very elongate fingers. With these wings the animals can perform active flight and they are the only mammals capable to do so. Other "flying" mammals like flying squirrels are only capable of a more passive gliding movement.

In the New World the order is represented only by the suborder Microchiroptera, the name of which is rather misleading as some of the species are very large, *Vampyrum spectrum* can attain a forearm length of about 110 mm.

In a previous publication (Husson, 1962) the bats of Suriname are very extensively treated, for more detailed information I may refer to that paper.

The number of species of bats known from Suriname (63) is more than 40% of the total number of mammal species so far known from the country.

In view of this large number of species it was though advisable not to give here a single key to all species, but instead have separate keys for families, subfamilies (if necessary) and species.

The external and skull measurements of Chiroptera used in the present paper are shown in figs. 1, 5, 6 and 7, in which also most of the terms are explained. All measurements given are in mm, unless indicated otherwise.

The 8 families of Chiroptera known from Suriname can be distinguished with the help of the following key.

Key to the Suriname families of Microchiroptera

- 1a. Tail thick and long, extending for about half its length beyond the posterior border of the well developed interfemoral membrane (fig. 8a) Molossidae, p. 186
- b. Tail, if present, extending not at all beyond the posterior border of the interfemoral membrane or with less than one-third of its length 2
- 2a. Muzzle with prominent nose leaf, the vertical, free portion lancet-shaped (fig. 21) Phyllostomidae (except Chilonycterinae), p. 77
- b. Muzzle without prominent true nose leaf, appendices of nose never lancet-shaped (fig. 10) 3
- 3a. Tail partly enclosed in the interfemoral membrane; the free part of the tail emerging proximally from the centre of the dorsal surface of the membrane (fig. 8f) 4
- b. Tail, if present, entirely enclosed in the interfemoral membrane (fig. 8d) or leaving the membrane at its posterior margin (fig. 27g) 6
- 4a. Third digit with two phalanges only 5

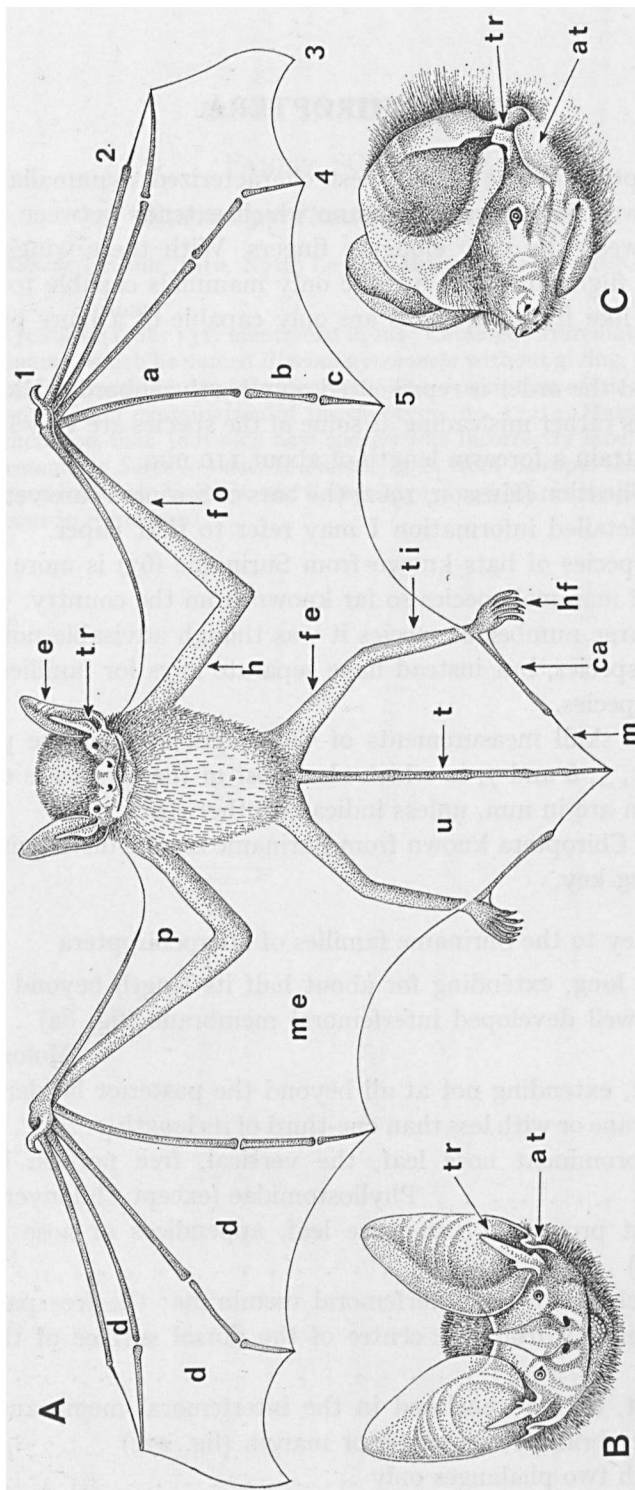


Fig. 5. Ventral view of a bat. — 1, thumb; 2, 3, 4, 5, second, third, fourth and fifth finger respectively; a, metacarpal; at, antitragus; b, first phalanx; c, second phalanx; ca, calcaneum or calcar; d, dactylopatagium; e, ear; fe, femur; h, humerus; hf, hind-foot; m, free margin of uropatagium; me, mesopatagium; p, propatagium (= antebrachial membrane); t, tail; ti, tibia; tr, tragus; u, uropatagium (= interfemoral membrane).

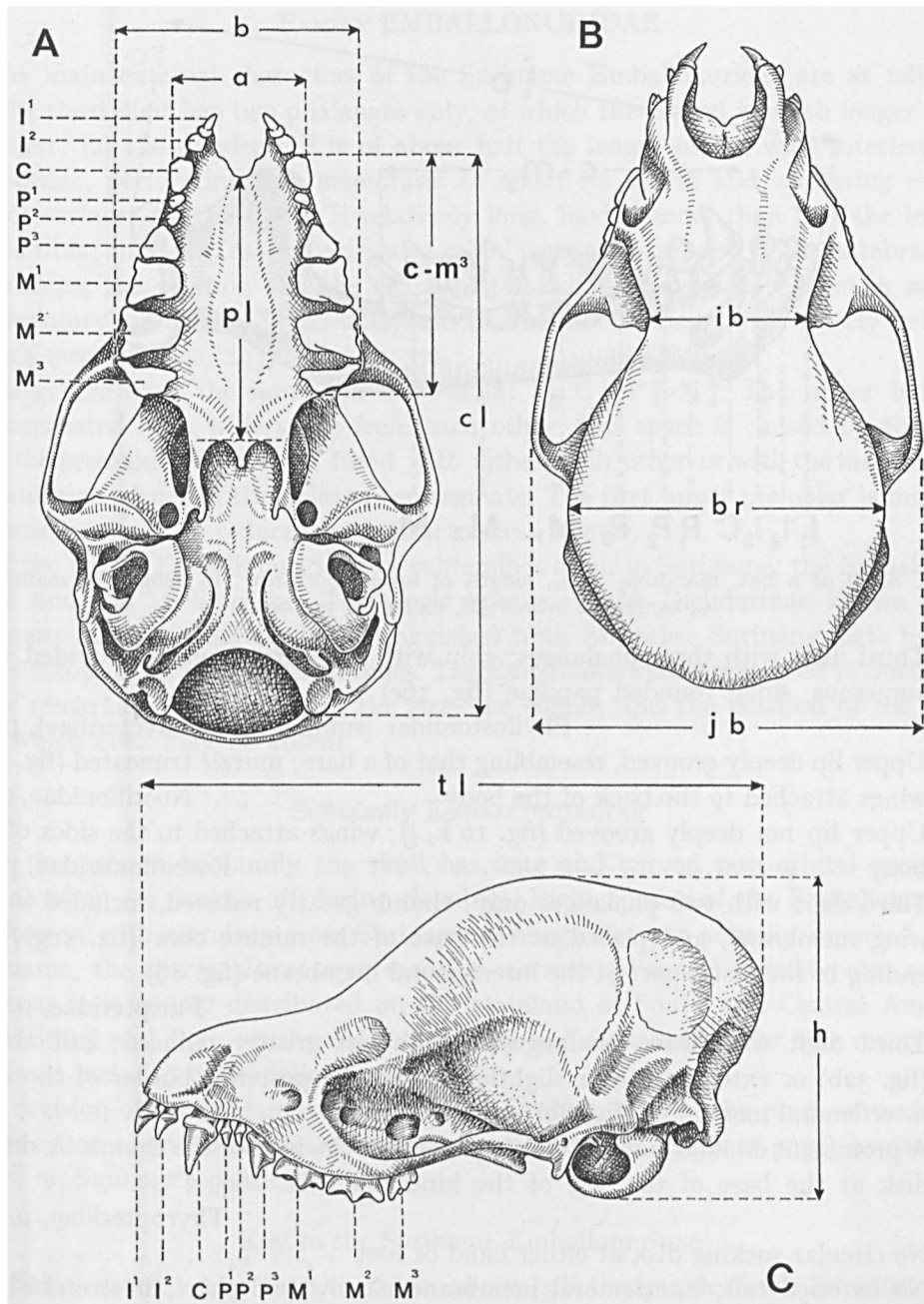


Fig. 6. Skull of a bat pictured in ventral, dorsal and lateral view to show the measurements and terms used in this paper. a, width across the cingula of the canines; b, width across the molars; br, width of braincase; cl, length from condyle to front of canine; c-m³, length of upper tooth-row; h, height of braincase; ib, width of interorbital constriction; jb, zygomatic breadth; pl, length of palate; tl, greatest length of skull; C, canine; I, incisor; M, molar; P, premolar.

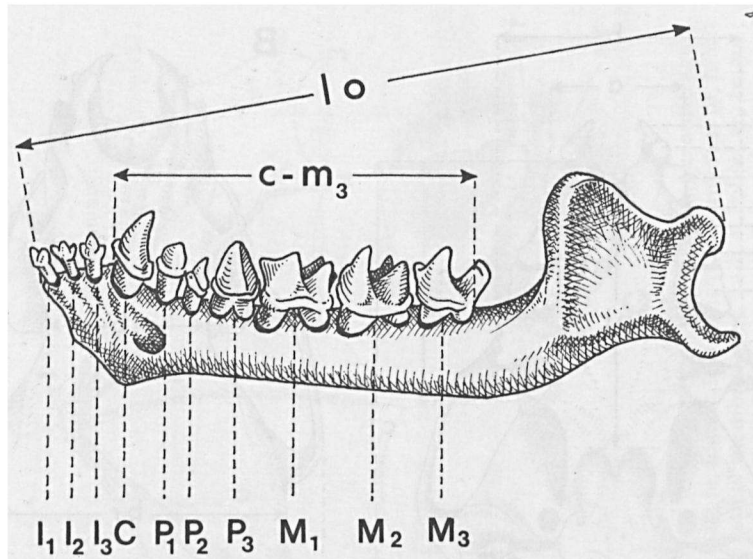


Fig. 7. Skull of a bat, mandible. $c-m_3$, length of lower tooth-row; lo , length of mandible; C, canine; I, incisor; M, molar; P, premolar.

- b. Third digit with three phalanges; chin with flat dermal plates provided with numerous, small rounded papillae (fig. 16e)
Phyllostomidae (subfamily Chilonycterinae), p. 78
- 5a. Upper lip deeply grooved, resembling that of a hare; muzzle truncated (fig. 15g) wings attached to the back of the body Noctilionidae, p. 71
- b. Upper lip not deeply grooved (fig. 10 k, l); wings attached to the sides of the body Emballonuridae, p. 45
- 6a. Third digit with two phalanges only; thumb greatly reduced, included in the wing membrane, and placed at the base of the minute claw (fig. 10g); tail ending in the distal part of the interfemoral membrane (fig. 8d)
Furipteridae, p. 164
- b. Third digit with three phalanges; thumb not greatly reduced; tail absent (fig. 32b) or extending to or slightly beyond the posterior border of the wide interfemoral membrane (fig. 8b) 7
- 7a. A prominent circular sucking disk is present at the base of the thumb. A similar disk at the base of the sole of the hind foot (fig. 10q, r)
Thyropteridae, p. 166
- b. No circular sucking disk at either hand or foot 8
- 8a. No external tail; interfemoral membrane narrow and short, if stretched extending from about the middle of one tibia to the other (fig. 8g).
Desmodidae, p. 158
- b. Tail present, reaching to or slightly beyond the posterior border of the wide interfemoral membrane; the membrane if stretched extending beyond the hind feet (fig. 8b) Vespertilionidae, p. 169

FAMILY EMBALLONURIDAE

The main external characters of the Suriname Emballonuridae are as follows: (1) the third digit has two phalanges only, of which the second is much longer than the first; (2) the slender tail is of about half the length of the wide interfemoral membrane, perforating this membrane at about its centre and appearing on its dorsal surface; (3) the calcar is relatively long, having more than half the length of the tibia, and (4) in most species a so-called wing sac is present in the antebrachial membrane, the position and the shape of this wing sac, well developed in males, rudimentary or absent in females, are characters to distinguish closely related genera (see Sanborn, 1937: 323 fig. 37).

All genera have the same dental formula: $I \frac{1}{3}, C \frac{1}{1}, P \frac{2}{2}, M \frac{3}{3}$. The upper incisors are separated by a wide space from each other; this space is caused by the fact that the premaxillaries are not fused with either each other or with the maxillaries; the anterior border of the palate is emarginate. The first upper premolar is minute, in some genera it is reduced to a structureless spicule.

Of the family Emballonuridae two subfamilies occur in Suriname: the Emballonurinae and the Diclidurinae. The single species of the Diclidurinae known from Suriname can immediately be distinguished from all other Suriname bats by the white colour of its fur and membranes. The Emballonurinae represented in Suriname show remarkable differences in the size, the colour, and the position of the wing sac, which even may be absent.

Subfamily EMBALLONURINAE

In the present subfamily the skull has long and curved post-orbital processes (which often are broken off during cleaning). Eight species of the Emballonurinae are known with certainty from Suriname. Though not yet actually reported from Suriname, the species *Peropteryx macrotis macrotis* (Wagner) possibly also occurs there as it is widely distributed on the mainland of South and Central America from Brazil and Peru northward to Yucatan and Guatemala. For this reason the species is included in the following key.

A revision of the subfamily was given by Sanborn (1937); the range of variation of the external and skull measurements mentioned in the present paper are mainly based on Sanborn's publication.

Key to the Suriname Emballonurinae

- 1a. Calcar much longer than the tibia, about half the length of the forearm; wing sac absent; small tufts of whitish hairs are present behind and along the dorsal surface of the forearm; dorsal surface of the body shows a light grizzled appearance, the ventral surface is whitish or greyish. Length of forearm varying from 35.5 to about 41 mm; length of upper tooth-row, c-m³, varying from 4.3 to 4.7 mm *Rhynchonycteris naso*, p. 48

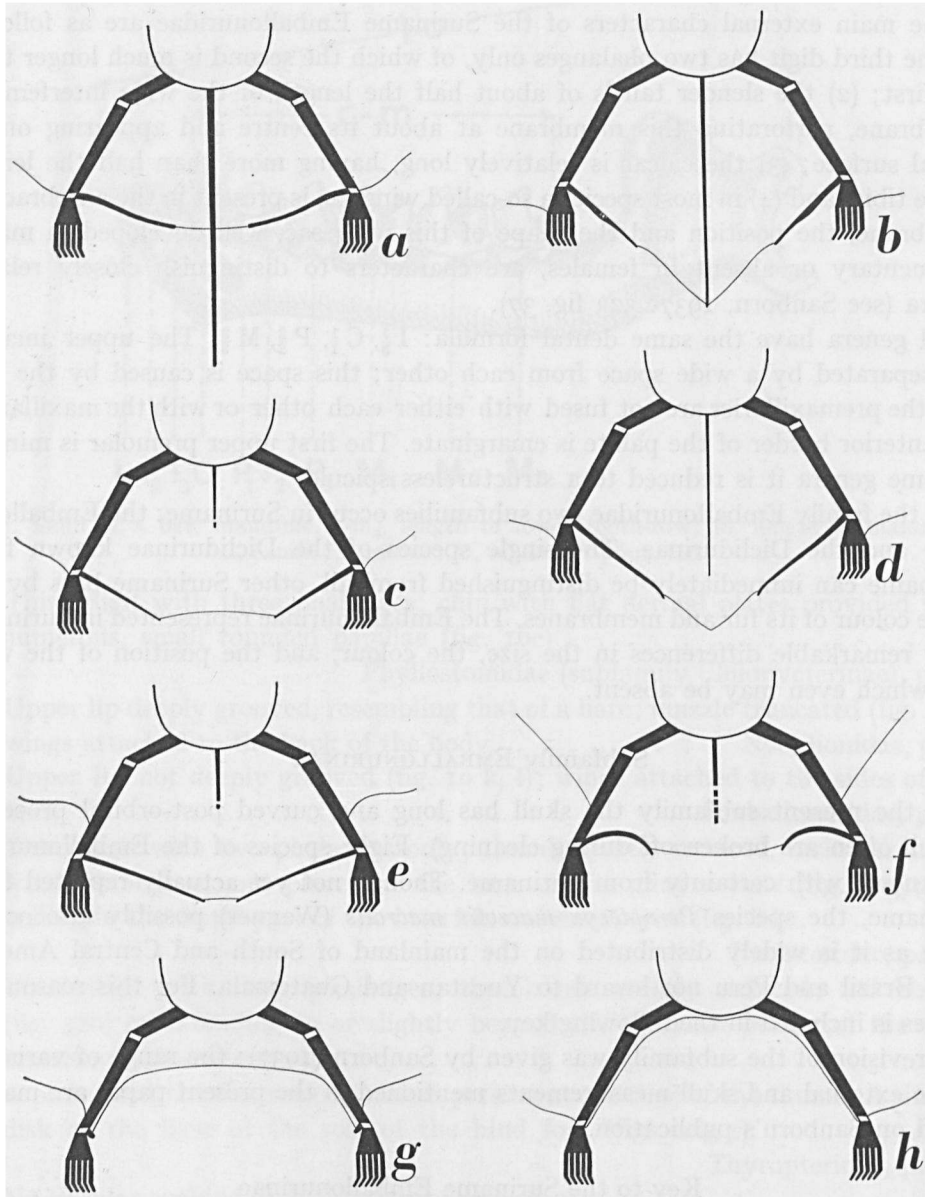


Fig. 8. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Suriname bats. a, Molossidae: *Eumops geijskesi* Husson; b, Vespertilionidae: *Lasiurus borealis frantzii* (Peters); c, Emballonuridae: *Peropteryx kappleri kappleri* Peters; d, Furipteridae: *Furipterus horrens* (F. Cuvier); e, Noctilionidae: *Noctilio leporinus leporinus* (L.); f, Chilonycterinae: *Chilonycteris rubiginosa rubiginosa* Wagner; g, Desmodidae: *Desmodus rotundus rotundus* (E. Geoffroy); h, Sturnirinae: *Sturnira lilium lilium* (E. Geoffroy).

- b. Calcar equals the length of the tibia or is shorter than the tibia; no tufts of whitish hairs along the dorsal surface of the forearm; wing sac usually present 2
- 2a. Wing membrane from the base of the outer toe or from the side of the foot above the base of the outer toe (fig. 9e) 3
- b. Wing membrane from the distal part of the tibia or from the ankles (fig. 9f) 4
- 3a. Metacarpal of the third digit equals the length of the forearm; wings from the base of the outer toes; no wing sac known. Length of forearm varying from 42.6 to 44.5 mm; length of upper tooth-row, c-m³, about 5.8 mm
Centronycteris maximiliani maximiliani, p. 67
- b. Metacarpal of the third digit considerably shorter than the forearm; wings from the side of the foot; wing sac long, often extending from near the anterior border of the antebrachial membrane to near the elbow. Length of forearm varying from 43.3 to 49.8 mm; length of upper tooth-row, c-m³, varying from 6.1 to 6.8 mm *Cormura brevirostris*, p. 62
- 4a. Ears connected by a low band across the forehead; wing membrane, at least between the body and a line drawn from the elbow to the knee, white; wing sac small, about in the middle of the anterior border of the antebrachial membrane. Length of forearm varying from 41 to 47 mm; length of tooth-row, c-m³, varying from 6 to 6.6 mm . . . *Peronymus leucopterus leucopterus*, p. 66
- b. Ears not connected by a low band across the forehead; wing membrane throughout of the same dark colour 5
- 5a. Dorsal surface of body with two more or less distinct longitudinal wavy lines of a whitish or buffy colour from back to rump; wing sac close to the forearm near the elbow 6
- b. Dorsal lines absent; wing sac small, near the anterior border of the antebrachial membrane 8
- 6a. Dorsal surface of body black, in specimens with worn pelage more brownish; wing membranes black; wing sac, at least in males, remarkably large. Length of forearm varying from more than 44 mm to 51.7 mm; length of upper tooth-row, c-m³, varying from 6.7 to 7.4 mm (usually more than 7 mm)
Saccopteryx bilineata, p. 54
- b. Dorsal surface of body uniformly brown or greyish brown; wing sac not remarkably developed. Length of forearm less than 44 mm; length of upper tooth-row, c-m³, varying from 4.6 to 5.5 mm 7
- 7a. Dorsal surface of body uniformly brown, ventral surface a little lighter; longitudinal lines usually distinct. Length of forearm varying from 37.4 to 42.3 mm; length of tooth-row, c-m³, varying from 5.1 to 5.5 mm, width across molars from 5.0 to 6.3 mm *Saccopteryx leptura*, p. 61
- b. Dorsal surface of body greyish or brownish with a grizzled appearance; ventral surface much lighter, grey or buffy; longitudinal lines usually indistinct and irregular. Length of forearm varying from 35.8 to 40.8 mm; length of upper tooth-row, c-m³, varying from 4.6 to 5.1 mm, width across molars from 5.1 to 5.6 mm *Saccopteryx canescens*, p. 59

- 8a. Length of forearm varying from 45 to 53.6 mm; greatest length of skull varying from 16 to 17.8 mm, length of the upper tooth-row, c-m³, from 6.7 to 7.8 mm, width across molars from 7 to 8.3 mm
Peropteryx kappleri kappleri, p. 65
- b. Length of forearm varying from 38.3 to 48.2 mm; greatest length of skull varying from 12 to 15 mm (mean 14.1 mm), length of upper tooth-row, c-m³, from 4.6 to 6.2 mm, width across molars from 5.5 to 6.8 mm
Peropteryx macrotis macrotis (Wagner)

Rhynchonycteris naso (Wied, 1820)

Text-figs. 9a (interfemoral membrane), 10l (head), 11 (roosting), 13a (canines and incisors), pl. 14 (skull)

Vespertilio Naso Wied, 1820, Reise nach Brasilien, 1: 251, footnote.

Type locality. — “Die Ufer des Mucuri”, Minas Geraes, Brazil.

Synonymies. — Sanborn, 1937: 325; Cabrera, 1958: 49; Husson, 1962: 29.

Vernacular names. — (E) Brazilian Long-nosed Bat; (N) Riviervleermuis.

Distribution. — The species has a wide range of distribution extending from southern Mexico through Central America to South America, where it occurs from Venezuela, Trinidad and the Guianas southward to northern Peru and Central Brazil (see Sanborn, 1937: 326, map in fig. 38; Hall & Kelson, 1959, map 43).

Occurrence in Suriname. — *Rhynchonycteris naso* is one of the most common species of bats along the Suriname creeks and rivers. The first Suriname record is that by Temminck (1841: 297), who described the species as new under the name *Emballonura lineata* from Suriname material. I have examined specimens from the following Suriname localities:

1. Frederik Willem IV Falls in Corantijn River at about 3°30'N, Nickerie District, 1 juvenile male (no. 17617, skin and skull).
2. Sipaliwini River near Sipaliwini airstrip, extreme south-eastern part of Nickerie District, 1 male (no. 17277, skin and skull), 13 specimens (no. 18248, skins and skulls).
3. Cupido, Amerindian village on Maratakka River, about 12 km south of Wageningen, 3 females (nos. 25484, 25485, skins and skulls).
4. Upper Maratakka River near its source, at about 120 km above its mouth near Wageningen, 3 males, 8 females (nos. 25486, 25487, skins and skulls).
5. Stondansi Falls in upper Nickerie River at about 5°5'N, 2 males, 2 females (nos. 22245, 25492, skins and skulls).
6. Lombok Falls in upper Nickerie River, 2 males, 4 females (nos. 25490, 25491, skins and skulls).
7. Upper Nickerie River between Graniet Falls and Paris Jacob Creek, at about 4°52'N 56°59'W, Nickerie District, 1 male (no. 25489, skin and skull).
8. Near confluence of Arawarra Creek and Wayombo River, at about 5°20'N 56°24'W, Saramacca District, 3 males (no. 25488, skins and skulls).
9. Coppename River, Saramacca District, 1 female (no. 25256, skin and skull).
10. Combé, northern part of Paramaribo, Suriname District, 4 males (nos. 3919, 3920, 3922, 3923, skins and skulls), 3 females (nos. 3917, 3918, 3921, skins and skulls).
11. Paramaribo, Suriname District, 1 male (no. 17546, skin and skull), 3 females (nos. 17547, 17548; ZMH no. 38831, skins and skulls).
12. Saramacca Creek near Zanderij, about 40 km south of Paramaribo, Para District, 2 males, 1 female (no. 8678, skins and skulls).

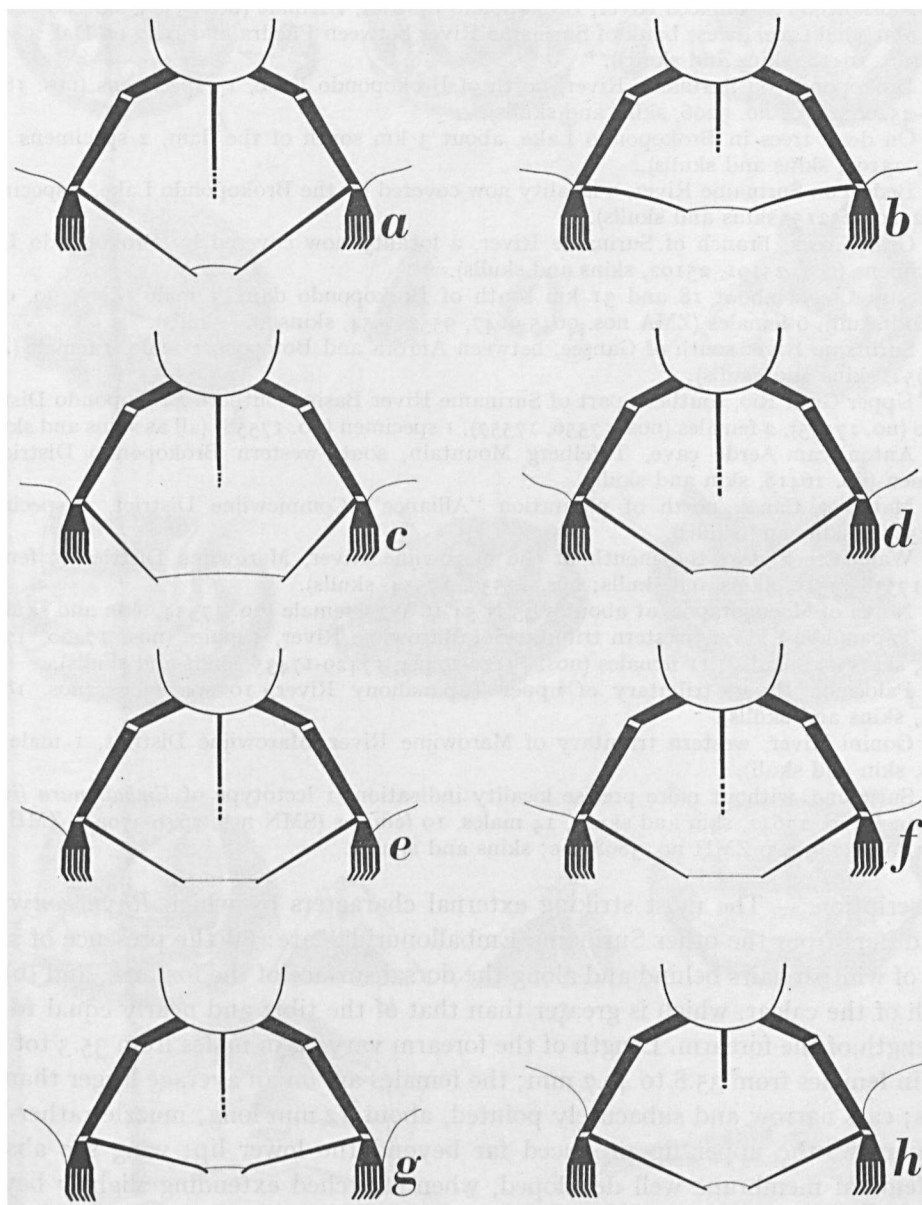


Fig. 9. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Emballonurinae (a-g) and Noctilionidae (h). a, *Rhynchonycteris naso* (Wied); b, *Saccopteryx bilineata* (Temminck); c, *Saccopteryx canescens* Thomas; d, *Saccopteryx leptura* (Schreber); e, *Cormura brevirostris* (Wagner); f, *Peronymus leucopterus leucopterus* (Peters); g, *Centronycteris maximiliani maximiliani* (Fischer); h, *Noctilio labialis albiventris* Desmarest.

13. Mambabasoe, upper Saramacca River, at about 4°15'N, Brokopondo District, 2 males (nos. 17443, 17445, skins and skulls), 9 females (nos. 17440-17442, 17444, 17446-17450, skins and skulls).
14. Finisanti on Saramacca River, Brokopondo District, 1 female (no. 25365, skin and skull).
15. Maréchal Creek, west bank of Suriname River between Phedra and Berg en Dal, 5 specimens (no. 10448, skins and skulls).
16. Brokopondo on Suriname River, north of Brokopondo Lake, 15 specimens (nos. 18254, 25196-25208; ZMA no. 9206, skins and skulls).
17. On dead trees in Brokopondo Lake, about 3 km south of the dam, 2 specimens (nos. 25193, 25194, skins and skulls).
18. Bedoti on Suriname River, a locality now covered by the Brokopondo Lake, 7 specimens (nos. 25209-25215, skins and skulls).
19. Gran Creek, branch of Suriname River, a locality now covered by Brokopondo Lake, 2 specimens (nos. 25191, 25192, skins and skulls).
20. Sara Creek, about 18 and 31 km south of Brokopondo dam, 1 male (ZMA no. 9555, skin and skull), 6 females (ZMA nos. 9645-9647, 9552-9554, skins and skulls).
21. Suriname River south of Gansee, between Aurora and Botopasi, 1 male, 1 female (ZMA no. 1652, skins and skulls).
22. Upper Gran Rio, southern part of Suriname River Basin, southern Brokopondo District, 1 male (no. 17555), 2 females (nos. 17556, 17557), 1 specimen (no. 17558) (all as skins and skulls).
23. Anton van Aerde cave, Tafelberg Mountain, south-western Brokopondo District, 1 specimen (no. 16418, skin and skull).
24. Matapica Canal, north of plantation "Alliance", Commewijne District, 2 specimens (no. 25258, skins and skulls).
25. Wane Creek near the mouth of the Marowijne River, Marowijne District, 5 females (nos. 17538-17540, skins and skulls; nos. 17537, 17554, skulls).
26. North of Moengotapoe, at about 5°35'N 54°16'W, 1 female (no. 17554, skin and skull).
27. Tapanahony River, western tributary of Marowijne River, 5 males (nos. 17420, 17425-17428, skins and skulls), 11 females (nos. 17421-17424, 17429-17435, skins and skulls).
28. Paloemeu River, tributary of upper Tapanahony River, 10 specimens (nos. 18252, 25272, skins and skulls).
29. Gonini River, western tributary of Marowijne River, Marowijne District, 1 male (no. 17439, skin and skull).
30. Suriname, without more precise locality indication, 1 lectotype of *Emballonura lineata* Temminck (no. 17642, skin and skull), 14 males, 19 females (SMN nos. 264b-370a-f, ZMB nos. A4203, A1837, 3225, ZMH no. 38983a-c; skins and skulls).

Description. — The most striking external characters by which *Rhynchonycteris naso* differs from the other Suriname Emballonuridae are: (a) the presence of small tufts of whitish hairs behind and along the dorsal surface of the forearm, and (b) the length of the calcar, which is greater than that of the tibia and nearly equal to half the length of the forearm. Length of the forearm varying in males from 35.3 to 40.5 mm, in females from 35.8 to 40.7 mm; the females are on an average larger than the males; ears narrow and subacutely pointed, about 12 mm long; muzzle rather long and narrow, the upper lip produced far beyond the lower lip; wing sac absent; interfemoral membrane well developed, when stretched extending slightly beyond the toes; calcar (about 18 mm) much longer than the tibia (about 14 mm), nearly equal to half the length of the forearm, and about three times as long as the free margin of the interfemoral membrane; tail not reaching to the middle of the interfemoral membrane, perforating this membrane and appearing on the dorsal surface, the free end being up to 5 mm long; wing membranes from the ankles or from the proximal part of the metatarsus. The fur is soft and dense; dorsally it extends on

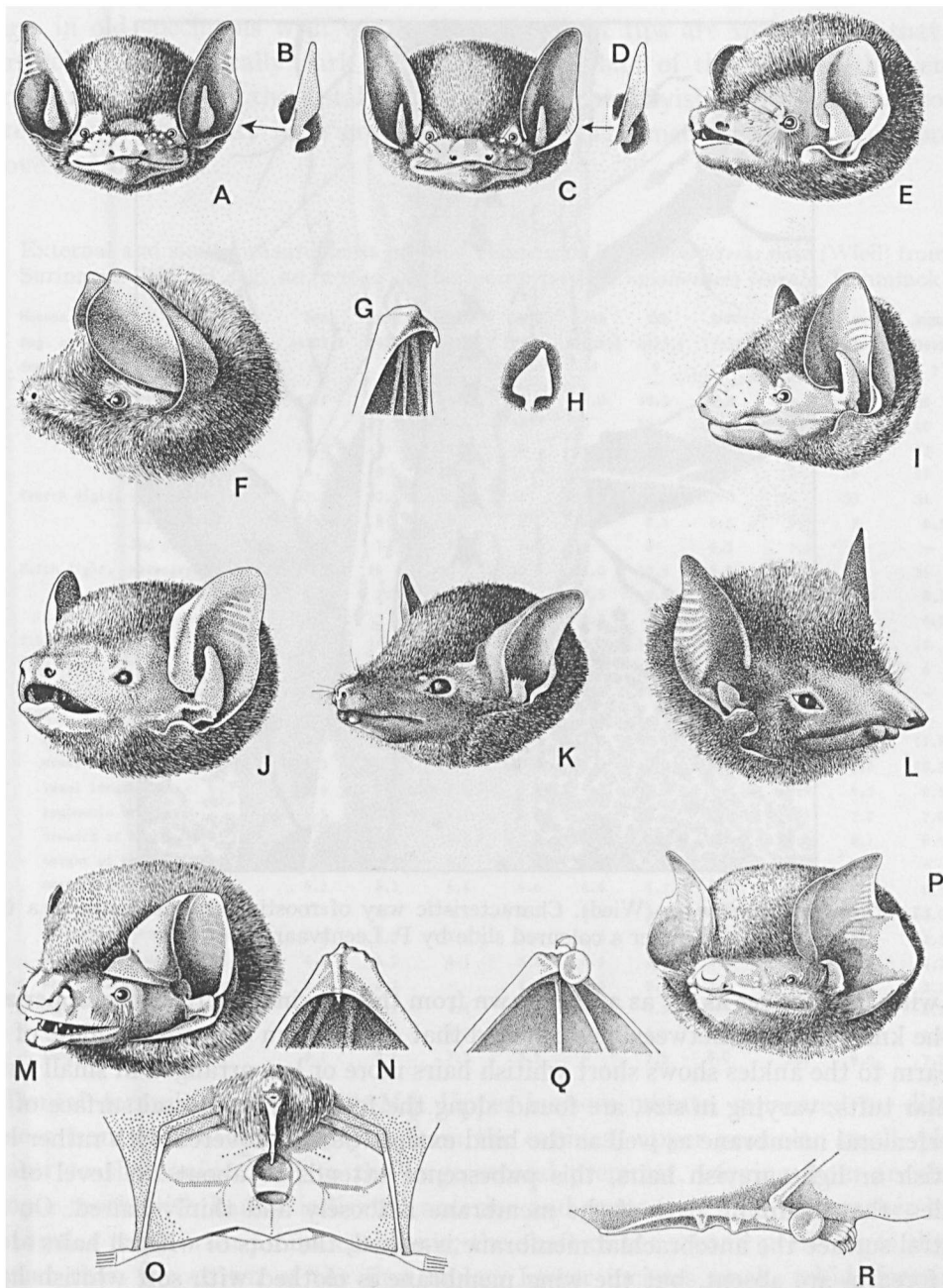


Fig. 10. a, *Myotis nigricans nigricans* (Schinz), ZMA no. 4468; b, tragus of same specimen; c, *Myotis albescens* (E. Geoffroy), SMN no. 264-861-1/2; d, tragus of same specimen; e, *Lasiurus borealis frantzii* (Peters), no. 17282; f, *Furipterus horrens* (F. Cuvier), SMN no. 684; g, thumb of same specimen; h, tragus of same specimen; i, *Eptesicus melanopterus* (Jentink), SMN no. 264a; j, *Dasypterus ega ega* (Gervais), no. 17370; k, *Saccopteryx bilineata* (Temminck), no. 17387; l, *Rhynchonycteris naso* (Wied), no. 17277; m, *Diclidurus scutatus* Peters, no. 17361; n, thumb of same specimen; o, interfemoral membrane of same specimen, ventral view; p, *Thyroptera tricolor tricolor* Spix, SMN no. 1301-4; q, thumb of same specimen; r, hind foot of same specimen.

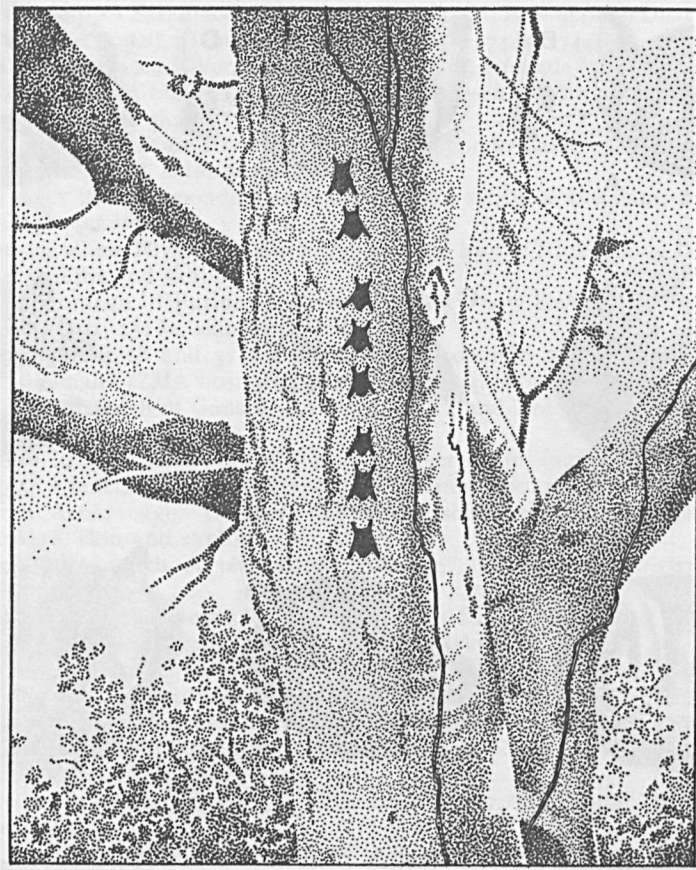


Fig. 11. *Rhynchonycteris naso* (Wied). Characteristic way of roosting on the trunk of a tree. After a coloured slide by P. Leentvaar.

the wing membranes as far as a line drawn from the proximal third of the upper arm to the knee, the area between this line and that drawn from about the middle of the forearm to the ankles shows short whitish hairs more or less arranged in small tufts; similar tufts, varying in size, are found along the forearm; the dorsal surface of the interfemoral membrane as well as the hind extremities are covered with rather long whitish or light greyish hairs, this pubescence extends to about the level of the ankles, the remaining part of the membrane is loosely and thinly haired. On the ventral surface the antebrachial membrane is naked, the dots of whitish hairs along the forearm are absent, but the wing membrane is clothed with soft whitish hairs as far as a line drawn from the elbow to the proximal third of the thigh; the ventral surface of the interfemoral membrane is rather regularly and thinly covered with very short whitish hairs. The hairs of the dorsal surface of the body are dark to blackish brown, the tips are whitish or greyish, giving the coat a grizzled appearance; in some specimens the lower back and the rump show two wavy lines of a whitish

tinge, in old specimens with worn pelage the light tips are worn off so that the coat colour is practically dark brown. The basal half of the hairs of the ventral surface is dark brown, the distal half whitish or light greyish so that the coat colour here is quite uniformly light greyish or whitish. The membranes are dark brown above and beneath.

TABLE 4

External and skull measurements of ten specimens of *Rhynchonycteris naso* (Wied) from Suriname. RMNH reg. no. 17642 is the lectotype of *Emballonura lineata* Temminck.

Museum	ZMB	RMNH	RMNH	RMNH	ZMB	ZMB	RMNH	RMNH	ZMB	RMNH
Reg. number	A4203,2	3920	3919	17556	A1837,4	3225,1	17557	3917	A4203,6	17642
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	?
Forearm	37.1	37.6	38.2	37.8	39.0	38.2	37.8	39.5	38.5	39
Third digit, metacarpal	37	37.5	38.5	37	40	38	38	41	40	40
1st phalanx	11.5	12	11.5	11	12	11.5	11.5	11.5	13	12
2nd phalanx	18	18	18	17	18	17	19	19	19	17
Fourth digit, metacarpal	31.5	30.5	32	31	31.5	32.5	32	34	33	34
1st phalanx	8.5	8	8	9	8.5	8.5	8.5	9	9	8.5
2nd phalanx	5.5	7	7	6.5	6	6	6.5	7.5	6	-
Fifth digit, metacarpal	29.5	29	30	30.5	31.0	30.5	30.5	31.5	31	31
1st phalanx	6.5	8.5	9	9	9.5	8.5	9	9.5	9.5	8.5
2nd phalanx	4.5	5	5	5	4.5	4	5	6	5	4.5
Tibia	13.5	14	14	13.5	14	14	14	14	14	14
Hind foot	7	7	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6
Calcar	18	18	17	18	18	17	18	19	19	-
Skull:										
greatest length from c	11.4	11.7	11.7	11.8	12.0	11.6	11.7	11.8	12.0	11.6
condylobasal length from c	10.3	10.3	10.1	10.6	10.6	10.2	10.3	10.6	10.4	10.3
basal length from c	9.4	9.3	9.2	9.6	9.5	9.2	9.4	9.5	9.5	9.5
zygomatic breadth	6.9	7.0	6.7	-	7.1	6.7	7.1	7.2	7.2	7.0
breadth of braincase	6.1	5.8	6.1	5.9	6.2	6.0	6.3	6.2	6.1	6.1
height of braincase	5.2	5.4	5.2	5.2	5.3	5.1	5.2	5.3	5.3	-
mastoid breadth	6.3	6.3	6.4	6.6	6.6	6.3	6.5	6.6	6.5	6.5
interorbital constriction	2.8	3.1	-	3.2	2.8	3.1	3.3	3.3	3.1	3.0
postorbital constriction	2.4	2.5	2.5	2.4	2.3	2.2	2.3	2.4	2.4	2.5
width across molars	4.5	4.2	4.1	3.8	4.5	4.3	4.6	4.7	4.6	4.7
width across cingula canines	3.0	3.2	-	2.6	3.0	3.1	3.2	3.2	3.3	3.2
upper tooth row, c - m ³	4.3	4.2	4.4	4.4	4.4	4.2	4.4	4.3	4.3	4.4
lower tooth-row, c - m ₃	4.4	4.3	4.5	4.5	4.4	4.2	4.4	4.3	4.3	4.4
length of mandible	8.1	8.1	7.7	8.1	-	7.5	8.0	7.7	8.0	7.7

Dental formula: $I \frac{1}{3}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors minute, separated by distinct spaces from each other as well as from the canines; upper premolar small, placed nearer to the canine than to the large second premolar, varying from an almost simple tooth with barely indicated anterior and posterior cusps to a rather broad triangular tooth with prominent cusps; the shaft of the second premolar is slightly higher than the crown of the first molar. Lower incisors small, trifold, forming a continuous row between the canines; canine slender; first lower premolar with distinct anterior and posterior cusps, touching the canine, but separated by a small space from the second premolar, the latter is about as wide as the former but its shaft is about twice as long as that of the first premolar. The basisphenoid pits are deep, not divided by a longitudinal plate. The shape of the palate and the tooth-

rows is very striking, the whole is about quadrate as the tooth-rows are parallel while the width across the molars equals the length of the tooth-row.

The external and skull measurements of ten specimens of the present species from Suriname, including the lectotype of *Emballonura lineata* Temminck, are given in Table 4.

Remarks. — The brothers Penard ("De Surinamer", 2 April 1905) described the habitat and habits of this species as follows (in free translation): 'The River Bat lives by preference in dark places near the water; here the animals hang in rows on tree branches, and from a distance often closely resemble knots in the wood. When disturbed, they fly away to settle close by on another tree. Their food consists of insects, which they catch at night when flying low over the water'. Dr. Geijskes' (in litt.) observations on this species confirm and elucidate those made by the brothers Penard: 'In the daytime this small bat hangs against tree trunks and on bare dead branches, that reach vertically or obliquely out of the water. The way in which they roost is most characteristic for the species: in groups of 8 to 10 individuals they hang, head downward, in a vertical row, one straight below the other with interspaces of about 10 cm (fig. 11). When disturbed, they fly away to settle close by in a similar fashion. No other bat has been observed to show this pattern of roosting'.

A review of previous records of this species from Suriname, and a discussion of these records was given by Husson (1962: 29-36), who also dealt with the nomenclature of the species and the genus.

Saccopteryx bilineata (Temminck, 1838)

Text-figs. 9b (interfemoral membrane), 10k (head), 12 (animal), 13b (canines and incisors), pl. 14 (skull)

Urocryptus bilineatus Temminck, 1838, Tijdschr. Natuurkundige Geschiedenis Physiologie, 5: 33-34, pl. 2.

Type locality. — "Suriname".

Synonymies. — Sanborn, 1937: 328; Cabrera, 1958: 49; Husson, 1962: 36.

Vernacular names. — (E) Greater White-lined Bat.

Distribution. — The species, in which no subspecies are recognized, occurs in Trinidad and "from southern Mexico (Colima, Guerrero, and Vera Cruz) south to central Bolivia and Matto Grosso and Rio de Janeiro, Brazil" (Sanborn, 1937: 330, map in fig. 39).

Occurrence in Suriname. — Sanderson (1939: 263) observed the species along the banks of rivers, namely the Coppename and Wayombo Rivers. The localities from where I have examined material also indicate that the species prefers the vicinity of water. So far it is only known from the coastal region and the foot-hill area of Suriname. I have examined the following material:

1. Plantation "Kwatta", north-west of Paramaribo, Suriname District, 10 specimens (nos. 17451-17460, skins and skulls).

2. Weg naar Zee, near the coast north of Paramaribo, 1 male (no. 24873, skull).

3. Agricultural Experimental Station (Cultuurtuin), Paramaribo, 1 male (no. 3929, skin and skull), 5 females (nos. 3925-3928, 2930, skins and skulls).

4. Swamps behind Agricultural Experimental Station, Paramaribo, 5 males (nos. 3932, 3934, 3943, 3946, 3948, skins and skulls), 13 females (3931, 3933, 3935-3942, 3944, 3945, 3947, skins and skulls).
5. Santo Boma, south-west of Paramaribo, 1 female (no. 24871, skin and skull).
6. Sumatra weg, just south of Paramaribo, Suriname District, 1 female (no. 24872, skin and skull).
7. Republiek, 35 km south of Paramaribo, Para District, 1 female (no. 7486, skin and skull).
8. Brokopondo on Suriname River north of Brokopondo Lake, Brokopondo District, 1 male (ZMA no. 9218, skin and skull), 2 females (no. 18253, ZMA no. 9217, skins and skulls), 2 specimens (no. 25263, skins and skulls).
9. Jai Creek, north of Moengotapoe, Marowijne District, 4 females (nos. 17469-17472, skins and skulls).
10. Seventh shell ridge counted from the sea shore, north of Moengotapoe, 2 females (nos. 17475, 17476, skins and skulls).
11. Bank of Marowijne River, 1 female (no. 17640, skull).
12. Nassau Mountains, west of Marowijne River at about 4°48'N, Marowijne District, 1 male (no. 17465, skin and skull), 3 females (nos. 17466-17468, skins and skulls).
13. Suriname, without more precise locality indication, 1 male holotype (no. 17461, skin and skull), 10 males and 14 females (no. 17387, ZMB nos. 2974, 3215, 3519, A1841, A4208, SMN no. 1176a), 1 skull (no. 17641).

Description. — Length of forearm in males varying from 44 to 49 mm, in females from 44.4 to 51.7 mm; ears about 15 mm long, with rounded tips, outer margin deeply concave in upper third, convex in lower two-thirds; upper lip projecting slightly beyond the lower lip; in the males the wing sac in the antebrachial membrane is situated close to the forearm near the elbow, opening on the dorsal surface of the membrane; on the ventral surface of this membrane the wing sac presents itself as a large swollen wrinkled pouch of about 9 mm long; in the females the wing sac is much smaller, sometimes even rudimentary. Interfemoral membrane well developed, when stretched extending to about the level of the bases of the toes; calcar about 17 mm long, conspicuously shorter than the tibia (which is about 22 mm), equal to the free margin of the interfemoral membrane; tail not reaching to the middle of the interfemoral membrane, perforating this membrane and appearing on its dorsal surface, the free end being up to 6 mm long; wing membranes from the ankles or from slightly above them on the tibia. The fur is soft and dense; dorsally it extends on the wing membranes as far as a line drawn from the proximal third of the upper arm to the knee, it is more loosely arranged on the interfemoral membrane and extends there to the exertion of the tail. The ventral fur of the wing membranes is less dense than dorsally, while the ventral surface of the antebrachial membrane as well as that of the interfemoral membrane are for their greater part covered with fine short whitish hairs; naked zones are usually found along the free margins of these membranes and along the thigh and tibia. The coat colour of the dorsal surface of the body is uniformly blackish brown or blackish, with the exception of two wavy longitudinal whitish or buffy white lines. These lines, which extend from about the shoulders either to the rump or to the base of the tail, are sometimes very distinct, but may be vague or interrupted; the hairs in these lines have only the tips white. In specimens with worn pelage the coat colour is more dark brownish.

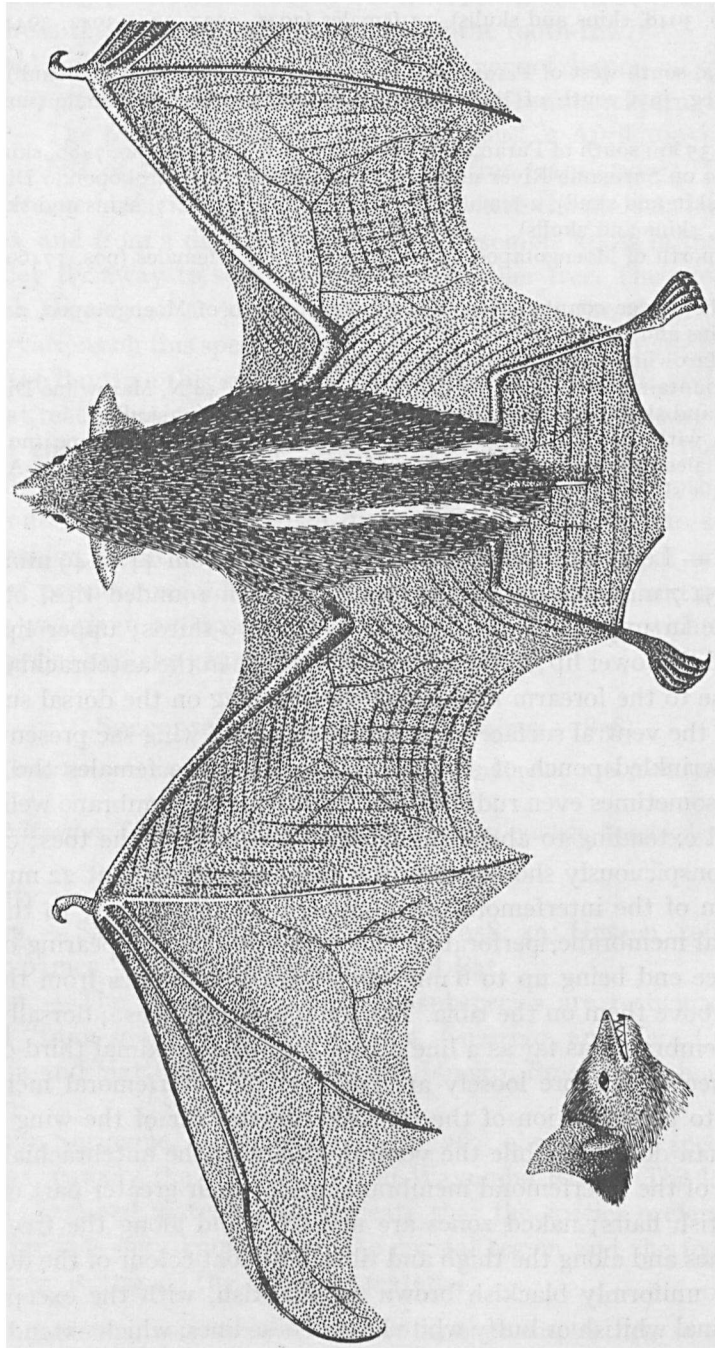


Fig. 12. *Saccopteryx bilineata* (Temminck), type of *Urocryptus bilineatus* Temminck. After Temminck, 1838.

The colour of the ventral surface is more greyish brown; here the hairs are bicoloured, the basal two-thirds are dark to blackish brown, the upper third is more greyish brown or buffy white. The membranes are blackish.

Dentition: $I \frac{1}{3}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors small, separated by distinct spaces from each other as well as from the canines; first premolar a simple spicule without anterior and posterior cusps, placed between the canine and the large second premolar without touching either; second premolar with its base of equal size as that of the canine, its shaft is about two-thirds the length of that of the canine; crowns of the molars distinctly lower than that of the second premolar. Lower incisors small, trifid, forming a continuous row between the slender canines; first premolar with a broad base which equals that of the second premolar, touching the canine as well as the second premolar, the shaft of the first premolar is slightly more than half the length of that of the second premolar. Skull with interorbital constriction broad and posterior constriction narrow, the two being separated by long and broad

TABLE 5

External and skull measurements of ten specimens of *Saccopteryx bilineata* (Temminck) from Suriname.

Museum	RMNH	RMNH	RMNH	SMN	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH
Reg. number	3934	3929	3946	1176a,3	3943	3926	3927	3930	3925	3928
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm	47.2	49.0	49.0	47.1	48.5	48.0	47.2	48.6	50.0	51.0
Third digit, metacarpal	45	48.5	46.5	45	48	48.5	46	48	48	49
1st phalanx	14.5	15.5	15.5	15	15.5	15	14.5	16	15	15
2nd phalanx	25	26	26	25	26	26	25	28	26	26
Fourth digit, metacarpal	40.5	42.5	41.5	40	44	43.5	41	43.5	42	43
1st phalanx	7.5	8	8.5	8.5	8.5	9	8	9.5	8	8.5
2nd phalanx	10	9.5	10	9.5	10	10	9.5	10.5	9.5	9.5
Fifth digit, metacarpal	37.5	40	40	38.5	40	40.5	38.5	41	40	41
1st phalanx	10.5	10.5	10.5	10.5	11	10.5	10	11.5	10	10.5
2nd phalanx	8.5	8.5	9.5	8.5	8.5	8.5	8	8.5	8	8.5
Tibia	21	22	23	21.5	22	22	21	22	22	22
Hind foot	10.5	11	11	11	10.5	10	10.5	12	10	11
Calcar	16	17	17	16	16	16	17	19	18	18
Skulls:										
greatest length	17.0	17.1	17.1	17.3	-	16.7	16.7	17.2	17.3	17.4
condylobasal length from f	15.3	15.5	15.3	15.6	-	15.1	15.3	15.6	15.8	15.9
condyle to front of canine	15.1	15.4	15.2	15.5	15.5	15.0	15.1	15.4	15.5	15.5
basal length from i	13.8	14.1	13.8	13.8	-	13.6	13.7	14.1	14.4	14.3
palatal length from i	6.8	7.0	6.9	6.8	-	7.1	7.1	7.1	7.2	7.5
zygomatic breadth	10.9	11.4	10.8	10.8	11.2	10.6	11.0	10.5	11.2	10.6
breadth of braincase	8.2	8.2	8.1	8.3	8.0	8.0	7.9	8.0	8.3	8.0
height of braincase, without crest	6.7	6.8	6.7	6.8	6.7	6.9	6.7	6.8	6.7	6.5
mastoid breadth	8.7	9.0	8.7	9.1	8.8	8.6	8.7	8.7	8.8	8.9
interorbital constriction	4.1	4.5	4.0	4.6	4.7	4.9	4.5	4.8	4.9	4.5
postorbital constriction	2.5	2.6	2.6	2.7	2.6	2.6	2.6	2.6	2.5	2.5
width across molars	7.5	7.6	7.5	7.4	7.5	7.2	7.4	7.5	7.6	7.5
width across cingula canines	4.0	4.3	4.0	4.0	4.1	4.0	4.1	4.2	4.0	4.1
upper tooth-row, c - m ³	7.1	7.2	7.2	7.3	7.3	7.1	7.1	7.2	7.0	7.3
lower tooth-row, c - m ₃	7.3	7.3	7.4	7.6	7.6	7.4	7.3	7.5	7.3	7.5
length of mandible	12.5	12.6	12.8	12.3	12.5	12.4	12.2	12.5	12.8	13.0

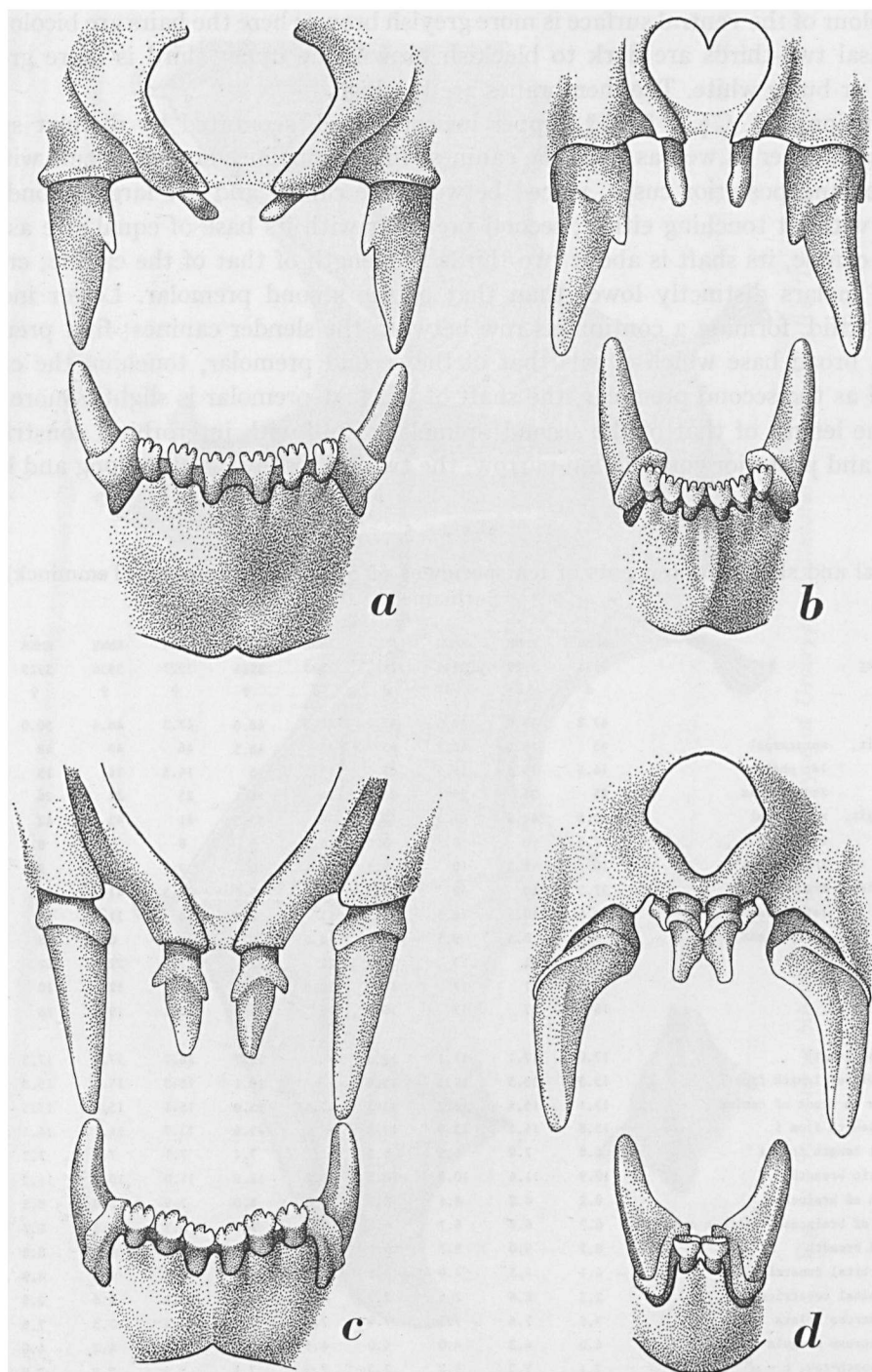


Fig. 13. Canines and incisors in front view. a, *Rhynchonycteris naso* (Wied), no. 3917; b, *Saccolpteryx bilineata* (Temminck), ZMB no. A1841-1; c, *Diclidurus scutatus* Peters, no. 17361; d, *Noctilio leporinus leporinus* (L.), no. 13490. Width across cingula canines, in mm: a, 3.2; b, 4.1; c, 3.9; d, 9.5.

postorbital processes. The sagittal crest, which extends from the postorbital region to the supraoccipital bone, is distinct, varying in height from 0.4 to 0.6 mm. The large basisphenoid pit is divided by a well developed longitudinal septum.

The external and skull measurements of ten specimens from Suriname are given in Table 5.

Remarks. — The taxonomy of the present species was discussed by Husson (1962: 39-41), who also gave more information about the holotype of the species.

Saccopteryx canescens Thomas, 1901

Text-fig. 9c (interfemoral membrane)

Saccopteryx canescens Thomas, 1901d, *Annals Magazine Nat. Hist.*, (7) 7: 366-367.

Type locality. — "Obidos, on the Amazon", Brazil.

Synonymies. — Sanborn, 1937: 334; Cabrera, 1958: 49; Husson, 1962: 45.

Distribution. — "From northern Colombia south through central Peru and east to French Guiana and the Amazon basin" (Sanborn, 1937: 334, map in fig. 41).

Occurrence in Suriname. — The species was first reported from Suriname by Thomas (1901d) in the original description of the species, some of his paratypes being labelled "Surinam". Husson (1962) gave some additional records, all from the coastal lowland area. So far the species is only known from these records. I have examined the following material from Suriname:

1. Tibiti River, tributary of the Coppename River, Saramacca District, 1 female (no. 12090, skin and skull).
2. Paramaribo, Suriname District, 4 females (CNHM nos. 93221-93223, ZMH no. 23517, skins and skulls).
3. Suriname, without more precise locality indication, 2 males (SMN no. 3587.3, ZMB no. A4208.4, skins and skulls).

Description. — Length of forearm varying from 34.4 to 40.8 mm; length of ear about 11 mm; interfemoral membrane, when stretched, extending beyond the toes; calcar (about 15 mm) slightly shorter than the tibia (about 16 mm); wing sac short, close to the forearm near the elbow and opening on the dorsal surface of the antebrachial membrane; wing membranes from the ankles or from the proximal part of the metatarsus; fur soft and dense, extending on the wing membranes, above and beneath, as far as a line drawn from the distal third of the humerus to the knee, and on the dorsal surface of the interfemoral membrane to the distal part of the tail; the ventral surface of the interfemoral membrane is sparsely clothed with short fine hairs; the colour of the dorsal surface varies from greyish brown to brownish with a grizzled appearance, it is usually darkest brown between the two whitish longitudinal stripes, which in some specimens are distinct, in others hardly visible; the hairs of the dorsal surface are bicolourous, the basal three-fourths dark brown, the tips whitish, light yellowish brown or buffy; the colour of the ventral surface is distinctly lighter than that of the back, the basal half of the hairs is dark brown to plumbeous, the upper half greyish or buffy; the wing membranes are blackish brown.

TABLE 6

External and skull measurements of six specimens of *Saccopteryx leptura* (Schreber), left of vertical line; and of four specimens of *Saccopteryx canescens* Thomas right of vertical line; all ten specimens from Suriname.

Museum	SMN	ZMB	RMNH	ZMB	RMNH	ZMB	SMN	ZMB	RMNH	ZMB
Reg. number	3587,1	3982,1	17584	3982,2	17587	A1840,2	3587,3	A4208,4	12090	23517
Sex	♂	♂	♂	♀	♀	♀	♂	♂	♀	♀
Forearm	38.5	39.6	37.5	40.6	39.0	40.5	36.3	36.3	39	39.8
Third digit, metacarpal	37.5	39	36.5	40	37.5	38.5	36	35	-	39
1st phalanx	11.5	11.5	10.5	12	10	12	11.5	11.5	-	12
2nd phalanx	23	22	21	22	20	23	20	17	-	17
Fourth digit, metacarpal	32.5	33.5	32	35.5	35	35	31.5	31	-	34.5
1st phalanx	7	6.5	7	7	7.5	7	7	7	-	6
2nd phalanx	8	7.5	8	7.5	8.5	7.5	7	7	-	7.5
Fifth digit, metacarpal	30.5	32	29.5	33	32.5	32	29.5	30.5	-	33.5
1st phalanx	8.5	7.5	8.5	8.5	9	8.5	8	8	-	7.5
2nd phalanx	7.5	6	6.5	6.5	6.5	6.5	5.5	5	-	5.5
Tibia	16	15	15	17	16	17	14.5	13.5	-	15
Hind foot	8	8	7.5	8	8	8	7	6.5	-	7
Calcar	13.5	13	13	14	-	14	12.5	13.5	-	14
Skull:										
greatest length	13.8	13.9	14.2	13.6	13.9	14.2	12.7	13.0	12.7	13.0
condylobasal length	12.3	12.5	12.5	12.3	12.5	12.8	11.4	11.3	11.3	11.9
condyle to front of canine	12.3	12.5	12.3	12.3	12.2	12.7	11.4	11.3	11.2	11.8
basal length from i	10.8	11.0	11.3	11.0	11.4	11.3	10.2	10.5	9.5	10.5
palatal length from i	5.1	5.1	5.3	4.9	5.1	5.1	4.5	4.7	4.6	5.1
zygomatic breadth	-	9.0	9.1	9.0	9.1	8.8	7.7	7.9	8.0	8.0
breadth of braincase	7.1	7.0	7.4	6.7	7.0	6.8	6.3	6.3	6.4	6.1
height of braincase	6.0	5.8	5.9	5.8	5.9	5.9	5.1	5.1	5.4	5.3
mastoid breadth	7.2	7.6	7.4	7.2	7.3	7.3	6.6	6.8	6.6	6.6
interorbital constriction	3.0	3.4	3.4	4.0	3.5	3.5	-	2.8	2.1	2.2
postorbital constriction	2.4	2.2	2.2	2.2	2.5	2.3	2.2	2.1	-	-
width across molars	6.1	6.0	6.1	6.2	6.0	5.8	5.3	5.3	5.2	5.5
width across cingula canines	3.2	3.1	3.0	3.3	3.2	3.1	2.7	2.7	2.9	2.8
upper tooth-row, c - m ³	5.3	5.3	5.4	5.5	5.3	5.3	5.0	5.0	4.7	5.1
lower tooth-row, c - m ₃	5.4	5.4	5.4	5.5	5.3	5.3	5.1	5.1	5.0	5.2
length of mandible	9.8	9.9	9.7	9.9	10.0	9.5	8.5	8.8	8.7	8.9

Dental formula: $I \frac{1}{3}, C \frac{1}{1}, P \frac{2}{2}, M \frac{3}{3}$. Skull and teeth essentially like in *Saccopteryx bilineata*, but in all dimensions much smaller.

The external and skull measurements of four specimens are given in Table 6.

In the original description of *Saccopteryx canescens*, Thomas (1901d: 366) stated that he also examined material of the species from Suriname. The coat colour of this smallest of the Suriname Emballonurinae proves to be variable, at least in the specimens examined. The grizzled appearance of the dorsal surface of the body is present in all specimens, while the colour of the ventral surface is much lighter, more washed with grey, than that of the dorsal surface. The extent and the distinctness of the whitish longitudinal dorsal lines vary strongly.

Sanborn (1937: 334-335) quite correctly considered *Saccopteryx pumila*, originally described by Thomas (1914: 410-411) from Venezuela (and reported by him also from French Guiana), to be identical with *S. canescens*. My material fully supports Sanborn's arguments for synonymizing the two species. In my Suriname specimens

the length of the upper tooth-row falls within the range of variation as given by Sanborn for the true *S. canescens*, while the three skulls seen by me, in which the basisphenoid is entire, show a median septum of the basisphenoid pit. Admittedly this septum is low and extends only half-way down the pit. It is not clear why Cabrera (1958: 50) still kept the two species separated.

Saccopteryx leptura (Schreber, 1774)

Text-fig. 9d (interfemoral membrane), pl. 15 (skull)

Vespertilio Lepturus Schreber, 1774, Die Säugthiere, pl. 57.

Type locality. — "Surinam".

Synonymies. — Sanborn, 1937: 332; Cabrera, 1958: 50; Husson, 1962: 41.

Vernacular names. — (E) Lesser White-lined Bat.

Distribution. — The species occurs from the Panama Canal Zone eastward through Venezuela, Tobago and Trinidad, and the Guianas, to north-eastern Brazil and south to south-western Peru (Sanborn, 1937: 332, map in fig. 40).

Occurrence in Suriname. — Although the species was originally described from Suriname, and since 1774 has several times been reported from that country, the first more precise records from within Suriname were provided by Husson (1962). The species evidently is not rare in the coastal lowlands of Suriname, but has not yet been found in the far interior. The following material has been examined by me:

1. Stondansi Falls, upper Nickerie River at about 5°5'N, Nickerie District, 1 male (no. 21698, skin and skull).
2. Tibiti River, tributary of Coppename River, Saramacca District, 1 male (no. 17585, skin and skull).
3. Neighbourhood of Paramaribo, Suriname District, 3 females (ZMA, skin and skull; CNHM nos. 93220, 93224, skins and skulls).
4. Baboenhol, north-west of Afobaka, about 80 km south of Paramaribo, Brokopondo District, 1 male (no. 24868, 1 skull).
5. Brokopondo on Suriname River north of Brokopondo Lake, 2 females (no. 18288, skull; ZMA no. 9565, skin and skull), 1 specimen (no. 25195, skin and skull).
6. Afobaka on Suriname River, north shore of Brokopondo Lake, 2 males (ZMA nos. 9559, 9560, skins and skulls), 1 female (ZMA no. 9558, skin and skull).
7. Njoenkondre on Suriname River, now covered by Brokopondo Lake, Brokopondo District, 1 female (no. 25242, skin and skull).
8. Coastal region between Moengotapoe and Wiawia Bank, Marowijne District, 5 males (nos. 17579, 17581, 17583, 17584, 17586, skins and skulls), 5 females (nos. 17577, 17580, 17582, 17587, 17588, skins and skulls), 1 skull (no. 17578).
9. Galibi, mouth of Marowijne River, 1 male (ZMA no. 9219, skin and skull).
10. Langamankondre near mouth of Marowijne River, south of Galibi, Marowijne District, 2 specimens (no. 18279, skins and skulls).
11. Suriname, without more precise locality indication, 6 males and 7 females (nos. 17543, 17544, SMN no. 3587, ZMA no. 1651, ZMB nos. 1840, 3215, 3982, 4208, skins and skulls).

Description. — Length of forearm varying in males from 37.4 to 40 mm, in females from 39.1 to 42.3 mm; muzzle slightly projecting beyond the lower lip; ears narrow, about 12 mm long; interfemoral membrane well developed, when stretched extending

to about the toes or beyond the feet; calcar, about 14 mm long, two or three millimetres shorter than the tibia, and about two and a half times as long as the free margin of the interfemoral membrane; in the males the ventral surface of the antebrachial membrane shows close to the forearm near the elbow a large, swollen wing sac of about 6 mm long, opening on the dorsal surface of the membrane; in females this pouch is rudimentary or absent; wing membranes from the ankles or from the proximal part of the metatarsus. Fur soft and dense; on the dorsal surface of the wing membrane the fur extends as far as a line drawn from the distal third of the upper arm to the knee, and on the dorsal surface of the thighs and of the interfemoral membrane as far as the exertion of the tail. On the ventral surface the extent of the fur is quite similar to that of the dorsal surface but it is less dense, while the whole of the interfemoral membrane is covered with short fine hairs, which are sparse on a broad zone along the tibia. The colour of the dorsal surface is uniformly dark brown, with the exception of two faint, longitudinal whitish wavy lines, which extend from behind the shoulders to the rump; in these lines, which are often very indistinct, the tips of the hairs are whitish or light yellowish. The colour of the ventral surface of the body is lighter than that of the dorsal since the distal third of the ventral hairs is light yellowish brown, the basal two-thirds being dark brown. The wings are blackish brown.

Dentition: I $\frac{1}{3}$, C $\frac{1}{1}$, P $\frac{2}{2}$, M $\frac{3}{3}$. Skull and teeth essentially like in *Saccopteryx bilineata*, but much smaller in all dimensions. The sagittal crest is sharply defined but low, usually less than 0.2 mm high (in *S. bilineata* the height of the crest varies from 0.4 to 0.6 mm). The deep and large basisphenoid pits are divided by a low longitudinal septum.

The external and skull measurements of six Suriname specimens of the present species are given in Table 6.

The differences in coat colour of *Saccopteryx bilineata*, *S. leptura*, and *S. canescens* can not always be relied upon to distinguish these species. However, the much greater length of the forearm and that of the tooth-row of *S. bilineata* distinguish this species immediately from the other two. *S. leptura* differs from *S. canescens* in the larger dimensions of the skull; the ranges of the length of the forearm in the two species overlap.

Remarks. — Husson (1962: 41, 43) listed and discussed the old records of this species from Suriname.

Cormura brevirostris (Wagner, 1843)

Text-fig. 9e (interfemoral membrane), pl. 15 (skull)

Emballonura brevirostris Wagner, 1843, Archiv Naturgeschichte, 9 (1): 367

Type locality. — "Marabitanas", Rio Negro, Amazonas, Brazil.

Synonymies. — Sanborn, 1937: 348; Cabrera, 1958: 50; Husson, 1962: 46.

Vernacular names. — (E) Wagner's Sac-winged Bat.

Distribution. — The present species has been reported from Nicaragua, Costa Rica, Panama, Ecuador, Peru, Venezuela, Suriname, the Amazon Basin and the Mato Grosso in Brazil (Sanborn, 1937: 348, map in fig. 47).

Occurrence in Suriname. — The first mention of this species from Suriname is by Miller (1906: 59), who described four specimens, collected by Kappler, as a new genus and species, *Myropteryx pullus*. Later Miller's types were shown to belong to the present species (Cabrera, 1958: 50; Husson, 1962: 46-51). Husson (1962) dealt with additional Suriname material of the species. So far, *Cormura brevirostris* is only known from the coastal lowland area of Suriname, but the available records are too few to give a reliable picture of the occurrence of the species within Suriname. I have examined the following Suriname specimens:

1. Coastal region between Moengotapoe and Wiawia Bank, Marowijne District, 5 males (nos. 17491, 17492, 17496-17498, skins and skulls), 4 females (nos. 17489, 17493-17495, skins and skulls).
2. Galibi, left bank of the mouth of the Marowijne River, Marowijne District, 1 male (no. 17490, skin and skull).
3. Suriname, without more precise locality indication, 2 males (ZMB nos. 3360a (paratype of *Myropteryx pullus* Miller, skin and skull), 4522, skin), 1 female holotype of *Myropteryx pullus* Miller (ZMB no. 3360, skin).

Description. — Length of forearm varying in the examined Suriname specimens from 41.5 to 47.0 mm; length of ears from meatus, about 12 mm; ear conch triangular, rounded above; tragus more or less rectangular, about one-third the length of the ear; wing sac about in the centre of the antibrachial membrane, extending from near the anterior border of the free margin of the membrane to near the elbow, up to 7 mm long, slightly more developed in males than in females; interfemoral membrane well developed, when stretched reaching slightly beyond the hind foot; tail not reaching to the middle of the interfemoral membrane, perforating it and appearing on its dorsal surface, the length of its free end varying from 1 to 3 mm; calcar usually slightly shorter than the tibia, but distinctly longer than the free margin of the interfemoral membrane; hind foot relatively short, much less than half the length of the tibia; wing membrane from the distal half of the metatarsus near the base of the outer toe. Fur soft and dense, above and beneath extending on the wing membrane as far as a line drawn from the middle of the upper arm to the middle of the thigh; the ventral surface of the interfemoral membrane is sparsely covered with short whitish hairs, often restricted to the sides of the tail only. Two colour phases occur: one bright reddish brown, the other more dark brown; in both phases both the dorsal and the ventral hairs are unicoloured, the extreme base of the hairs only is somewhat lighter; the ventral surface of the body is slightly paler than the dorsal. The wings are dark to blackish brown.

Dental formula: $I \frac{1}{3}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors minute, probably deciduous in early stage in most specimens; first upper premolar small, rounded, with distinct anterior and posterior cusps, almost or actually touching the canine, but separated by a distinct space from the second, large premolar; it reaches to or slightly beyond

the middle of the height of the cingulum of the canine; the large second premolar touches the first molar, its shaft being distinctly higher than the crown of the latter. Lower incisors small, trifold, forming a continuous row between the slender canines; first lower premolar triangular with distinct anterior and posterior cusps, which touch the canine as well as the second premolar; the first premolar is as high as or slightly higher than the anterior margin of the cingulum of the canine, it is about half as high as the second premolar. The sagittal crest is well developed, its height being up to 0.7 mm in males, up to 0.4 mm in females; it extends from the postorbital region to the supraoccipital bone. In the five undamaged Suriname skulls seen by me the posterior margin of the palate ends distinctly behind the last molar; this margin is V-shaped. These five skulls show no septum dividing the basisphenoid pit.

The external and skull measurements of ten specimens from Suriname are given in Table 7.

Remarks. — Husson (1962: 48-51) discussed the synonymy of this species and the identity of *Myropteryx pullus*.

TABLE 7

External and skull measurements of ten specimens of *Cormura brevirostris* (Wagner) from Suriname. ZMB reg. no. 3360 is the holotype of *Myropteryx pullus* Miller.

Museum		ZMB	RMNH	RMNH	RMNH	RMNH	RMNH	ZMB	RMNH	RMNH	ZMB
Reg. number		3360	17494	17493	17489	17498	17491	4522	17497	17490	3360, a
Sex		♀	♀	♀	♀	♂	♂	♂	♂	♂	♂
Forearm		45.0	41.5	44.5	45.1	41.5	44.0	45.6	46	46.5	47.0
Third digit, metacarpal		40.5	40.5	42	41.5	40.5	40.5	40	42	42	41
1st phalanx		14	12	14	13	12	12	13	13	13	13
2nd phalanx		22	22	20	22	20	22	21	19	20	21
Fourth digit, metacarpal		34.5	34.5	35.5	35	33	35	34.5	35	36	34
1st phalanx		10	10	10.5	10	10	9.5	9	10	10	10
2nd phalanx		8	7.5	7.5	-	7	6	7	7.5	7.5	7
Fifth digit, metacarpal		32.0	30.5	33.5	31.5	31	31.5	32	32.5	34	32
1st phalanx		11	11	11.5	11	11	11	11	11	11	11
2nd phalanx		7	7	7	-	7	5	7	7	7	6
Tibia		16	15	16	15	15.5	15	16	16.5	16	16
Hind foot		7	7	-	7	7	6.5	7	7	7	7
Calcar		14	14	13.5	15	13	14.5	15	13	-	15.5
Skull:											
greatest length		-	-	15.3	15.1	-	15.8	-	-	15.4	-
condylobasal length		-	-	-	-	-	14.7	-	7	-	-
condyle to front of canine		-	13.9	14.3	13.6	-	14.3	-	-	13.8	-
basal length		-	-	12.7	11.3	-	13.0	-	-	11.7	-
palatal length		-	-	6.4	5.2	-	7.3	-	6.1	5.4	-
zygomatic breadth		-	-	10.0	9.6	-	10.0	-	-	9.8	-
breadth of braincase		-	7.8	7.6	7.7	-	7.8	-	-	7.5	-
height of braincase, without crest		-	6.0	6.2	6.1	-	6.3	-	-	6.0	-
mastoid breadth		-	8.8	8.8	8.3	-	8.8	-	-	8.5	-
interorbital constriction		-	4.7	4.9	4.9	-	4.5	-	-	5.0	-
postorbital constriction		-	2.7	2.8	3.0	-	2.8	-	3.2	2.8	-
width across molars		-	-	7.4	7.2	6.9	7.4	-	-	7.4	-
width across cingula canines		-	-	3.8	3.8	3.7	3.8	-	-	3.7	-
upper tooth-row, c - m ³		-	6.2	6.3	6.2	6.2	6.2	-	6.3	6.2	6.3
lower tooth-row, c - m ₃		-	6.5	6.3	6.3	6.4	6.5	-	6.5	6.5	6.6
length of mandible		-	11.1	11.3	11.1	11.2	11.0	-	11.3	11.2	11.2

***Peropteryx kappleri kappleri* Peters, 1867**

Text-fig. 8c (interfemoral membrane)

Peropteryx Kappleri Peters, 1867, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1867: 473-474.

Type locality. — "Surinam".

Synonymies. — Sanborn, 1937: 343; Cabrera, 1958: 51; Husson, 1962: 51.

Vernacular names. — (E) Greater Doglike Bat.

Distribution. — South-eastern Brazil and Peru through northern South America and Central America north to S. Mexico (Veracruz). The smaller Peruvian form has been distinguished as a separate subspecies *P. kappleri intermedia* Sanborn, 1951.

Occurrence in Suriname. — The only specimen of this species known so far from Suriname is the holotype female, labelled "Surinam" (ZMB no. 3348, skin), collected by A. Kappler, probably near his home at Albina on the Marowijne River.

Description. — Length of forearm varying from 45 to 53.6 mm; ear length about 18 mm; interfemoral membrane, when stretched, reaching to the foot; wing sac short, on the anterior edge of the antebrachial membrane; calcar (about 17.5 mm) shorter than the tibia (about 19.5 mm), about as long as the free margin of the interfemoral membrane; wing membranes from the ankles. According to Sanborn (1937: 343) "there are two colour phases; one is close to mummy brown and the other is a little darker than Prout's brown. In both, the underparts are slightly lighter".

Dental formula: $I \frac{1}{3}, C \frac{1}{1}, P \frac{2}{2}, M \frac{3}{3}$. Upper incisors small, separated by a distinct space from each other as well as from the canines; first upper premolar a structureless spicule, separated by a space from the second premolar. Lower teeth essentially like those of *Saccopteryx bilineata*. The rostrum is sharply set off by an angle from the braincase, the dorsal surface of the rostrum is nearly parallel to the tooth-row; the basisphenoid pit is not divided by a septum.

In my opinion it is almost certain that the above mentioned specimen from the Berlin Museum is the holotype of *Peropteryx kappleri* Peters. The specimen itself is not labelled, while the inscription on the label affixed to the jar in which it is preserved is difficult to decipher; as far as I can see, however, it contains no indication referring to a type. Unfortunately the skull was extracted and is no longer with the specimen; it could not be found in the Berlin Museum, and must probably be considered lost. The external measurements of the present specimen taken by me agree so well with those given by Peters of his type that the identity of the two seems highly probable. The differences in the lengths of the forearm and of the metacarpals found by me may be due to a different method of measuring; the remarkable difference in the length of the second phalanx of the third digit can be explained by assuming that Peters measured the length of the curved outline, while I took the shortest distance between the extreme tip of the second phalanx and the articulation between the first and second phalanges. The following measurements were taken by me, in parentheses Peters's measurements of the holotype are given: forearm, 51.6

(50); length of third metacarpal, 47 (45); first phalanx, 15 (15); second phalanx, 24 (27); length of fourth metacarpal, 39.5 (38); first phalanx, 10.5 (10); second phalanx, 10 (10); length of fifth metacarpal, 37.5 (36); first phalanx, 12 (12); second phalanx, 7 (7.5); length of ear from meatus, 14 (13.5); tragus, 6 (5.5); tibia, 21 (20); hind foot, 10.5 (10); calcar, 17 (17); length of tail from anus, 15 (16) mm. The tail is free for about 2 mm; the calcar is somewhat shorter than the free margin of the inter-femoral membrane.

The following are the ranges of variation of the skull measurements as given by Sanborn (1937: 343): skull, greatest length, 16-17.8; condylobasal length, 14.1-16.2; palatal length, 6.3-7.1; zygomatic breadth, 9.5-10.9; breadth of braincase, 7.1-8; mastoid breadth, 8.1-9; interorbital constriction, 2.6-3.5; width across molars, 7-8.3; width across cingula canines, 4.1-5.2; upper tooth-row, c-m³, 6.8-7.8 mm.

Remarks. — *Peropteryx kappleri kappleri* seems to be rare in Suriname; though I examined a rather great number of Suriname Emballonurinae I did not see any specimen of this species, apart from the above mentioned supposed holotype. According to Sanborn (1937: 344) "the members of the genus *Peropteryx* have often been reported from very shallow caves or from crevices between boulders where light can enter". Since in Suriname bats never have been systematically collected, it is very likely that such places have not been thoroughly explored. This also may explain why the widely distributed species *Peropteryx macrotis macrotis* (Wagner) so far has not been reported from Suriname. This latter species is on the average smaller than *P. kappleri* (see the key on page 48); for its description I refer to Dobson (1878: 373-374: *Saccopteryx canina*), Sanborn (1937: 339-341; fig. 43: map of distribution), Husson (1960: 57-59, fig. 9: head, front and right side views, pl. 12: skull), and Goodwin & Greenhall (1961: 215-216, figs. 8-11: head, antebrachial membrane, rostrum and palate of skull, pl. 8 figs. 1-3: skull).

***Peronymus leucopterus leucopterus* (Peters, 1867)**

Text-fig. 9f (interfemoral membrane)

Peropteryx leucoptera Peters, 1867, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1867: 474.

Type locality. — "Surinam".

Synonymies. — Sanborn, 1937: 345; Cabrera, 1958: 52; Husson, 1962: 54.

Distribution. — The nominate subspecies has been reported from southern Venezuela, Suriname and the Amazon basin (Sanborn, 1937: 345, map in fig. 46). A second subspecies, *P. l. cyclops* Thomas is only known from Peru.

Occurrence in Suriname. — So far the only known Suriname specimens of this species are the types, which were collected by A. Kappler, possibly near his home at Albina on the Marowijne River. I have examined the types, 2 males (ZMB no. A1840, A4208, skins and skulls), 6 females (ZMB no. A, B, A1839, 3349.1 and 2, and A4208.1, skins and skulls; 3349.2, skin).

Description. — The most striking characters of the present species are the following: (a) the ears are connected across the forehead by a low band, (b) the greater part of the wing membranes is white, and (c) the deep basisphenoid pit is undivided by a plate, and has two large pterygoid pits at its anterior end.

Length of forearm varying in males from 40.9 to 44.6 mm, in females from 42.2 to 47 mm; ears united across the forehead by a low band with a deep notch in the centre; interfemoral membrane, when stretched, extending to the toes; calcar (about 14 mm) equal to or slightly shorter than the tibia (about 15 mm), about one and a half times as long as the free margin of the interfemoral membrane; wing membrane from the ankles or from the proximal part of the metatarsus; wing sac short, situated on the upper edge of the antebrachial membrane approximately above the middle of the upper arm; fur soft and dense, extending on the dorsal surface of the wing membranes as far as a line drawn from about the middle of the upper arm to the knee, and on the interfemoral membrane extending to the point of exit of the tail; on the ventral surface, the fur extends on the wing membranes as far as a line drawn from the proximal third of the upper arm to the basal part of the thigh, while the entire interfemoral membrane is clothed with short fine hairs. The coat colour is dark brown above, somewhat paler beneath; distal parts of the wing membranes are white from at least a line drawn from the elbow to the knee, the antebrachial and the interfemoral membranes are dark brown.

Dental formula: $I \frac{1}{3}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors slender and small, separated by a distinct space from each other as well as from the canines; first upper premolar small, about twice as wide as the incisors, without anterior or posterior cusps, standing in about the centre of the space between the canine and the large, second premolar; the basis of the second premolar slightly shorter than that of the canine, its shaft about two-thirds as high as that of the canine. Lower teeth essentially similar to those of *Saccopteryx bilineata*. The basisphenoid pit is deep, not divided by a plate; there are two large lateral pterygoid pits at its anterior end (see Sanborn, 1937: fig. 45).

The external and skull measurements of seven specimens from Suriname are given in Table 8.

Remarks. — The taxonomic position of the present species has been discussed by Husson (1962: 55, 56).

***Centronycteris maximiliani maximiliani* (Fischer, 1829)**

Text-fig. 9g (interfemoral membrane), pl. 16 (skull)

Vespertilio Maximiliani Fischer, 1829, Synopsis Mammalium: 112-113.

Type locality. — "In ora orientali Brasiliae". The type locality is given more precisely by Wied (1826: 271): "Diese Fledermaus wurde auf der *Fazenda zu Coroaba* am Flösschen *Jucú*, unweit des *Rio do Espirito Santo* gefunden".

Synonymies. — Sanborn, 1937: 336; Cabrera, 1958: 53; Husson, 1962: 56.

Vernacular names. — (E) Thomas's Bat.

TABLE 8

External and skull measurements of seven specimens of *Peronymus leucopterus leucopterus* (Peters) from Suriname in the Berlin Museum.

Reg. number	A1840,1	A	A4208,1	B	3349,1	3349,2	A1839
Sex	♂	♀	♀	♀	♀	♀	♀
Forearm	40.9	44.3	44.1	45.0	43.0	42.2	43.0
Third digit, metacarpal	37.5	40	40	40.5	38	37.5	39
1st phalanx	10	11.5	10	11	11	10	10
2nd phalanx	20	22	22	22	22	21	22
Fourth digit, metacarpal	30	33	33.5	33.5	32	31	32.5
1st phalanx	8	8.5	8.5	9	8.5	8.5	8
2nd phalanx	10	9	-	9	9	9	9
Fifth digit, metacarpal	29	31	31	32.5	30.5	30	31
1st phalanx	10	11	10.5	10.5	10.5	10.5	10
2nd phalanx	8.5	8.5	8	8.5	8	7.5	8
Tibia	15	15	14	16	15	14.5	15
Hind foot	8	8	8	8	8.5	8.5	9
Calcar	13	15	13	15.5	15	13.5	14
Skull:							
greatest length	15.0	14.5	14.7	15.0	15.0	-	15.4
condylobasal length	13.7	13.8	13.5	13.5	13.7	-	13.9
condyle to front of canine	13.3	13.6	12.9	13.4	13.5	-	13.4
basal length	12.6	12.3	12.1	12.4	12.6	-	12.5
palatal length	6.5	6.1	6.1	6.2	6.0	-	6.3
zygomatic breadth	9.2	9.5	9.2	9.4	9.6	-	9.8
breadth of braincase	6.8	7.4	7.1	7.0	7.1	-	7.5
height of braincase	5.8	5.8	5.7	5.6	5.3	-	5.6
mastoid breadth	7.6	8.0	7.7	7.6	8.0	-	8.0
interorbital constriction	5.7	5.8	5.9	6.2	5.7	-	-
postorbital constriction	3.0	3.0	3.1	3.3	3.1	-	-
width across molars	7.0	7.3	6.8	6.9	6.8	-	7.0
width across cingula canines	3.8	3.8	3.7	3.8	3.7	-	3.9
upper tooth-row, c - m ³	6.0	6.2	5.9	6.1	6.0	-	6.2
lower tooth-row, c - m ₃	6.2	-	6.0	6.2	6.2	-	6.3
length of mandible	9.9	-	10.5	10.7	10.5	-	10.7

Distribution. — The species occurs from eastern Brazil northward to Mexico. Sanborn (1937: 337, map in fig. 42) and Cabrera (1958: 53) recognized two subspecies: (1) the nominate subspecies occurring in eastern Brazil and the Guianas, and (2) *C.m. centralis* Thomas from Perú and western Brazil north to Mexico.

Occurrence in Suriname. — The species was reported for the first time from Suriname by Husson (1962), who reported upon a female from a savanna forest near Tibiti River, tributary of Coppename River, Saramacca District (no. 12111, skin and skull), this still is the only specimen known from the country.

Description. — Length of forearm varying from 42.6 to 44.5 mm; ears somewhat longer than the head, about 11.5 mm long; interfemoral membrane well developed, when stretched reaching about the level of the toes; tail perforating the interfemoral membrane at about its centre, the free end of the tail about 3 mm long; calcar of about the same length as the tibia, the free posterior margin of the interfemoral membrane short; wing membrane from the base of the outer toe; fur rather long and soft, extending on the basal part of the interfemoral membrane, which for the

rest is thinly pubescent; short stiff hairs are present on the blackish brown small spots, which are arranged in transverse lines on the interfemoral membrane. In the original description the colour of the fur is given as reddish brown on the dorsal surface, paler on the ventral parts. In the dried Suriname skin, however, the coat colour is more dull greyish brown above and paler beneath; the wings are dark brown.

Dental formula: $I \frac{1}{3}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. First upper premolar with distinct anterior and posterior cusps like the larger second premolar; basisphenoid divided by a median septum; sagittal crest indistinct, not extending onto the small postorbital processes of the frontals.

The following are external and skull measurements of the examined Suriname female specimen; in parentheses are the external measurements of the type, as given by Peters (1867: 479; see for correction of the length of the calcar: Peters, 1872: 701). Forearm, 42.6 (44.5); length of third metacarpal, 45 (45); first phalanx, 18 (17); second phalanx, 23.5 (28); length of fourth metacarpal, 36 (37.5); first phalanx, 10 (9.4); second phalanx, 11 (11); length of fifth metacarpal, 34 (32.2); first phalanx, 10 (10); second phalanx, 8 (9.3); tibia, 18 (19); hind foot, 7 (7.5); calcar, 18 (18) mm. — Skull: greatest length from canine, 13.9; condyle to front of canine, 12.8; basal length, 11.0; zygomatic breadth, 8.8; breadth of braincase, 6.8; height of braincase, 5.4; mastoid breadth, 7.3; interorbital constriction, 3.2; width across molars, 6.2; upper tooth-row, c-m³, 5.8; lower tooth-row, c-m₃, 5.7; mandible, 10.0; length of basisphenoid pits, 2.5 mm.

Remarks. — Husson (1962: 58) discussed the taxonomic status of this subspecies.

Subfamily DICLIDURINAE

The only species of the subfamily Diclidurinae known with certainty from Suriname is *Diclidurus scutatus* Peters. The subfamily includes also the South American genera *Cyttarops* and *Depanycteris*, which are extensively dealt with by Vieira (1942: 254-255).

Diclidurus scutatus Peters, 1869

Text-figs. 10m (head), 10n (thumb), 10o (interfemoral membrane), 13c (canines and incisors), pl. 16 (skull)

Diclidurus scutatus Peters, 1869, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1869: 400-401.

Type locality. — "Südamerica". Restricted by Husson (1962: 59) to "Pará, Lower Amazonas, Brazil".

Synonymies. — Husson, 1962: 59.

Vernacular names. — (E) Lesser White Bat.

Distribution. — The species has been reported from Amazonas, Brazil and from the Guianas.

Occurrence in Suriname. — The only certain Suriname records of the species published thusfar are those from the upper Suriname River and from "Suriname" provided by Husson (1962: 59). The complete list of the material examined by me is the following:

1. Brokopondo on Suriname River, north of Brokopondo Lake, Brokopondo District, 1 skull (no. 18004).
2. Afobaka, on Suriname River, northern shore of Brokopondo Lake, 1 female (no. 17843, skin and skull).
3. Upper Suriname River, probably Brokopondo District, 1 female (no. 17361, skin and skull).
4. Suriname, without more precise locality indication, 1 female (ZMA no. 1625, skin and skull).

Description. — The presents species differs from all other Suriname bats in the combination of the following characters: (1) the whitish colour of the long silky fur of the body and of the membranes, (2) the very short thumb, which has a rudimentary claw, and which is almost wholly contained within the wing membrane, and (3) the presence of a cordate pouch in the middle of the interfemoral membrane; this pouch is separated by a distinct interval from a second pouch, which is much flatter than the anterior one.

Length of forearm varying from 51 to 57.3 mm; ears, and also the tragus, short and broad; thumb very short, with a rudimentary claw, almost wholly contained within the wing membrane; wing membrane from the ankles; interfemoral membrane well developed, when stretched reaching to behind the ankles; tail about half the length of the interfemoral membrane, the extreme tip ends on the dorsal surface of a cordate pouch, which is separated by a distinct interval from a second pouch, much flatter than the first, the posterior border of this second pouch being about 5 mm from the free margin of the membrane; calcar well developed somewhat shorter than the tibia; fur consisting of long silky hairs of an almost white colour, the basal parts of the hairs greyish brown, these greyish brown parts are shorter on the back than on the ventral surface; short hairs of a black colour are placed around the eyes; the claws of the hind foot are blackish; the wings and the digits are light yellowish.

Dental formula: $I \frac{1}{5}, C \frac{1}{1}, P \frac{2}{2}, M \frac{3}{3}$. Upper incisors slender, conical, with a distinct cusp at the outer side of the cingulum, a less pronounced cusp on the inner side at about the middle of the tooth; upper incisors separated from one another and from the canines; upper canines with a small but distinct cusp at about one third from the tip; the first upper premolars are very small, in no. 17361 they touch the canine as well as the second premolar, in ZMA no. 1625 this premolar touches the canine but is separated by a small space from the second premolar; postorbital processes short and blunt. Lower incisors trifold, crowded between the canines; first lower premolar about one-third the size of the second premolar.

The following are external and skull measurements of Suriname specimens from the Leiden and the Amsterdam Museum, of lots 3 and 4 respectively; in parentheses

some of the measurements of the type are given as published by Peters in 1869. Forearm, 57.3, 54.5, (51); length of third metacarpal, 55.5, —, (49.5); first phalanx, 10, —, (9); second phalanx, 27, —, (23.4); length of fourth metacarpal, 44, 41, (39); first phalanx, 11, 12, (10.7); second phalanx, 11, 11.5, (9.3); length of fifth metacarpal, 34, 33, (30); first phalanx, 17, 16.5, (16); second phalanx, 6.5, 7.5, (6); ear, length, 14, 13; ear, breadth, 10, 10; tibia, 20.5, 20, (19.5); hind foot, 8.5, 8, (8.8); calcar 17.5, 16.5, (16.6) mm. — Skull: greatest length, 15.3, 15.5; condyle to front of canine, 14.7, 14.2; basal length, 11.2, 10.6; palatal length, 4.5, 4.1; zygomatic breadth, 10.7, 10.6; breadth of braincase, 8.3, 8.5; height of braincase, 6.9, 7.2; mastoid breadth, 9.3, 9.3; interorbital constriction, 4.3, 4.4; width across molars, 7.2, 7.1; width across cingula canines, 3.9, 3.8; upper tooth-row, c-m³, 6.6, 6.3; lower tooth-row, c-m₃, 7.3, 7.1; length of mandible, 12.4, 12.1 mm.

Remarks. — Another white species of bat may be found in Suriname, viz., *Diclidurus albus* Wied, 1819, a species, the range of which extends from south-eastern Brazil to Central America. *D. albus* is a larger species than *D. scutatus*, as shown by the fact that its upper tooth-row (c-m³) is about 8 mm (6.5 mm in *D. scutatus*) and that its forearm length is about 63 mm (in *D. scutatus* 51-57.3 mm). Also the interfemoral membrane in *D. albus* is different (cf. Goodwin & Greenhall, 1961: 218, fig. 13).

White bats have been reported several times from Suriname (see Husson, 1962: 62), the first time in 1844, but the reports are not sufficiently accurate to make a certain identification possible.

Some authors (Vieira, 1942: 252; Cabrera, 1958: 54) synonymized *D. albus* and *D. scutatus*.

FAMILY NOCTILIONIDAE

The two species of the family Noctilionidae occurring in Suriname can immediately be recognized by (1) the peculiar shape of the truncated muzzle and of the upper lip (which resembles that of a bulldog and of a hare), with the chin having well-developed transverse ridges, (2) the long, narrow, pointed ears, the small tragus of which shows prominent tooth-like processes, (3) the short, brightly coloured fur on the back, which narrows from the shoulders towards the tail, where its breadth is about 10 to 15 mm, (4) the wings, which are attached to the back and not to the sides. Other striking characters are the short tail, which does not exceed half the length of the well-developed interfemoral membrane, and the free tip of which, appearing on the upper surface of the membrane, is 2 to 4 mm long; the remarkably large and strong hind foot, which is about three-fourth the length of the tibia. Like in the families Emballonuridae and Furipteridae there are only two phalanges in the third digit, the second phalanx is about three times or more the length of the first phalanx. The length of the forearm is more than 50 mm, while the massive and broad skull, at least in the adult males, has a high sagittal crest.

Key to the Suriname Noctilionidae

- 1a. Length of forearm more than 70 mm; combined length of the tibia and hind foot more than 70 per cent of the length of the forearm
Noctilio leporinus leporinus, p. 73
- b. Length of forearm less than 70 mm; combined length of the tibia and hind foot less than 70 per cent of the length of the forearm
Noctilio labialis albiventris, p. 72

***Noctilio labialis albiventris* Desmarest, 1818**

Text-figs. 9h (interfemoral membrane), 15h (head), pl. 17 (skull)

Noctilio albiventris Desmarest, 1818, Nouveau Dictionnaire d'Histoire Naturelle, (nouv. éd.) 23: 15-16.

Type locality. — "Patrie. Inconnue, mais très-vraisemblablement l'Amérique méridionale" (Desmarest, 1820: 118). Restricted by Cabrera (1958: 56) to Rio São Francisco, Bahia, Brazil.

Synonymies. — Cabrera, 1958: 55; Husson, 1962: 63.

Distribution. — The species inhabits central and northern South America and southern Central America. The range of the present subspecies (the easternmost of the three subspecies) extends from northern Argentina through Brazil to the Guianas.

Occurrence in Suriname. — The present species was reported for the first time from Suriname by Peters (1865b: 571), who examined a specimen from Paramaribo. The only other Suriname record is by Husson (1962: 63; 1973: 6), who also reported on a specimen from Paramaribo. I have seen the following material:

1. Wageningen, northern Nickerie District, 1 male (no. 24719, skin and skull).
2. Highway between Paramaribo and Uitkijk at Vijfde Rijweg, Suriname District, 1 female (no. 17296, skin and skull).
3. Plantation "Meerzorg", east bank of Suriname River opposite Paramaribo, Suriname District, 1 male (no. 24718, skin and skull), 2 females (nos. 24720, 24722, skins and skulls).
4. Tamanredjo, about 17 km due east of Paramaribo, Commewijne District, 1 male (no. 24721, skin and skull).
5. Suriname, without a more accurate locality indication, 1 male (no. 24688, skin and skull).

Description. — Length of forearm varying from (54) 60 to 68.7 mm; ears large, narrow and pointed; tragus small, with prominent tooth-like processes; chin with raised cutaneous ridges; interfemoral membrane large, when stretched expanding slightly behind the toes; tail short, perforating the basal third of the membrane and appearing on its dorsal surface; calcar long, about 1.5 times the length of the tibia, the free margin of the interfemoral membrane very short; wing membrane from the distal third of the tibia; combined length of the tibia and hind foot less than 70 per cent the length of the forearm; fur very short above and beneath, narrowing on the back from behind the shoulders to the tail where its breadth is about 15 mm; colour greatly varying, above as well as beneath, from greyish brown to reddish brown dorsally, and from whitish to grey and yellowish to dark orange ventrally;

on the back a whitish median streak from interscapular region to the tail, this streak often indistinct or absent; membranes blackish.

Dentition: I $\frac{2}{1}$, C $\frac{1}{1}$, P $\frac{1}{2}$, M $\frac{3}{3}$. Upper inner incisors placed close together, in contact at about the middle, the distal part of their inner margins diverging. Upper outer incisors strikingly smaller than the inner, placed somewhat behind the inner and in contact with them, but distinctly separated from the canines; upper premolar, about as high as the molars, but about half as long, crowded between canine and first molar. Lower incisors crowded between the canines, with broad bifid crown, reaching to the inner margin of the cingulum of the canines; first lower premolar crowded out of the tooth-row to the inside, so that the second premolar and the canine are almost in contact with each other; base of first premolar about half as long as that of the second, the latter tooth being about as high as the molars.

External and skull measurements of the examined female Suriname specimen. Forearm, 64.9; length of third metacarpal, 57; first phalanx, 13.5; second phalanx, 55; length of fourth metacarpal, 58.5; first phalanx, 9; second phalanx, 28; length of fifth metacarpal, 53.5; first phalanx, 10.5; second phalanx, 5; length of ear, 20.5; tibia, 20; hind foot, 16; depth of interfemoral membrane from anus, about 38; calcar, 30; tail, 15.5; free end of tail, 2.5 mm. — Skull: greatest length, 21.2; condylobasal length, 19.6; condyle to front of canine, 18.4; basal length, 17.1; palatal length, 9.8; zygomatic breadth, 15.8; breadth of braincase, 11.7; height of braincase, without crest, 8.6; mastoid breadth, 14.0; interorbital constriction, 5.8; width across molars, 10.1; width across cingula canines, 6.9; upper tooth-row, c-m³, 7.9; lower tooth-row, c-m₃, 8.4; length of mandible, 14.2 mm.

Remarks. — Husson (1962:64, 65) dealt with the colour of the two then known Suriname specimens, and discussed the food and biology of the species, its taxonomic status and its nomenclature.

Noctilio leporinus leporinus (Linnaeus, 1758)

Text-figs. 8e (interfemoral membrane), 13d (canines and incisors), 14 (animal), 15g (head), pl. 17 (skull)

Vespertilio leporinus Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 32

Type locality. — "*Habitat in America*". Restricted by Thomas (1911:131) to Suriname.

Synonymies. — Cabrera, 1958: 56; Husson, 1962: 65.

Vernacular names. — (E) Suriname Fish-eating Bat; (N) Hazemond Vleermuis.

Distribution. — *Noctilio leporinus* has a wide range of distribution extending from north-eastern Argentina, Paraguay, and south-eastern Brazil northwards to southern Mexico, and the Lesser and Greater Antilles. The status of the four recognized subspecies is not clear, but it is generally assumed that the nominate subspecies occurs in Brazil north of the Mato Grosso and Minas Geraes, in Peru, Colombia, the Guianas, Venezuela, Curaçao, Trinidad, Tobago and the Lesser Antilles.

Occurrence in Suriname. — As far as is known to me Fermin (1765: 9) was the first author who definitely mentioned the occurrence of the present species in Suriname, giving it the (unavailable) scientific name *Vespertilio Minor*. Later popular authors (Hartsinck, 1770; Teenstra, 1835; Lammens, 1844) added little or no new information, while Jentink (1887, 1888) and Goodwin (1928) dealt with museum specimens labelled "Surinam" (see Husson, 1962. 65-73, for more information on these records). The first author who reported the species from definite localities within Suriname was Husson (1962: 66), his material is that listed below under nos. 2, 3, 5 and 6. Until now I have examined the following Suriname specimens:

1. Wageningen, northern Nickerie District, 3 females (nos. 24896-24898, skins and skulls).
2. Karel François on the Saramacca River about 80 km west of Paramaribo, Saramacca District, 1 male (no. 13489, skin and skull).
3. Kampongbaroe about 25 km west of Paramaribo, south-west of Uitkijk, Saramacca District, 1 female (no. 17368, skin and skull).
4. Weg naar Zee, near the sea-shore north of Paramaribo, Suriname District, 1 female (no. 24895, skin and skull).
5. Paramaribo, Suriname District, 3 females (nos. 12002, 12003, 13502, skins and skulls).
6. Suriname, without more precise locality indication, 8 males (nos. 13490, 13494, 13503, 17376a, b, SMN no. 238-2, ZMA no. 1643b, c, skins and skulls), 3 females (SMN no. 238-1, ZMA no. 1643a, d, skins and skulls), 2 skeletons (no. 17375a, b).

Description. — Length of forearm varying from 77 to 85 mm; ears large, narrow and pointed, about 24 mm long and 10 mm broad; tragus small, with prominent tooth-like processes; chin with raised transverse cutaneous ridges; interfemoral membrane well-developed, when stretched expanding behind the ankles; tail short, not exceeding half the length of the interfemoral membrane, perforating it and appearing for about 4 mm on its dorsal surface; calcar distinctly longer than the tibia, the free margin of the interfemoral membrane short, at most half as long as the calcar; wing membrane from the distal third of the tibia and from the back; combined length of the tibia and hind foot more than 70 per cent of the length of the forearm; fur very short, above and beneath, narrowing on the back from behind the shoulders to the tail where its breadth is about 10 to 15 mm; colour greatly varying, above as well as beneath, from dark to reddish brown dorsally, and from yellowish to bright reddish orange ventrally; an indistinct whitish median dorsal streak extends from the shoulders to the tail, but may be absent; membranes blackish or dark brown, the ventral surface of the interfemoral membrane is much lighter than its dorsal surface, being often yellowish.

Dentition: $I \frac{2}{1}$, $C \frac{1}{1}$, $P \frac{1}{2}$, $M \frac{3}{3}$. Teeth essentially like in *Noctilio labialis*, the most striking difference, at least in the examined specimens from Suriname, is that in *N. leporinus* the upper molars are separated postero-internally by wide spaces, while in the one examined specimen of *N. labialis* the molars touch each other nearly over their full breadth. Sagittal crest sharply defined, in adult males it is more developed than in adult females, in the former being about to 2.5 mm high.

The external and skull measurements of eleven Suriname specimens are given in Table 9.

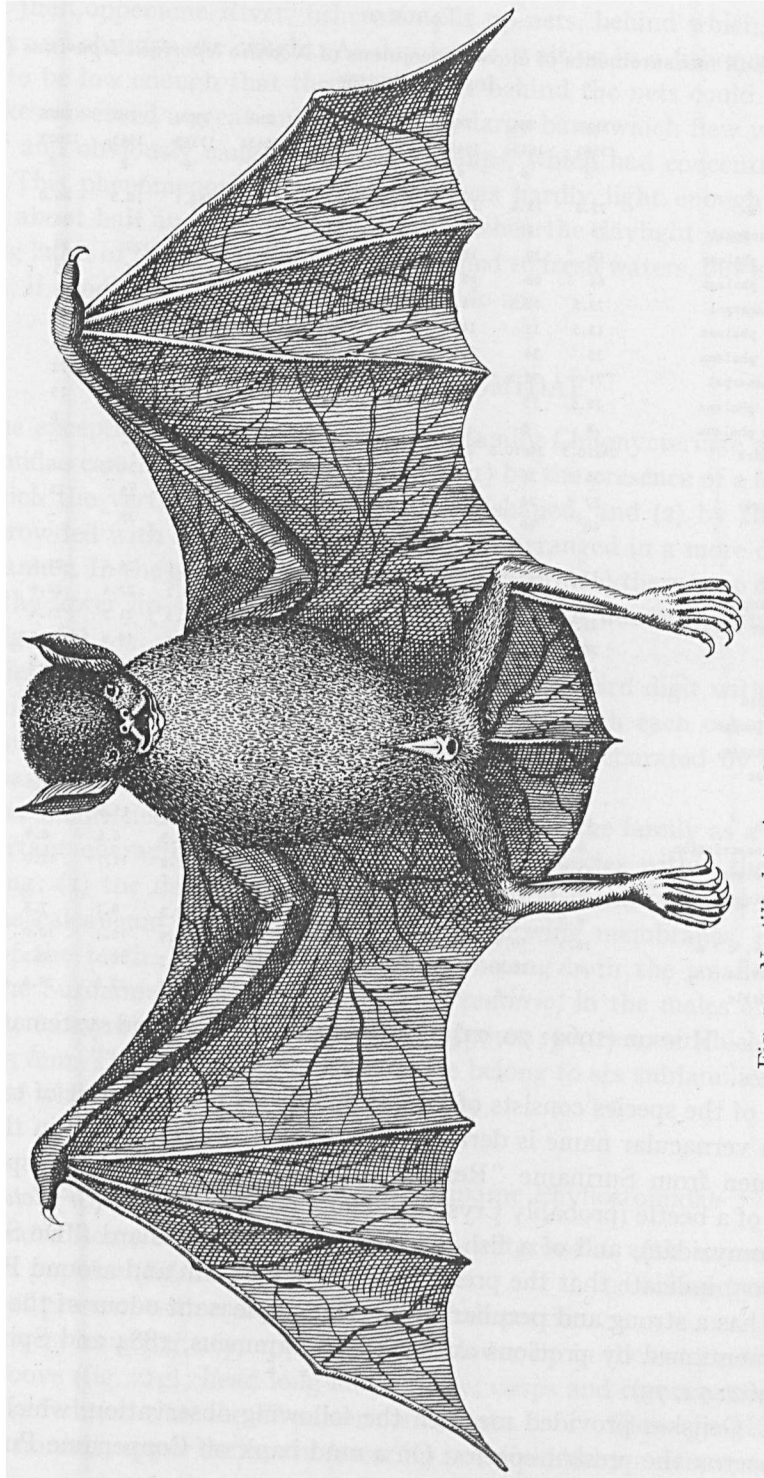


Fig. 14. *Noctilio leporinus leporinus* (L.), after Seba, 1734.

TABLE 9

External and skull measurements of eleven specimens of *Noctilio leporinus leporinus* (Linnaeus) from Suriname.

Museum	RMNH	ZMA	ZMA	SMN	RMNH	ZMA	RMNH	ZMA	RMNH	SMN	RMNH
Reg. number	13503	1643c	1643b	238,2	13490	1643d	17368	1643a	12003	238,1	12002
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀	♀
Forearm	77.3	78.8	77.7	80.0	81.2	79.3	82.1	78.5	80.0	80.0	78.8
Third digit, metacarpal	73	74	74.5	75	75.5	72	75	74	75	74	72
1st phalanx	19	20	18	20	20	20	20.5	20	18	20	18
2nd phalanx	64	68	68	67	68	65	68	66	65	65	63
Fourth digit, metacarpal	73.5	75.5	74.5	76	76.5	73.5	76	75.5	74	75	73.5
1st phalanx	13.5	13	14	13	13	14	12.5	13	12	13	11.5
2nd phalanx	35	34	35	35	35	34	35	35	31	37	32
Fifth digit, metacarpal	71	72.5	71.5	73	73	69.5	73	72.5	72	72	70
1st phalanx	16.5	15	16	16	16	16	16	16	15	16	14.5
2nd phalanx	8	8	8	8	8	8	8	8	8	9	8
Ear, length x breadth	24x10.5	24x10.5	24x-	24x-	24x9.5	-	24x9	-	-	24x-	-
Tibia	36	36	36	37	36	37	35	34	36	35	36
Hind foot; with claws	27	28	28	26	28	27	26	25	26	27	26
Calcar	40	40	37	45	38	40	40	39	-	40	-
Skull:											
greatest length	23.3	24.5	24.7	26.1	26.2	-	24.1	24.4	24.6	24.7	24.9
condylobasal length	22.8	23.5	23.0	23.5	23.7	22.0	22.7	22.4	22.6	23.2	22.8
condyle to front of canine	21.9	22.3	22.3	22.4	22.5	20.7	21.3	21.5	21.4	22.2	21.7
basal length	20.1	20.4	20.1	21.0	20.9	19.3	19.5	19.5	20.3	20.4	20.4
palatal length	11.7	12.4	12.4	12.8	12.6	11.2	12.1	12.3	12.5	12.4	12.6
zygomatic breadth	17.0	18.3	19.1	19.0	18.5	16.8	17.8	18.0	18.3	17.6	18.3
breadth of braincase	12.7	13.4	13.9	13.5	13.5	13.0	13.5	13.5	13.5	13.4	13.4
height of braincase,											
without crest	9.7	9.7	10.3	10.2	10.2	9.9	9.8	9.8	10.3	10.4	10.4
with crest	10.0	10.7	11.3	12.5	12.5	10.1	10.5	11.0	11.0	11.3	11.6
mastoid breadth	14.9	-	-	17.0	18.4	-	15.3	15.9	16.0	15.1	16.0
interorbital constriction	6.9	6.8	6.8	7.0	7.2	6.7	6.5	6.6	6.8	6.7	6.6
width across molars	11.9	11.9	12.5	-	12.3	-	11.8	11.7	12.0	12.2	12.1
width across cingula											
canines	8.5	8.4	8.5	9.3	9.5	8.0	8.3	8.1	7.8	8.2	8.2
upper tooth-row, c - m ³	10.3	10.3	10.5	10.4	10.5	9.9	9.9	10.1	10.0	10.2	10.1
lower tooth-row, c - m ₃	10.9	10.9	11.1	10.9	11.3	10.6	10.5	10.5	10.5	10.8	10.5
length of mandible	17.4	17.6	17.8	18.0	18.3	17.1	17.3	17.0	17.6	17.5	17.3

Remarks. — Husson (1962: 70, 71) discussed the variation and systematic position of the species.

The food of the species consists of insects and fish. From its habit of eating fishes the English vernacular name is derived. Goodwin (1928: 111) found in the stomach of a specimen from Suriname "Remains of many ants (*Solenopsis* sp.), winged. Fragments of a beetle (probably Crysomelidae), of a mole-cricket (*Gryllotalpa* sp.), of a fly (Sapromyzidae), and of a fish-trace". The brothers Penard ("De Surinamer", 12 April 1905) indicate that the present species is found in and around Paramaribo, and that it has a strong and peculiar odour. The unpleasant odour of the species has also been mentioned by previous authors, like Lammens, 1884 and Spix, 1823 (cf. Husson, 1962: 72, 73).

Dr. D. C. Geijskes provided me with the following observation, which he is convinced concerns the present species: On a mud bank off Coppename Punt near the

mouth of the Coppename River, fishermen put up nets, behind which, with falling tide fishes and shrimps are caught. At day break, waiting in a fishermen's boat for the tide to be low enough that the fish caught behind the nets could be collected, Dr. Geijskes observed a great number of fairly large bats, which flew very low over the water and obviously caught fishes or shrimps, which had concentrated behind the nets. This phenomenon started when it was hardly light enough to see, and lasted for about half an hour, ending abruptly when the daylight was quite bright. The fishing habit of the species thus is not confined to fresh waters, but is also carried out at sea, if conditions permit the animals to do so.

FAMILY PHYLLOSTOMIDAE

With the exception of the species of the subfamily Chilonycterinae all Suriname Phyllostomidae can immediately be recognized (1) by the presence of a distinct nose leaf of which the vertical, free portion is lancet-shaped, and (2) by the lower lip, which is provided with small wart-like outgrowths arranged in a more or less semi-circular manner. In the genus *Chilonycteris* (Chilonycterinae) there is no distinct nose leaf, and the lower lip shows plate-like outgrowths with numerous small rounded papillae (fig. 16e).

All species of the Suriname Phyllostomidae have the third digit with three phalanges, while in the skull the premaxillaries are fused with each other as well as with the maxillaries, so that the upper incisors are not separated by an anterior palatal emargination (fig. 22).

The above mentioned characters are characteristic for the family as a whole. The most important characters for the distinction of the species within the group are the following: (1) the development of the interfemoral membrane, (2) that of the tail and the calcaneum, (3) the attachment of the wing membranes, and (4) the structure of the teeth. To the Phyllostomidae belong both the smallest and the largest of the Suriname bats, namely *Ametrida centurio*, in the males of which the length of the forearm is about 25 mm, and *Vampyrum spectrum*, of which this length is about 105 mm. The Suriname Phyllostomidae belong to six subfamilies, the main characters of which are given in the following key.

Key to the subfamilies of the Suriname Phyllostomidae

- 1a. Nose leaf absent, lower lip with plate-like outgrowths with numerous small rounded papillae (fig. 16e) Chilonycterinae, p. 78
- b. Nose leaf present, with a distinct vertical, free portion 2
- 2a. Tongue very long (fig. 26); upper surface of lower lip in the centre divided by a deep groove (fig. 21g); head long and narrow; cusps and commissures of upper molars so reduced that the W-pattern is absent . . . Glossophaginae, p. 113
- b. Tongue normal; upper surface of lower lip not divided by a deep groove . . 3

- 3a. Interfemoral membrane reduced to a very narrow band along the legs and the posterior part of the body (fig. 8h), covered with fine long fur; calcar indistinct (or absent?); crown of molars with a distinct longitudinal groove (pl. 28 lower figs.) Sturnirinae, p. 134
- b. Interfemoral membrane moderately to largely developed; calcar distinct; tail present or absent 4
- 4a. External tail absent or hardly visible 5
- b. Tail distinct 8
- 5a. Muzzle long and narrow (fig. 16h); length of forearm more than 70 mm Phyllostominae (genera *Vampyrum* and *Chrotopterus*), p. 80
- b. Muzzle short and broad
- 6a. Length of forearm more than 40 mm Stenodermatinae, p. 138
- b. Length of forearm less than 40 mm 7
- 7a. Lower lip with a central wart flanked on each side by a larger elongate wart (fig. 21c); length of forearm varying from about 30 to 35 mm 6
Caroliinae (genus *Rhinophylla*), p. 126
- b. Lower lip with a central wart surrounded by a row of small warts Stenodermatinae, p. 138
- 8a. Calcar shorter than the foot; length of forearm varying from 40 to 45 mm; zygomatic arches incomplete Caroliinae (genus *Carollia*), p. 126
- b. Calcar equal to or longer than the foot, if shorter (except *Vampyrum* and *Chrotopterus*) the length of forearm more than 50 mm Phyllostominae, p. 80

Subfamily CHILONYCTERINAE

The species of the subfamily Chilonycterinae differ from all other Phyllostomidae by the presence of plate-like outgrowths on the lower lip and by the absence of a distinct nose leaf. In the only species of this group known at present from Suriname, *Chilonycteris rubiginosa* Wagner, the lower lip is much expanded and folded outward with numerous rounded small papillae. Perhaps also the genus *Pteronotus* occurs in Suriname; this genus has a wide distribution in northern South America north of the Mato Grosso.

The two known species of *Pteronotus* can immediately be recognized by the attachment of the wings to the median line of the dorsal surface of the body instead of to the sides of the body; in this manner the wings cover the fur so that the upper part of the body appears to be naked below the shoulders.

Chilonycteris rubiginosa rubiginosa Wagner, 1843

Text-figs. 8f (interfemoral membrane), 16e (head), 22b (canines and incisors), pl. 28 (skull)

Chilonycteris rubiginosa Wagner, 1843, Archiv Naturgeschichte, 9 (1): 367.

Type locality. — "Caiçara, Mato Grosso, Brazil".

Synonymies. — Cabrera, 1958: 58; Husson, 1962: 74.

Vernacular names. — (E) Leaf-chinned Bat.

Distribution. — The species has a wide range of distribution on the mainland of South and Central America, from the Mato Grosso, Brazil, north to Mexico. The nominate subspecies inhabits Brazil and the Guianas.

Occurrence in Suriname. — So far only one specimen of this species is known from Suriname, it is a female (no. 16420, skin and skull) found in 1958 by Dr. D. C. Geijskes in the Anton van Aerde Cave at the Tafelberg Mountain in the southwestern Brokopondo District. The species was found there together with specimens of *Anoura geoffroyi* Gray (see p. 123). Geijskes (1959: 44, 47-48) described the cave and the collecting of these bats. The specimen has already been mentioned by Husson (1962: 22, 74).

Description. — Length of forearm varying from 59 to 64 mm; nose leaf absent; lower lip covered with prominent, wart-like papillae; ears abruptly attenuated above, about 20 mm in length; tragus about one-third of ear-length; length of the first phalanx of the third finger about one-fifth the length of the third metacarpal; inter-femoral membrane well developed, reaching about the bases of the toes; calcar about as long as the tibia; tail perforating the interfemoral membrane, and projecting for about half its length on the dorsal surface; wing membrane from the inner side of the lower third of the tibia and from the calcar. Two colour phases occur: a bright reddish brown and a more greyish phase, the ventral surface being always somewhat lighter.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{3}$, $M \frac{3}{3}$. The upper incisors, completely fill the space between the canines; the middle incisors, much larger than the outer, are bifid; the first upper premolar, much smaller than the second, stands perfectly in the tooth-row. The lower incisors are about equal in size, their cutting edges are trifid; the first and the third lower premolars are of about equal size; the first premolar is in contact with the canine as well as with the third premolar, while the small middle premolar is crowded out of the tooth-row on the lingual side.

External and skull measurements of the examined Suriname female specimen. Forearm, 63.3; length of third metacarpal, 55; first phalanx, 11; second phalanx, 17.5; length of fourth metacarpal, 52.5; first phalanx, 12; second phalanx, 15; length of fifth metacarpal, 51.5; first phalanx, 12; second phalanx, 14; length of ear, 20; tibia, 25; hind foot, 12.5; calcar, 25 mm. — Skull: greatest length, 22.1; condylobasal length, 21.1; condyle to front of canine, 20.5; basal length 19.7; palatal length, 10.9; zygomatic breadth, 12.6; breadth of braincase, 10.7; height of braincase, 8.9; mastoid breadth, 11.8; interorbital constriction, 4.6; width across molars, 8.3; width across cingula canines, 6.2; upper tooth-row, c-m³, 9.5; lower tooth-row, c-m₃, 10.2; length of mandible, 16.1 mm.

The examined Suriname specimen of *Chilonycteris* has the hairs of the upper parts uniformly bright reddish brown with a golden tinge; the hairs of the under parts are darker brown without a golden tinge, while their tips are somewhat lighter. The length of the forearm of this specimen being 63.3 mm, it belongs to *Ch. rubiginosa rubiginosa*. The coat colour as well as the dimensions of the Suriname specimen agree

very well with those given by J. A. Allen (1911: 261-263) for specimens from El Callao, eastern Venezuela south of the Orinoco, which Allen considered to belong to *Ch. rubiginosa*.

Remarks. — The taxonomic status of the present species has been discussed by Husson (1962: 75, 76).

It is possible that a second species of the genus *Chilonycteris* occurs in Suriname, namely *C. personata* Wagner. This species resembles *C. rubiginosa* in a very striking way, but in all its dimensions it is much smaller. The forearm is said to vary from 41 to 47 mm in *C. personata*.

Subfamily PHYLLOSTOMINAE

The main character by which the Phyllostominae differ from all other Phyllostomid bats (except the Chilonycterinae) is that of the structure of the molars, of which the cusps and commissures are never so reduced that the W-pattern is not evident (see Miller, 1907: 118, 122-123). In all species the nose leaf as well as the interfemoral membranes are well developed, but there are considerable differences among the various species in the extent of the tail and the length of the calcar; the attachment of the wings also may be widely different in different species (fig. 20a-e).

In the collections of Suriname bats examined by me twelve species of Phyllostominae are represented; no other species of this subfamily have been reported from Suriname in the literature studied. However, considering the distribution of the Neotropical Phyllostominae, it would be not surprising if the following species not yet reported from Suriname would actually occur there; *Lonchorhina aurita* Tomes (text-figs. 17a, 18b, 20c), *Phyllostomus latifolius* Thomas, *Phylloderma stenops* Peters (pl. 22, text-figs. 20d, 23d), *Tonatia bidens* (Spix), and *Chrotopterus auritus guianae* Thomas (text-figs. 17c, 18a, 20b). For this reason these species are included in the following key. Since *Tonatia bidens* and *Phyllostomus latifolius* are closely related to *Tonatia silvicola laephotis* and *Phyllostomus elongatus*, respectively, some remarks on the former species are given under the latter.

Key to the Suriname Phyllostominae

- 1a. External tail absent or rudimentary; length of forearm more than 70 mm 2
- b. Tail present; in most species the length of the forearm is less than 70 mm. 3
- 2a. Two lower incisors (fig. 17c); tail rudimentary, may be discerned with some difficulty; length of forearm varying from 77 to 83 mm; wings from the base of the outer toe; fur long and soft; dorsal surface dark brown, ventral surface greyish; wing membranes dark brown, the ends being broadly white.
Chrotopterus auritus guianae Thomas
- b. Four lower incisors (fig. 24a); no external tail; length of forearm about 105 mm
Vampyrum spectrum, p. 107
- 3a. Tail enclosed in the interfemoral membrane, extending to the posterior border 4

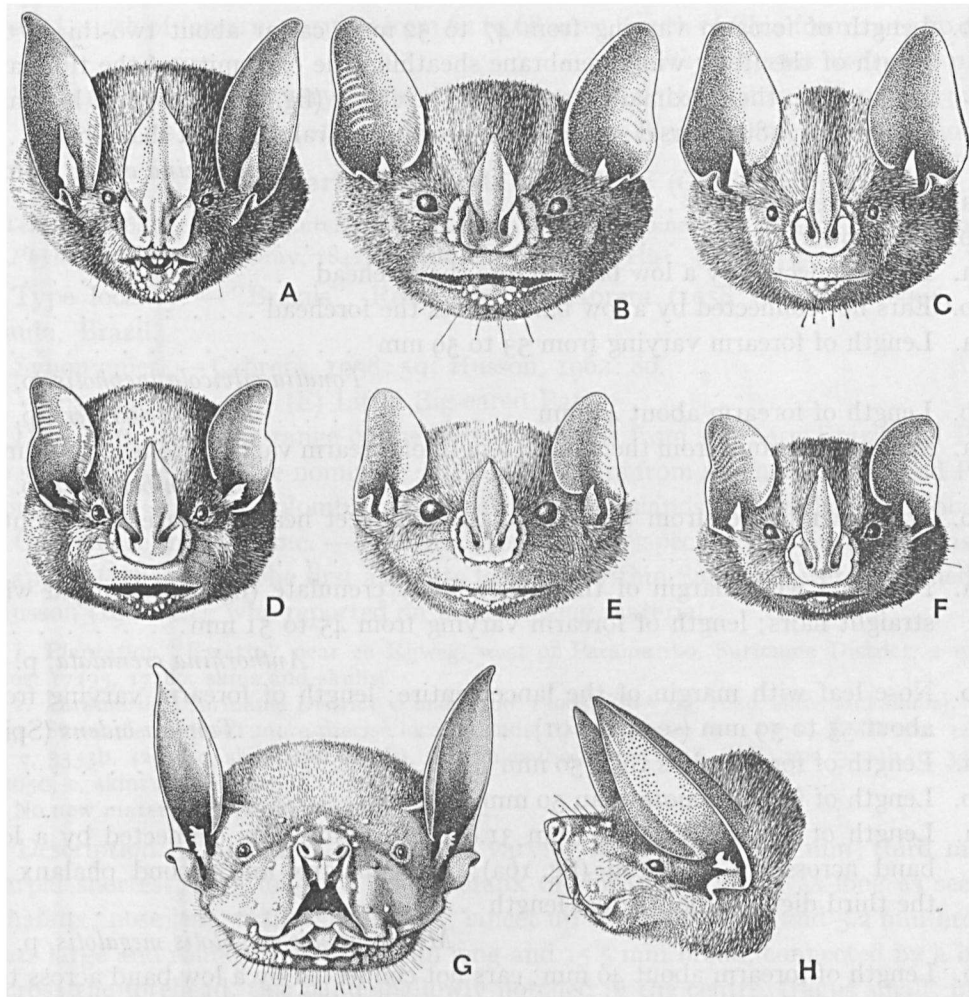


Fig. 15. a, *Macrophyllum macrophyllum* (Wied), BMNH no. 3.10.1.94; b, *Artibeus lituratus fallax* Peters, no. 17384; c, *Vampyrops helleri* Peters, no. 17372; d, *Artibeus cinereus cinereus* (Gervais), SMN no. 861; e, *Chiroderma villosum villosum* Peters, SMN no. 450; f, *Uroderma bilobatum bilobatum* Peters, no. 13079; g, *Noctilio leporinus leporinus* (L.), no. 13503; h, *Noctilio labialis albiventris* Desmarest, no. 17271.

- b. Tail short, but distinct, enclosed in the interfemoral membrane, reaching the middle of the membrane or reaching less far; in some species the membrane is perforated by the tail, the extreme tip of the tail appearing free on the dorsal surface 5
- 4a. Length of forearm varying from 34 to 39 mm; the distal part of the ventral surface of the interfemoral membrane with peculiar dermal denticles which are arranged longitudinally in more or less parallel rows; wing membrane from the distal half of the tibia; calcar of about the same length as the tibia (fig. 20a); fur rather long and soft; dorsal surface sooty brown, ventral surface a shade paler *Macrophyllum macrophyllum*, p. 86

- b. Length of forearm varying from 47 to 52 mm; calcar about two-thirds the length of the tibia; wing membrane sheathing the extremity of the tibia and arising from the proximal extremity of the calcar (fig. 20c); nose leaf long and slender (fig. 18b); dorsal surface dark brown, ventral surface a shade paler . . .
Lonchorhina aurita Tomes
- 5a. Two lower incisors 6
 b. Four lower incisors 10
- 6a. Ears connected by a low band across the forehead 7
 b. Ears not connected by a low band across the forehead 8
- 7a. Length of forearm varying from 53 to 59 mm
Tonatia silvicola laephotis, p. 89
- b. Length of forearm about 45 mm *Tonatia carrikeri*, p. 88
- 8a. Wing membranes from the ankles; length of forearm varying from 51 to 53 mm
Mimon bennettii, p. 91
- b. Wing membranes from the side of the hind feet near the base of the outer toe 9
- 9a. Nose leaf with margin of the lancet finely crenulate (fig. 21a), fringed with straight hairs; length of forearm varying from 45 to 51 mm.
Anthorhina crenulata, p. 95
- b. Nose leaf with margin of the lancet entire; length of forearm varying from about 55 to 59 mm (see page 91) *Tonatia bidens* (Spix)
- 10a. Length of forearm less than 50 mm 11
 b. Length of forearm more than 50 mm 12
- 11a. Length of forearm varying from 31.8 to 36.2 mm; ears connected by a low band across the forehead (fig. 16a); first phalanx and second phalanx of the third digit of about equal length
Micronycteris megalotis megalotis, p. 83
- b. Length of forearm about 40 mm; ears not connected by a low band across the forehead; first phalanx of third digit much shorter than the second phalanx, being about 14 and 18 mm, respectively. *Micronycteris brachyotis*, p. 85
- 12a. Nose leaf with the margin of the lancet finely toothed (fig. 21f)
Trachops cirrhosus cirrhosus, p. 105
- b. Nose leaf with the margin of the lancet entire 13
- 13a. Calcar distinctly shorter than the hind foot 14
 b. Calcar about as long as or longer than the hind foot 15
- 14a. Length of forearm varying from 67 to 70 mm; wing membrane from the side of the hind foot (fig. 20d) *Phylloderma stenops* Peters
 b. Length of forearm varying from about 55 to 65 mm; wing membranes from the ankles (fig. 20e) *Phyllostomus discolor discolor*, p. 97
- 15a. Length of forearm varying from 79 to 88 mm; nose leaf shorter than the hind foot *Phyllostomus hastatus hastatus*, p. 102
 b. Length of forearm less than 75 mm 16

- 16a. Length of forearm varying from 62 to 68 mm; length of tibia from 24 to 30 mm
Phyllostomus elongatus, p. 99
- b. Length of forearm varying from 58 to 60 mm; length of tibia from 21 to 23 mm
 (see pages 100 and 101) *Phyllostomus latifolius* Thomas

Micronycteris megalotis megalotis (Gray, 1942)

Text-figs. 16a (head), 19a (interfemoral membrane), 22c (canines and incisors), pl. 20 (skull)
Phyllophora megalotis Gray, 1842, Annals Magazine Nat. Hist., (1) 10: 257.

Type locality. — "Brazils". Restricted by Cabrera (1958: 60) to Pereque, São Paulo, Brazil.

Synonymies. — Cabrera, 1958: 59; Husson, 1962: 80.

Vernacular names. — (E) Little Big-eared Bat.

Distribution. — The range of the species extends from southern Brazil and Peru to southern Mexico. The nominate subspecies occurs from southern Brazil and Peru north to the Guianas, Colombia, Venezuela and the islands of Trinidad and Tobago.

Occurrence in Suriname. — The first record of the species from Suriname was by Kappler (1881: 163). The first accurate localities within Suriname were provided by Husson (1962: 81), who reported on the following material:

1. Plantation "Kwatta" near 2e Rijweg, west of Paramaribo, Suriname District, 2 males (nos. 17295, 17367, skins and skulls).
2. Paramaribo, Suriname District, 2 males (no. 15904, ZMA no. 1629, skins and skulls).
3. Suriname, without more precise locality indication, 8 males (no. 15904, ZMB nos. 3222a, d, e, 3353b, 4265a-c, skins and skulls), 6 females (SMN no. 1408, ZMB nos. 3222b, c, 3353a, 4265d, e, skins and skulls).

No new material has been examined by me.

Description. — Length of the forearm varying from 31.8 to 36.2 mm; third metacarpal shortest, fifth longest; first phalanx of third digit about as long as second phalanx; nose leaf small, but distinct, lancet up to 7.8 mm long and 5.2 mm broad; ears large and rounded, up to 18 mm long and 15.5 mm broad, connected by a band across the forehead, this band shallowly notched in the centre, tragus small; interfemoral membrane well developed, when stretched its posterior margin extending to the level of the ankles; calcar longer than hind foot with claws, but shorter than tibia; tail reaching almost the middle of the membrane, its extreme tip appearing on the dorsal surface of the membrane; wing membrane from the ankles; fur dense and soft, extending on the upper arm, but hardly on the almost wholly naked membranes; dorsal surface of body dark brown, bases of hairs usually pure white; ventral surface of about the same brown colour as dorsal surface, but hairs uniformly coloured; membranes dark to blackish brown.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors completely filling the space between the canines, the inner about half as high as the canines, the outer minute, scarcely exceeding the cingulum of the inner; inner lower incisors at base distinctly separated, but in contact with each other in the middle, the tips slightly diverging; cutting edge of the inner incisor notched near the outer side, forming two unequal lobes; first and second upper premolars subequal in size and height, about half as

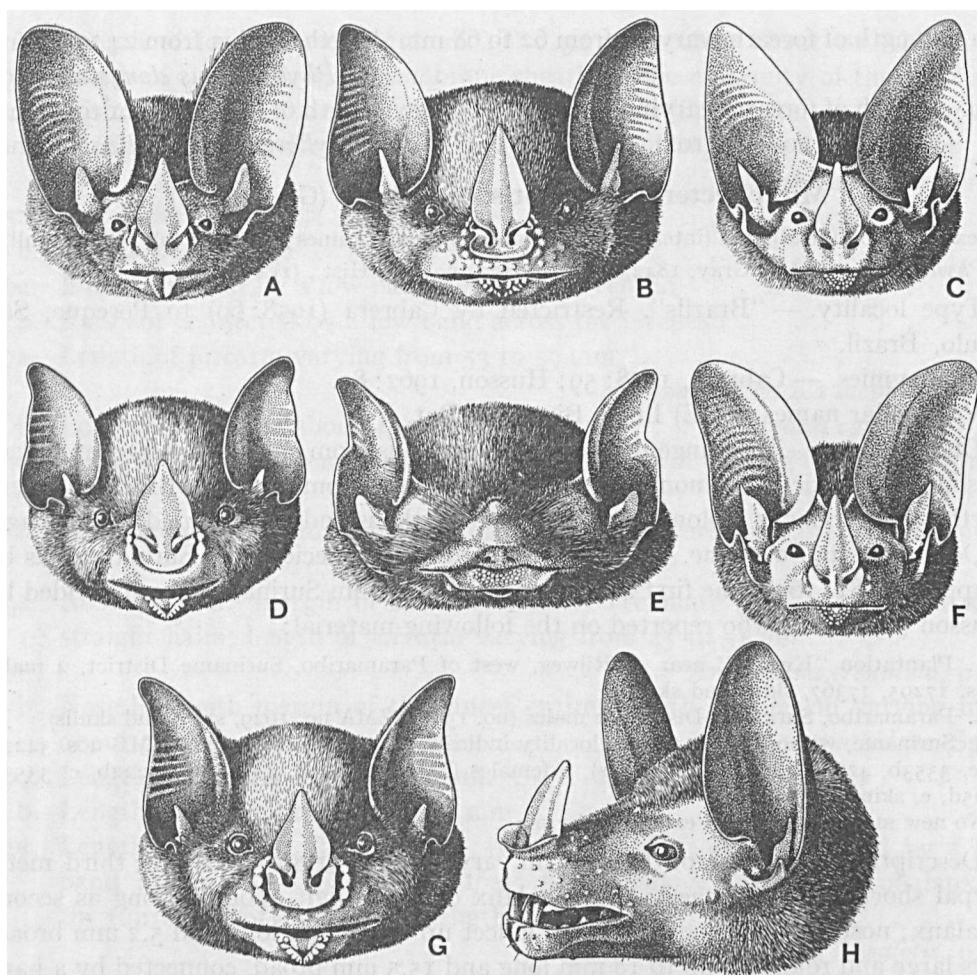


Fig. 16. a, *Micronycteris megalotis megalotis* (Gray), no. 17367; b, *Phyllostomus elongatus* (E. Geoffroy), ZMB no. 3217; c, *Tonatia carrikeri* (J. A. Allen), ZMB no. 4334; d, *Phyllostomus discolor discolor* (Wagner), ZMB no. A1838; e, *Chilonycteris rubiginosa rubiginosa* Wagner, no. 16420; f, *Tonatia silvicola laephotis* Thomas, no. 15786; g, *Phyllostomus hastatus hastatus* (Pallas), SMN no. 240; h, *Vampyrum spectrum* (L.), no. 15909.

high as canine. Lower incisors forming a continuous semicircular row between the canines, their cutting edges faintly bifid; first lower premolar distinctly larger and higher than second and third premolars, the latter two are subequal in height; the base of the middle premolar is slightly shorter than that of the last premolar, which is often a trifle higher than the second; the three lower premolars stand perfectly in the tooth-row, touching each other, the anterior premolar touches the canine, and the posterior premolar is in contact with the first molar.

The external and skull measurements of nine of the examined specimens are given in Table 10.

Remarks. — The specimens from Kwatta were found in a barn.

TABLE 10

External and skull measurements of nine specimens of *Micronycteris megalotis megalotis* (Gray) from Suriname.

Museum	RMNH	ZMA	ZMB	ZMB	ZMB	ZMB	ZMB	ZMB	ZMB
Reg. number	17295	1629	4265b	3222a	4265a	4265c	3222b	3222c	4265a
Sex	♂	♂	♂	♂	♂	♂	♀	♀	♀
Forearm	35.7	34.5	31.1	31.4	33.0	34.4	34.9	33.0	35.0
Third digit, metacarpal	30	29	26	26.3	27.5	28.5	29	27	29.5
1st phalanx	13	14	11.5	11.5	11.5	12.5	13	11.5	13.5
2nd phalanx	13	14	11	11.5	11.5	14	13	12	14.5
3rd phalanx	9	9.5	9	8	10	9.5	8.5	9	9.5
Fourth digit, metacarpal	30	29.5	26.5	26.5	28	29.5	29.5	27.5	30
1st phalanx	10.5	10	9	9	9	9.5	10	9.5	10.5
2nd phalanx	9	9	9	8.5	8	10	9	9.5	10
Fifth digit, metacarpal	31	31	27.5	26.8	29	30	30.3	28	30.5
1st phalanx	10.5	11	9	9.5	9.5	10	10.5	9.5	11
2nd phalanx	9	9	9.5	9	10	10.5	9.5	9	9.5
Tibia	15.5	15	15	15	15.5	15	15	15	15
Hind foot	9.5	9	9	9	9.5	10	9	9.5	9
Calcar	10.8	10.5	9.5	9	10	10.5	10	9	10
Skull:									
greatest length	18.5	18.6	17.1	17.1	17.7	17.3	17.5	17.5	17.3
condylobasal length	16.6	16.3	15.2	15.0	15.5	-	15.3	15.5	-
condyle to front of canine	16.2	16.2	15.0	14.6	15.2	-	15.1	15.2	-
basal length	14.5	14.0	12.8	13.0	13.2	-	13.3	13.3	-
palatal length	8.5	8.5	7.3	7.3	7.4	-	7.9	7.9	-
zygomatic breadth	-	9.2	8.2	8.5	8.7	-	9.0	-	8.7
breadth of braincase	7.7	7.6	7.0	7.3	7.2	7.2	7.4	7.3	-
height of braincase	7.3	7.4	6.8	7.1	7.0	-	7.1	7.0	-
mastoid breadth	8.5	-	7.8	8.1	8.1	8.1	8.5	8.0	-
postorbital constriction	4.1	4.2	3.7	3.8	3.9	4.1	4.0	3.9	4.0
width across molars	6.3	6.0	5.6	5.6	5.9	6.1	5.8	5.7	5.8
width across cingula canines	3.3	3.2	2.9	2.9	2.9	3.0	2.9	2.9	3.0
upper tooth-row, c - m ³	7.1	7.2	6.6	6.4	6.6	6.6	6.6	6.5	6.5
lower tooth-row, c - m ₃	7.6	7.7	7.1	6.9	7.1	7.1	7.3	7.0	7.1
length of mandible	12.1	11.9	11.0	10.7	11.2	11.5	11.3	11.3	11.3

Micronycteris brachyotis (Dobson, 1879)

Schizostoma brachyote Dobson, 1879, Proc. Zool. Soc. London, 1878: 880.

Type locality. — "Cayenne", Guyane.

Synonymies. — Cabrera, 1958: 62.

Vernacular names. — (E) Yellow-throated Bat.

Distribution. — The Guianas.

Occurrence in Suriname. — Husson (1962: 83) suggested the possible occurrence of this species in Suriname, but at that time no Suriname specimens of it were known. Since then, however, I have received from Dr. F. Lukoschus, 6 males collected at Gros, on the railroad from Paramaribo into the interior, about 100 km S. of Paramaribo, Brokopondo District (nos. 24988-24992, skins and skulls).

Description. — This species is very close to *Micronycteris megalotis*, but may immediately be distinguished by the following characters: (1) in the present specimens the length of the forearm is 40.2 to 42.9 mm (40.5 mm in the type), while in *M.*

megalotis it is at most 36.5 mm, (2) no transverse band connects the ears across the forehead, (3) the fourth metacarpal is shortest, the third and fifth are about equal in length, while the second phalanx of the third digit (about 17.8 mm in the type) is considerably longer than the first, which is about 14 mm in the type.

Remarks. — The Gros specimens were collected in an old goldmine in the savanna area.

Macrophyllum macrophyllum (Schinz, 1821)

Text-figs. 15a (head), 17b (canines and incisors), 20a (interfemoral membrane)

Phyllostoma macrophyllum Schinz, 1821, in Cuvier, *Thierreich*, (ed. 1): 163.

Type locality. — “In den Wäldern von Brasilien”. The actual type locality is “am Flusse *Mucuri*”, Minas Geraes, Brazil, where the holotype was collected by Prince Maximilian von Wied-Neuwied (Wied, 1826: 192).

Synonymies. — Cabrera, 1958: 63.

Vernacular names. — (E) Long-legged Bat.

Distribution. — Northern South America from Minas Geraes (E. Brazil) and Colombia north to Panama.

Occurrence in Suriname. — Although Husson (1962: 78) mentioned the likelihood that the present species would be found in Suriname, at that time no specimens were known from that country. Only after the publication of my 1962 paper I received Suriname material of *Macrophyllum macrophyllum*, and therefore the species was entered in my checklist (1973 : 6). The following Suriname specimens were collected by Dr. G. F. Mees in 1965 and 1966 (lots 2-4) and Dr. F. Lukoschus in 1971 (lot 1), and have been examined by me:

1. Santo Boma locks, about 12 km south-west of Paramaribo, Suriname District, 3 males (nos. 24901, 24904, 24905, skins and skulls), 7 females (nos. 24899, 24900, 24903, 24906-24908, skins and skulls).

2. Highway between Paramaribo and Afobaka about 6 km south of Kraka, and 66 km south of Paramaribo, Brokopondo District, 4 specimens (nos. 25186-25189, skins and skulls).

3. Plantation “Berg en Dal”, west bank of Suriname River, about 75 km south of Paramaribo, 1 male, 3 females (no. 19651, skins and skulls).

4. Brownsweg, north-west corner of Brokopondo Lake, Brokopondo District, 1 male, 13 females (no. 19652, skins and skulls).

Description. — The species can be distinguished by the characters given in the key (pp. 80-83). In the present material the length of the forearm varies from 34.4 to 36.5 mm in the males, and from 36.0 to 38.3 mm in the females.

Remarks. — Cabrera (1958: 63) cited the author's name of the present species as “(Wied)”, and referred to “Wied, en Schinz, Thierr., 1, 1821: 163”. As nowhere in Schinz's (1821) German revision of Cuvier's *Règne Animal* there is an indication that Prince Maximilian von Wied-Neuwied “is alone responsible both for the name and the conditions that make it available” (International Code of Zoological Nomenclature, Art. 50), Schinz has to be cited as the author of the name *P. macrophyllum* and

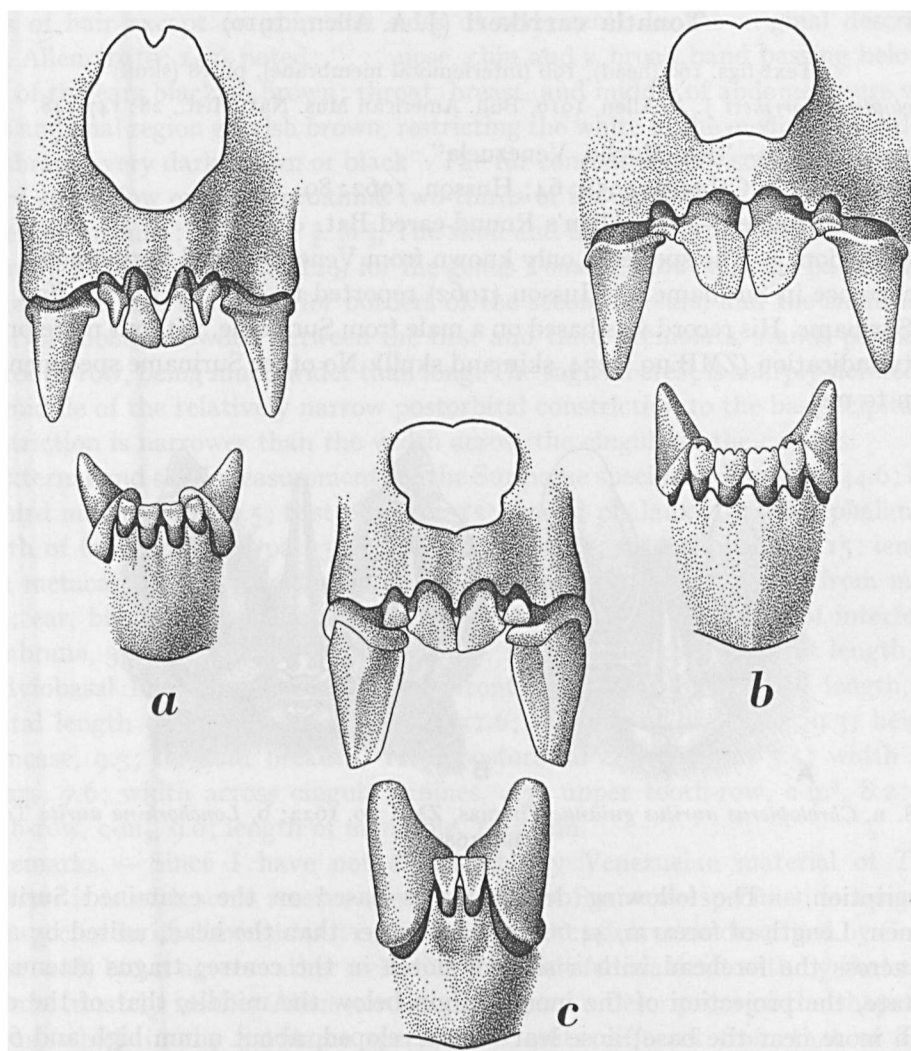


Fig. 17. Canines and incisors in front view. a, *Lonchorhina aurita* Tomes, no. 16844; b, *Macrophyllum macrophyllum* (Wied), BMNH no. 11.4.28.7; c, *Chrotopterus auritus guianae* Thomas, no. 5001. Width across cingula canines, in mm: a, 4.5; b, 3.5; c, 7.7.

of several other names assigned to Wied. The indication "P.Max." after the name "Phyllost. macrophyllum" by Schinz is not sufficient to make Wied the author of that name: Prince Maximilian may have been responsible for the name (and he most likely was), but there is no indication whatever that he also was responsible for the description.

The specimens from lots 2, 3 and 4 all were found in culverts under highways.

Tonatia carrikeri (J. A. Allen, 1910)

Text-figs. 16c (head), 19b (interfemoral membrane), pl. 18 (skull)

Chrotopterus carrikeri J. A. Allen, 1910, Bull. American Mus. Nat. Hist., 28: 147-148.

Type locality. — "Rio Mocho, Venezuela".

Synonymies. — Cabrera, 1958: 64; Husson, 1962: 89.

Vernacular names. — (E) Allen's Round-eared Bat.

Distribution. — The species is only known from Venezuela and Suriname.

Occurrence in Suriname. — Husson (1962) reported the species for the first time from Suriname. His record was based on a male from Suriname, without more precise locality indication (ZMB no. 4234, skin and skull). No other Suriname specimens are known to me.

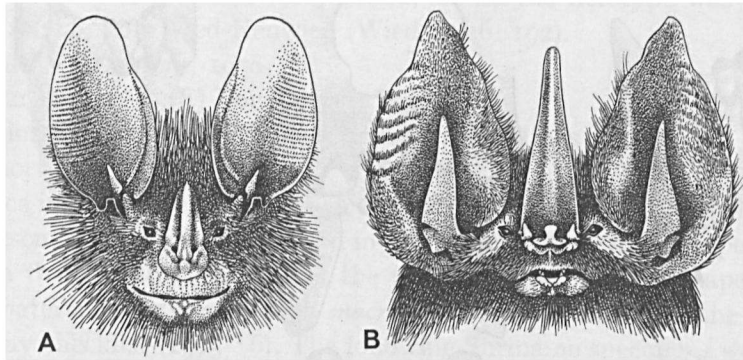


Fig. 18. a, *Chrotopterus auritus guianae* Thomas, ZMA no. 1622; b, *Lonchorhina aurita* Tomes, no. 16844.

Description. — The following description is based on the examined Suriname specimen. Length of forearm, 44.6 mm; ears longer than the head, united by a low band across the forehead with a shallow notch in the centre; tragus attenuated, bidentate, the projection of the inner margin below the middle, that of the outer margin more near the base; nose leaf well developed, about 9 mm high and 6 mm broad; margin of the upper lip entire, warts of the lower lip vague; calcar well developed, somewhat larger than the hind foot, about equal in length to the free margin of the interfemoral membrane; the tail, from anus about 10.5 mm long, is enclosed in the basal part of the membrane, ending at about one-fourth of the length of the membrane; interfemoral membrane well developed, when stretched reaching to about the level of the metatarsus; wing membrane starting from the dorsal surface of the hind foot near the base of the outer toe.

The Suriname specimen, which has been preserved for about a hundred years, is too bleached by the action of the preservative to give a correct idea of the original coat colour; so the head and wings are practically white. Goodwin (1942: 207) described the colour as follows: "General color of upperparts Mummy brown, the hairs finely tipped with pale buff, extreme base of fur white; underparts pure white to

roots of hair except on chin and sides of abdomen". In the original description J. A. Allen (1910: 147) noted: "... nose, chin and a broad band passing below the base of the ears blackish brown; throat, breast, and middle of abdomen pure white; sides and anal region greyish brown, restricting the white to the median ventral area; membranes very dark brown or black". The fur consists of very soft hairs, extending above and below over the proximal two-thirds of the humerus.

Dental formula: $I \frac{2}{1}$, $C \frac{1}{1}$, $P \frac{2}{3}$, $M \frac{3}{3}$. The skull and teeth show all essential characters given by Miller (1907a: 128-129) for the genus *Tonatia*. However, the palate ends on a line connecting the posterior borders of the second molars, and the small middle lower premolar, crowded between the first and third premolars, stands perfectly in the tooth-row, being much wider than long. The sagittal crest is sharply defined from the middle of the relatively narrow postorbital constriction to the basioccipital, this constriction is narrower than the width across the cingula of the canines.

External and skull measurements of the Suriname specimen. Forearm, 44.6; length of third metacarpal, 37.5; first phalanx, 15; second phalanx, 19; third phalanx, 10; length of fourth metacarpal, 38.5; first phalanx, 15; second phalanx, 15; length of fifth metacarpal, 40.5; first phalanx, 15.5; second phalanx, 17; ear, from meatus, 21.5; ear, breadth, 14.5; tragus, 7; tibia, 22; hind foot, 13; depth of interfemoral membrane, 35; tail from anus, 10.5; calcar, 15 mm. — Skull: greatest length, 23.2; condylobasal length, 19.6; condyle to front of canine, 19.6; basal length, 17.5; palatal length 9.4; zygomatic breadth, 11.6; breadth of braincase, 9.3; height of braincase, 9.3; mastoid breadth, 11.5; postorbital constriction, 3.5; width across molars, 7.6; width across cingula canines, 4.7; upper tooth-row, c-m³, 8.2; lower tooth-row, c-m₃, 9.0; length of mandible, 14.4 mm.

Remarks. — Since I have not examined any Venezuelan material of *Tonatia carrikeri* it is with some reserve that the present Suriname specimen is assigned to that species. In its dimensions it is smaller than the adult male described by Goodwin (1942: 208) but it agrees rather well with the adult female dealt with by that author.

Unfortunately neither Allen nor Goodwin gave a description of the shape of the tragus, which in the Suriname specimen is quite different from that of *Tonatia silvicola laephotis* (see fig. 16c, f).

***Tonatia silvicola laephotis* Thomas, 1910**

Text-figs. 16f (head), 22a (canines and incisors), pl. 18 (skull)

Tonatia laephotis Thomas, 1910, *Annals Magazine Nat. Hist.*, (8) 6: 184-185.

Type locality. — "River Supinaam, a tributary of the Lower Essequibo", Demerara, Guyana.

Synonymies. — Cabrera, 1958: 64; Husson, 1962: 84.

Vernacular names. — (E) Round-eared Bat.

Distribution. — The species *Tonatia silvicola* (d'Orbigny, 1936) inhabits northern South America from central Brazil (Mato Grosso), Bolivia and Peru north, and

southern Central America north to British Honduras. The subspecies *T. s. laephotis* has been reported from the lower Amazon basin, Brazil and the Guianas.

Occurrence in Suriname. — The species was reported for the first time from Suriname by Husson (1962), who dealt with the material listed below under 2 and 3.

I have examined the following specimens:

1. Brownsberg near the west bank of Brokopondo Lake, Brokopondo District, 1 female (no. 24987, skin and skull).

2. Between Moengotapoe and the Wiawia Bank, coastal region of north-eastern Suriname, Marowijne District, 1 male (no. 15786, skin and skull), 2 females (nos. 15785, 15787, skins and skulls).

3. Suriname, without more precise locality indication, 1 female (ZMB no. 4214, skin and skull).

Description. — Length of forearm varying from 53 to 59 mm (mean of 5 specimens: 56 mm); ears large and broad, rounded above, longer than the head, about 28 mm long and 18 mm broad; behind each ear there is a small connecting band, the two bands touching each other nearly in the middle of the forehead between the ears; tragus well developed, attenuated in its upper third, the basal part of its outer margin has three small tooth-like projections; nose leaf well developed, fused with upper lip, distance between tip of nose leaf and margin of upper lip about 12 mm; interfemoral membrane well developed, when stretched it extends to the level of the ankles; calcar somewhat longer than the hind foot, but somewhat shorter than the total free margin of the interfemoral membrane; tail extending to about one-third the length of the interfemoral membrane, the extreme tip appearing on its dorsal surface; the wing is attached on the dorsal surface of the hind foot near the base of the fourth digit; fur soft, extending on the basal half of the humerus, above and beneath; hairs of the dorsal surface dark mummy brown, the tips being pale buff; the hairs of the neck and behind the ears for the greater part white with dark tips; on the ventral surface the fur of the chin is distinctly whitish, this colour gradually passes in the more silvery greyish or greyish tinges of the abdomen; the sides of the body are more greyish brown, but paler than the dorsal surface; wings blackish brown, the lower part of the wing between the second and fifth fingers lighter, contrasting sharply, at least in the examined specimens, with the yellowish white colour of the metacarpals and phalanges.

Dental formula: $I \frac{2}{1}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Inner upper incisor much larger than the forward crowded outer incisor, the latter completely filling the space between the canine and inner incisor; anterior upper premolar much broader than long; postorbital constriction narrower than the width across cingula of canines; sagittal crest well developed in both sexes, running from the middle of the postorbital constriction to the basioccipital, not divided anteriorly. Lower incisors much higher than wide; lower canines posteriorly nearly in contact with each other; small middle lower premolar much wider than long, crowded outward, but in such a way that it still touches both the first and third premolars, so that these are separated.

External and skull measurements of the examined male (RMNH no. 15786) and the two females (ZMB no. 3214, and RMNH no. 15785, respectively). Forearm, 57.2, 55.2, 57.0; length of third metacarpal, 46.5, 43, 46; first phalanx, 20, 19, 21; second phalanx, 21, 20.5, 21; third phalanx 21, 19, 20; length of fourth metacarpal, 45.5, 43, 45; first phalanx, 19, 17.5, 18.5; second phalanx, 19, 18.5, 18; length of fifth metacarpal, 49, 47.5, 50; first phalanx, 18, 17.5, 18; second phalanx, 19, 18.5, 16.5; tibia, 30, 29, 30; calcar, 18, 17, 16 mm. — Skull: greatest length, 27.7, 26.6, 28.0; condylo-basal length, 24.0, 23.1, 24.0; condyle to front of canine, 24.1, 23.0, 23.7; basal length, 20.4, 19.8, 20.3; palatal length, 11.9, 11.5, 12.1; zygomatic breadth, 14.1, 12.9, 13.7; breadth of braincase, 11.2, 10.3, 10.5; height of braincase, 10.6, 10.1, 10.6; mastoid breadth, 14.6, 13.3, 13.8; postorbital constriction, 4.1, 3.9, 4.0; width across molars, 9.4, 8.4, 9.0; width across cingula of canines, 6.5, 5.5, 5.8; upper tooth-row, c-m³, 10.2, 9.6, 10.0; lower tooth-row, c-m₃, 11.6, 10.5, 11.0; length of mandible, 18.2, 17.5, 18.1 mm.

Remarks. — Husson (1962: 88) dealt with the nomenclature and taxonomy of the present subspecies.

It is possible that also the related species *Tonatia bidens* (Spix, 1823) occurs in Suriname, since Goodwin (1942: 205) reported upon a specimen from Kartabo, Guyana. *Tonatia bidens* is of about the same size as *T. silvicola laephotis*, the length of the forearm varying from 55 to 59 mm, but it can be distinguished from the last mentioned species by (1) the shorter ears, which are as long as the head, and are not connected by a low band across the forehead, and (2) that the postorbital region is not constricted, its width being the same as that across the upper canines.

Mimon bennettii (Gray, 1838)

Text-figs. 19c (interfemoral membrane), 21b (head), 23a (canines and incisors), pl. 19 (skull)
Phyllostoma Bennettii Gray, 1838, Magazine Zool. Bot., 2: 488.

Type locality. — "S. America". Restricted by Hershkovitz (1951: 555) to Ypanema, São Paulo, Brazil.

Synonymies. — Cabrera, 1958: 65; Husson, 1962: 91.

Vernacular names. — (E) Little Spear-nosed Bat.

Distribution. — South-eastern Brazil and Suriname.

Occurrence in Suriname. — Peters (1867: 469) was the first author to report the present species from Suriname. Also Jentink (1887: 291) reported upon Suriname material, which, however, was incorrectly assigned by him to *Lophostoma bidens*. Husson (1962) examined both Peters's material and that of Jentink, which so far are the only Suriname specimens known of the species: Suriname without more precise locality indication, 2 adult females (ZMB no. 3350a, b), 1 skull (no. 17369).

Description. — Length of forearm varying from 51 to 53 mm; nose leaf large and broad, length up to 17 mm, breadth up to 8.5 mm; ears large, broad, and pointed, length up to 27 mm, breadth up to 18.5 mm; tragus well developed, about 12 mm

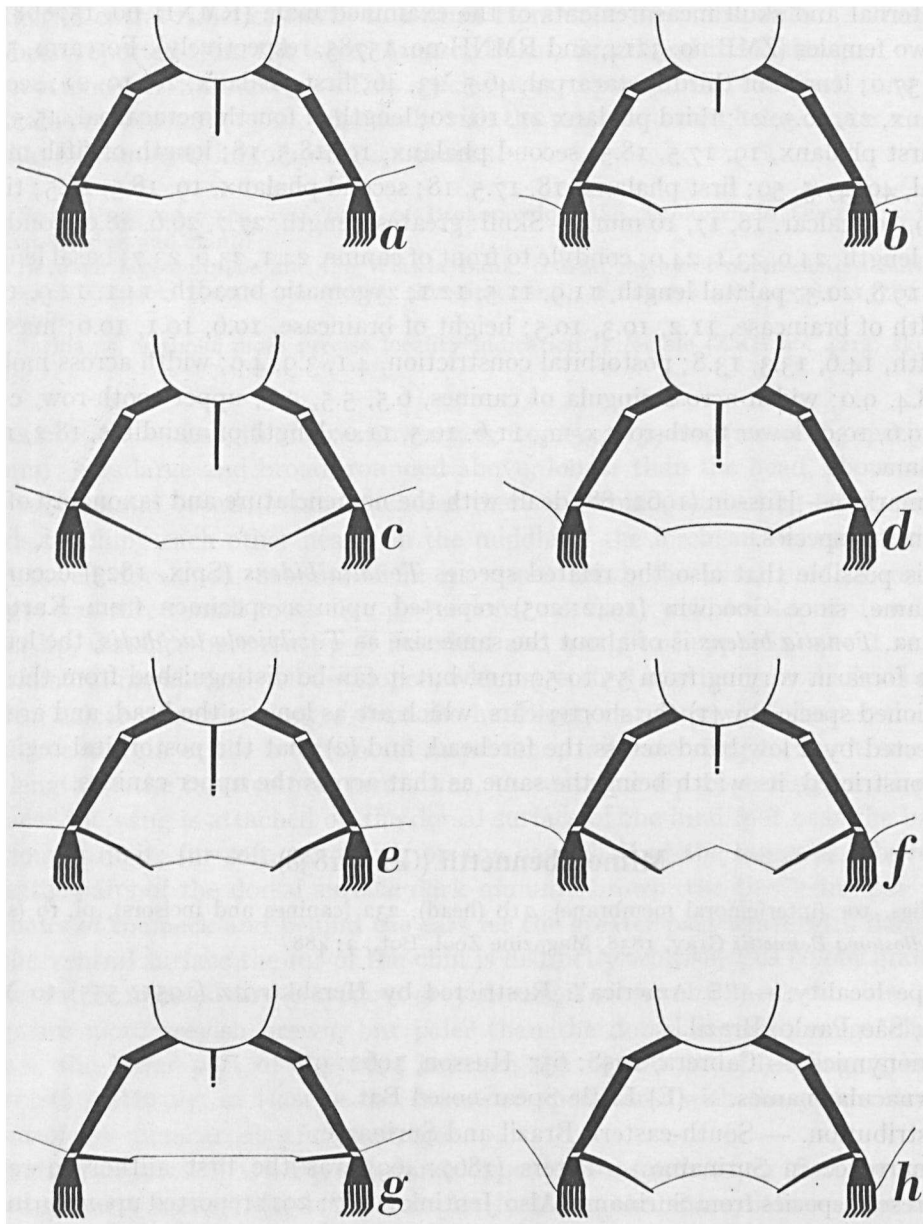


Fig. 19. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Suriname Phyllostominae. a, *Miconycteris megalotis megalotis* (Gray); b, *Tonatia carrikeri* (J. A. Allen); c, *Mimon bennettii* (Gray); d, *Anihorhina crenulata* (E. Geoffroy); e, *Phyllostomus elongatus* (E. Geoffroy); f, *Phyllostomus hastatus hastatus* (Pallas); g, *Trachops cirrhosus cirrhosus* (Spix); h, *Vampyrum spectrum* (L.).

in length; interfemoral membrane large, when expanded extending to the bases of the toes; calcar long, about four-fifth the length of the tibia, and shorter than the free margin of the membrane; tail included in the interfemoral membrane, ending about in its middle; wing membrane from the ankles; fur long and dense, above and beneath; upper parts fulvous-brown, under parts paler.

Dental formula: $I \frac{2}{1}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors completely filling the space between the canines, the outer about half as high as the inner, touching the inner as well as the canines; inner incisors in contact in the middle, their tips diverging; first upper premolar about half the size of the second, standing perfectly in the tooth-row, in contact with the canine as well as with the second premolar. Lower incisors higher than wide, as high as the cingulum of the canines; first lower premolar somewhat broader but slightly shorter than the second lower premolar. The auditory bullae are small in comparison to those of the closely related forms of the genus *Anthorhina*.

External and skull measurements of the two examined females from Suriname, ZMB no. 3350 a and b, respectively: length of forearm, 52.2, 51.4; length of third metacarpal, 45.5, 45; first phalanx, 17.5, 17.5; second phalanx, 24, 24; third phalanx, 14, 15; length of fourth metacarpal, 45, 44.5; first phalanx, 15, 15; second phalanx, 16.5, 14; length of fifth metacarpal, 48.5, 48; first phalanx, 15, 14.5; second phalanx, 15, 13.5; ears, length, 27, 27; ears, breadth, 18.5, 18; length of tragus, 12, 11; nose leaf, length, 17, 17; nose leaf, breadth, 8.5, 8; tibia, 22.5, 22; hind foot, 14, 15; calcar, 18, 17; depth of interfemoral membrane, 40, 38; length of tail, 20, 20 mm. — Skull: greatest length, 25.1, 25.0; condylobasal length, 21.8, 22.3; condyle to front of canine, 21.6, 21.5; basal length, 19.6, 19.8; palatal length, 12.2, 12.1; zygomatic breadth, 13.7, 13.7; breadth of braincase, 9.8, 9.8; height of braincase, without crest, 9.5, 10.0; mastoid breadth, 11.6, 11.5; postorbital constriction, 4.5, 4.7; width across molars, 9.2, 9.4; width across cingula canines, 5.7, 5.5; upper tooth-row, $c-m^3$, 9.2, 9.2; lower tooth-row, $c-m_3$, 10.3, 10.3; length of mandible, 16.6, 16.6 mm.

Remarks. — In the dried type specimen of *Mimon bennettii* the calcar is apparently as long as or slightly longer than the tibia (Peters, 1866a: 677-678; Dobson, 1878: 492). In the alcohol specimens from Suriname, however, the calcar is decidedly shorter than the tibia. Unfortunately neither Vieira (1942: 298) nor Dalquest (1957: 46) gave the length of the calcar, so that it is not known at present whether the length of the calcar is really subject to such a great variation, or that the method of preservation is the cause of the different measurements found.

The skull of the Suriname specimen mentioned by Jentink (1887: 291) under the name *Lophostoma bidens* Spix proves to belong to the present species: it consists of the rostrum and the damaged mandible only. It is unknown to me when and in which way the Leiden Museum acquired this skull of which the skin apparently never formed part of the collections. The few measurements which could be taken are: width across molars, 9.1; width across cingula canines, 5.5; upper tooth-row, 9.2; lower tooth-row, 10.2.

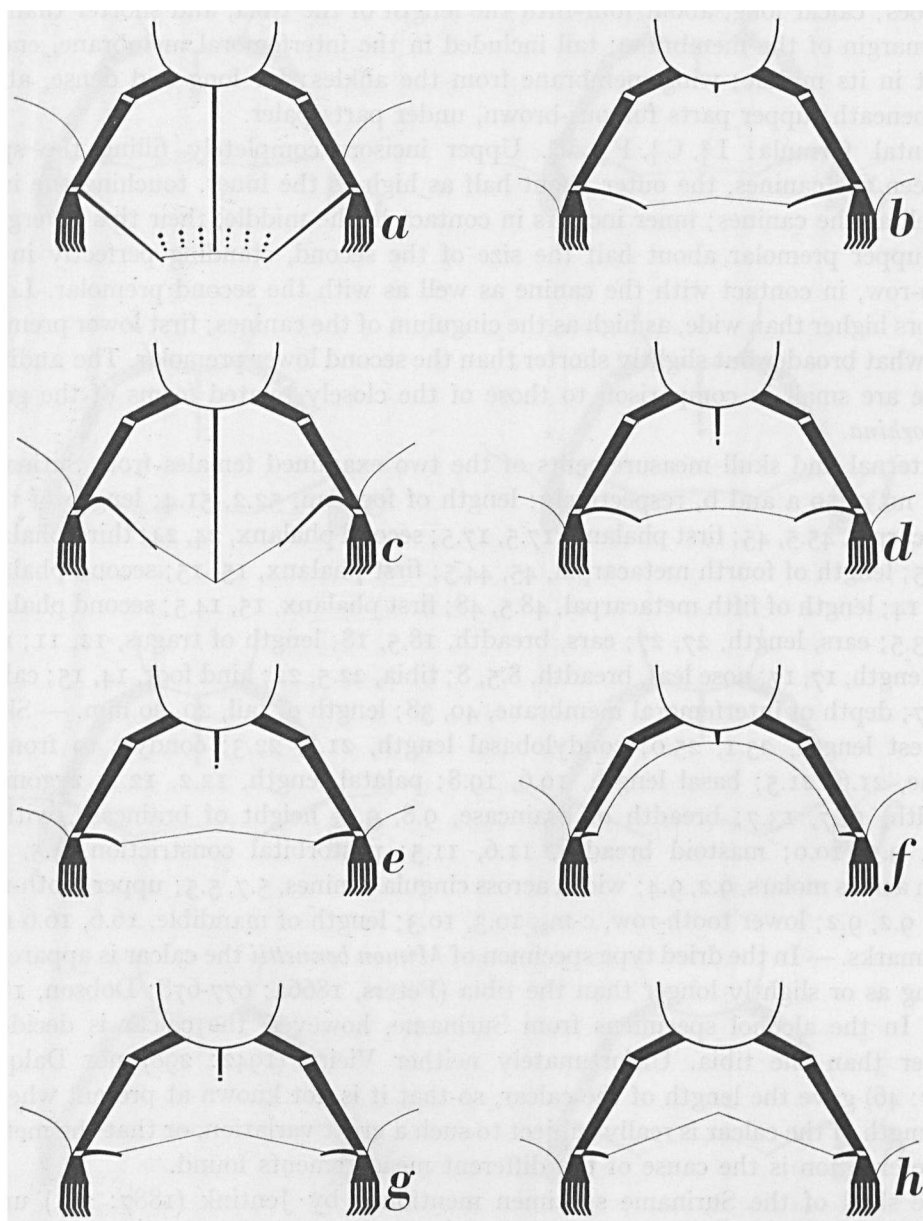


Fig. 20. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Phyllostominae (a-e), Glossophaginae (f), and Carolliinae (g, h). a, *Macrophyllum macrophyllum* (Wied); b, *Chrotopterus auritus guianae* Thomas; c, *Lonchorhina aurita* Fomes; d, *Phyloderma stenops* Peters; e, *Phyllostomus discolor discolor* (Wagner); f, *Anoura caudifer caudifer* (E. Geoffroy); g, *Carollia perspicillata perspicillata* (L.); h, *Rhinophylla pumilio* Peters.

The Berlin Museum specimens of *Mimon bennettii* are too discoloured to permit any statement about the original colour. Dobson (1876: 492) noted: "Fur above cinnamon-brown, paler beneath; on both surfaces long and dense, covering the humerus, but scarcely extending to the membranes".

***Anthorhina crenulata* (E. Geoffroy, 1810)**

Text-figs. 19d (interfemoral membrane), 21a (head), 23b (canines and incisors), pl. 19 (skull)
Phyllostoma crenulatum E. Geoffroy, 1810, Ann. Mus. Hist. Nat. Paris, 15: 183-184, pl. 10.

Type locality. — "Patrie. Inconnue; en Amérique vraisemblablement". Restricted to Bahia, Brazil, by Cabrera (1958: 66).

Synonymies. — Cabrera, 1958: 66; Husson, 1962: 94.

Vernacular names. — (E) Hairy Spear-nosed Bat.

Distribution. — Bahia, Brazil, through the lower Amazon region and the Guianas to Trinidad and eastern Venezuela.

Occurrence in Suriname. — The first record of the species from Suriname was by Dobson (1878: 490), his material being only labelled "Surinam". Kappler (1881) listed "*Thylorhinna fumilis*" from Suriname, probably meaning the present species. Husson (1962) dealt with material from "Suriname" and from Kayserberg airstrip. I have examined the following material, which includes my 1962 specimens:

1. Kayserberg airstrip near Zuid River, about 3°6'N 56°30'W, Nickerie District, 1 male (CNHM no. 93208, skin and skull).
2. Weg naar Zee, near the sea coast north of Paramaribo, Suriname District, 1 male (no. 24707, skin and skull).
3. Suriname, without more precise locality indication, 1 male (no. 12089, skin and skull), 1 female (no. 24692, skin and skull).

Description. — Length of forearm varying from (45) 48 to 51 mm; nose leaf about 17 mm long and 8 mm broad, the free margins of the erect portion more or less crenulate, fringed with fine straight hairs; ears large, rounded above, about 22 mm long and 17 mm broad; tragus narrow, acutely pointed, outer margin with prominent projections below; interfemoral membrane large, when expanded reaching somewhat beyond the feet; calcar long, varying greatly in size (in specimen no. 12089 it is about three-fourths the length of the tibia, in one of the other specimens it is as long as the tibia); tail extending to about the middle of the interfemoral membrane, the tip perforating the membrane's dorsal surface; wing membrane from the side of the hind foot about half-way between the ankle and the base of the outer toe; dorsally the soft fur consists of long dark greyish hairs with dark brown to blackish brown tips; an indistinct median line of white colour runs from the crown of the head to the tail; ventrally the tips of the hairs are light yellowish brown; the lip and chin are yellowish white.

Dental formula: $I \frac{2}{1}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors completely filling the space between the canines; the height of the outer incisors is almost half that of the inner incisors, the tips of the latter diverge. First upper premolar as large as the outer

upper incisors, crowded somewhat out of the tooth-row on the outer side, and touching the canine and the large second premolar; the latter is separated from the canine by a small space. Lower incisors with crowns about as wide as high, and with faintly trifid cutting edges; the base of the first lower premolar about as long as that of the second. The auditory bullae are large and swollen (see pl. 19), the sagittal crest is sharply defined, being highest on the top of the braincase.

External (no. 12089) and skull measurements (no. 12089, and CNHM no. 93208, respectively) of the two examined male specimens from Suriname. The lengths of the forearm and the ear of the Chicago Museum specimen were noted on the label

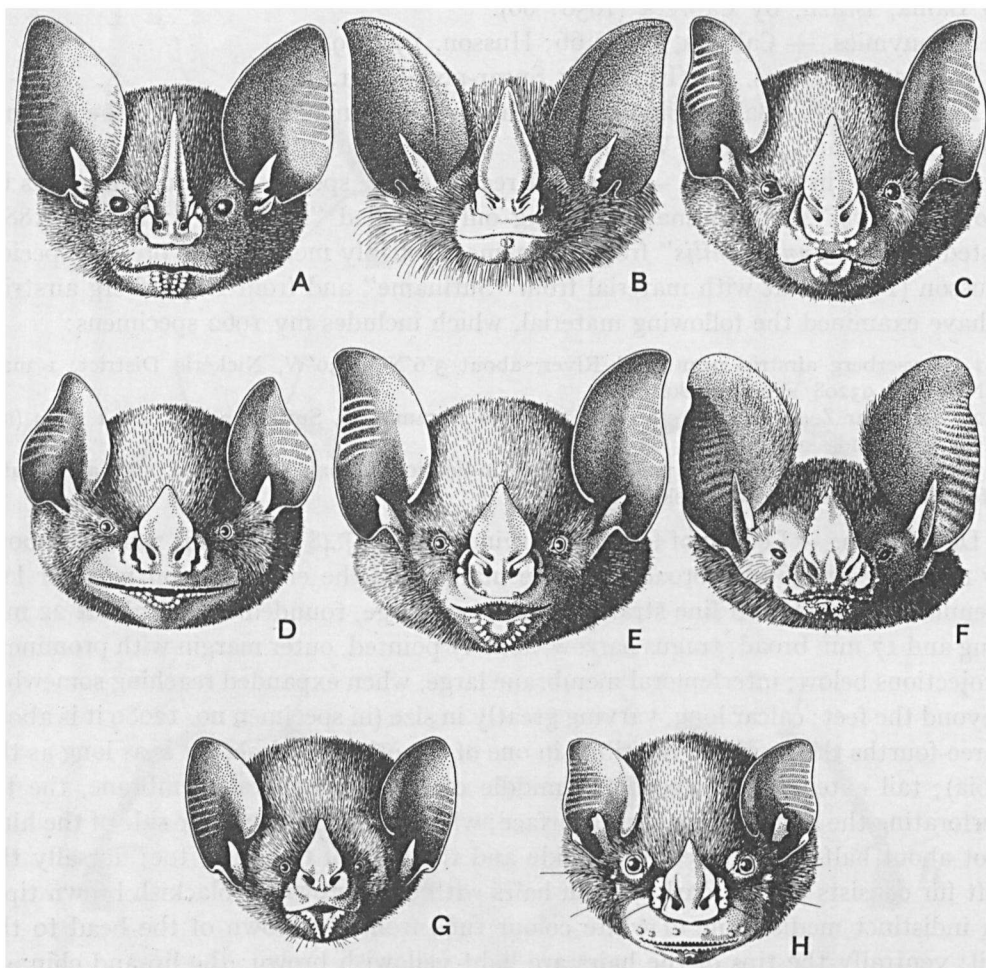


Fig. 21. a, *Anthorhina crenulata* (E. Geoffroy), no. 12089; b, *Mimon bennettii* (Gray), ZMB no. 3350b; c, *Rhinophylla pumilio* Peters, SMN no. 289-1; d, *Sturnira lilium lilium* (E. Geoffroy), SMN no. 1064-2; e, *Carollia perspicillata perspicillata* (L.), no. 17377; f, *Trachops cirrhosus cirrhosus* (Spix), no. 13217; g, *Glossophaga soricina soricina* (Pallas), no. 17559; h, *Ametrida centurio* Gray, SMN no. 1633.

to be 50 mm and 24 mm, respectively. Forearm, 49.9; length of third metacarpal, 47; first phalanx, 15; second phalanx, 26; third phalanx, 17; length of fourth metacarpal, 45; first phalanx, 12; second phalanx, 15; length of fifth metacarpal, 46; first phalanx, 10; second phalanx, 13.5; ear, length \times breadth, 22 \times 17; tragus, 7.5; nose leaf, length \times breadth, 17 \times 8; tibia, 24; hind foot, 11; calcar, 18; free end of tail, 3 mm. — Skull: greatest length, 22.0, 21.5; condylobasal length, 19.2, 19.1; condyle to front of canine, 19.0, 18.7; basal length, 17.4, 17.1; palatal length, 9.5, —; zygomatic breadth, 12.2, 12.7; breadth of braincase, 8.2, 8.4; height of braincase, without crest, 8.2, 7.8; mastoid breadth, 11.3, 11.0; postorbital constriction, 4.1, 4.1; width across molars, 8.7, 8.9; width across cingula canines, 5.4, 5.6; upper tooth-row, c-m³, 7.8, 8.1; lower tooth-row, c-m₃, 8.6, 8.8; length of mandible, 14.3, 14.2 mm.

Remarks. — The taxonomy and nomenclature of the present species are discussed by Husson (1962: 97, 98).

***Phyllostomus discolor discolor* (Wagner, 1843)**

Text-figs. 16d (head), 20e (interfemoral membrane), 23c (canines and incisors), pl. 21 (skull)
Phyllostoma discolor Wagner, 1843, Archiv Naturgeschichte, 9 (1): 366.

Type locality. — "Cuyaba", Mato Grosso, Brazil.

Synonymies. — Cabrera, 1958: 67; Husson, 1962: 98.

Vernacular names. — (E) Lesser Spear-nosed Bat.

Distribution. — The species occurs from central Brazil and western Peru north to southern Mexico. The nominate subspecies inhabits the southern part of this range (central Brazil and western Peru to Panama, Venezuela, Trinidad and the Guianas).

Occurrence in Suriname. — The species was reported for the first time from Suriname by Dobson (1878: 487), also Jentink (1888: 206) mentioned the species. The first more accurate indication of a locality within Suriname was provided by Husson (1962: 98), who examined the following material:

1. Kayserberg airstrip near Zuid River, about 3°6'N 56°30'W, Nickerie District, 4 males and 3 females (CNHM nos. 93187-93189, 93192, 93193, skins and skulls; nos. 93190 and 93191, skins).

2. Suriname, without more precise locality indication, 5 males (no. 15903, ZMB nos. 3227a-c, A1838, skins and skulls).

Description. — Length of forearm varying from 55.4 to 66 mm; nose leaf well developed, about 13 mm long and 7 mm broad; ears relatively short and broad, shorter than the head, about 18 mm long and 12 mm broad; tragus small, about one-third the length of the ear; lower lip with a distinct V-shaped pad margined by small warts; interfemoral membrane well developed, when stretched reaching to the level of the ankles; calcar shorter than the hind foot, less than half the length of the tibia; tail about one-third the length of the interfemoral membrane, its tip appearing on the dorsal surface of that membrane; wing membranes from the ankles; fur soft and dense, practically confined to the body, the ventral surface of the an-

tebrachial membrane being loosely haired; dorsal surface of body dark to blackish brown, the basal parts of the hairs being whitish followed by a broad band of dark brown, while the extreme tips are greyish; colour of the ventral surface varying from cinnamon and pale brownish buff to dark greyish or silverish, paler on chest, the basal parts of the hairs are whitish, followed by a broad band of pale or greyish buff, the tips are silverish; wings dark to blackish brown. The males have a distinct gular glandular sac, which is rudimental in females.

Dentition: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors completely filling the space between the canines; outer incisors short and blunt, scarcely rising to the cingulum of the canines and that of the inner incisors; inner incisors about as broad as high, their bases separated, the inner margins in contact from the middle to the tips; base of first upper premolar somewhat shorter than that of second, its shaft about half as high as that of the second; the last upper molar about one-third the length of, but equal in breadth to the second. Lower incisors forming an arcuate continuous

TABLE II
External and skull measurements of ten specimens of *Phyllostomus discolor discolor*
(Wagner) from Suriname.

Museum	CNHM	CNHM	CNHM	RMNH	ZMB	ZMB	ZMB	ZMB	CNHM	CNHM
Reg. number	93193	93192	93187	15903	3227a	3227b	3227c	A1838	93189	93188
Sex	♂	♂	♂	♂	♂	♂	♂	♂	♀	♀
Forearm	60	60	60	60.9	64.4	61.4	63.1	59.8	61	66
Third digit, metacarpal	-	-	-	56.5	61	58	57.5	56.5	-	-
1st phalanx	-	-	-	14.5	16	15	14	15	-	-
2nd phalanx	-	-	-	26.5	27	28	26.5	27	-	-
3rd phalanx	-	-	-	20	19	16	19	17.5	-	-
Fourth digit, metacarpal	-	-	-	55	59	55	55	54.5	-	-
1st phalanx	-	-	-	11.5	11	11.5	10	11.5	-	-
2nd phalanx	-	-	-	19	18.5	19	19	17.5	-	-
Fifth digit, metacarpal	-	-	-	54.5	59	55	54.5	53	-	-
1st phalanx	-	-	-	10	9	9.5	9.5	9.5	-	-
2nd phalanx	-	-	-	13.5	14.5	13	12	13.5	-	-
Tibia	-	-	-	22.5	25	24	22.5	22	-	-
Hind foot	-	-	-	14.5	16.5	14	14	14.5	-	-
Calcar	-	-	-	8.5	10	11	11	11	-	-
Depth of interfemoral membrane	-	-	-	23	27	25	23	28	-	-
Skull:										
greatest length	28.3	29.0	29.3	30.3	-	-	-	-	27.4	29.5
condylobasal length	25.0	26.3	26.7	-	-	-	-	-	25.3	27.3
condyle to front of canine	23.9	25.3	25.1	-	-	-	-	-	23.9	25.7
basal length	22.5	23.0	22.5	-	-	-	-	-	-	23.4
palatal length	13.4	12.8	12.8	14.2	-	13.1	13.1	-	-	13.1
zygomatic breadth	-	-	15.6	15.5	-	-	-	-	-	15.3
breadth of braincase	11.7	12.1	12.2	12.2	-	-	-	-	11.5	12.2
height of braincase	10.2	10.0	10.7	10.2	-	-	-	-	10.0	10.7
mastoid breadth	13.8	14.2	15.0	14.2	-	-	-	-	-	14.1
postorbital constriction	6.3	6.3	6.2	6.6	-	6.3	-	6.7	6.0	6.7
width across molars	9.4	-	9.9	10.3	10.4	10.2	9.6	10.0	9.5	10.0
width across cingula canines	6.8	7.3	7.2	7.4	7.5	7.3	7.2	7.0	6.3	7.2
upper tooth-row, c - m ³	9.1	9.4	9.2	9.5	9.8	9.4	9.6	9.5	9.2	9.8
lower tooth-row, c - m ₃	10.4	10.5	10.3	10.7	10.8	10.7	10.8	10.6	10.3	10.8
length of mandible	18.2	19.0	19.2	19.3	20.1	19.6	19.1	19.1	18.1	19.4

row between the canines, the outer slightly smaller than the inner, their cutting edges, if unworn, faintly trifold; cingulum of the two lower premolars about equal in length; the shaft of the first lower premolar broadly triangular, not so high as the narrow triangular shaft of the second premolar.

The external and skull measurements of ten examined specimens from Suriname are given in Table 11.

Remarks. — The specimens of *Phyllostomus discolor* of the Berlin and the Leiden Museums are too bleached to permit of a description of the coat colour. The Kayserberg specimens show no noticeable variation in the coat colour of the dorsal surface, this being dark to blackish brown with a somewhat silverish tinge caused by the silver colour of the extreme tips of the hairs. The ventral surface of these specimens, however, shows several shades of dark greyish or silverish; the hairs are usually tricolourous as pointed out in the description. According to the data found in the literature the coat colour of the present species is subject to rather large variation; animals with a reddish brown dorsal surface and with the under parts washed with dirty yellowish brown have been reported. It is quite possible that such colour variants are also to be found in Suriname.

The external and skull measurements of the examined Suriname specimens of *Phyllostomus discolor discolor* agree rather well with those given by Sanborn (1936: 98), Dalquest (1951: 29), and Goodwin & Greenhall (1961: 238) for Venezuelan and Trinidad animals.

***Phyllostomus elongatus* (E. Geoffroy, 1810)**

Text-figs. 16b (head), 19e (interfemoral membrane), pl. 22 (skull)

Phyllostoma elongatum E. Geoffroy, 1810, Ann. Mus. Hist. Nat. Paris, 15: 182-183, 185, pl. 9.

Type locality. — "Patrie. Inconnue; en Amérique, selon toute apparence". Restricted by Cabrera (1958: 67) to Rio Branco, Mato Grosso, Brazil.

Synonymies. — Cabrera, 1958: 67; Husson, 1962: 102.

Distribution. — Peru, Ecuador, Brazil and the Guianas.

Occurrence in Suriname. — The species was first recorded from Suriname by Gray (1866: 144), who described it as new under the name *Alectops ater*. Later authors synonymized Gray's species with the present. The first accurate localities for this species within Suriname were provided by Husson (1962), who dealt with the specimens listed below under 1, 3 and 4. I have examined the following material:

1. Paramaribo, Suriname District, 1 male (ZMA no. 1648, skin and skull).
2. Gros gold placer, on the railroad about 100 km south of Paramaribo, Brokopondo District, 1 male (no. 24874, skin and skull).
3. Tempati on Tempati Creek, Commewijne basin, southern Commewijne District, 1 male (ZMA no. 4467, skin and skull).
4. Suriname, without more precise locality indication, 2 males and 2 females (ZMB no. 3217, 3359, 3985a, b, skins and skulls).

Description. — Length of forearm varying from 61.5 mm to 68.6 mm; nose leaf well developed, lanceolate, pointed, up to 18 mm long and 9 mm broad, usually with a pronounced central rib; ears large, rounded above, about 22 mm long and 16 mm broad; tragus short, about one-third the length of the ear; interfemoral membrane broad, when stretched reaching to the ankles; calcar well developed, about 19 mm long, always distinctly longer than the hind foot; tail enclosed in the interfemoral membrane, perforating it in its basal part, the free tip (varying from 1 to 3 mm) projecting on the dorsal surface of this membrane; wing membranes from the ankles; gular sac distinct in the males, rudimentary in the females; fur short and dense, practically restricted to the body, on the wings extending only on the dorsal and ventral sides of the proximal half of the upper arm; colour of the dorsal surface of the body dark reddish brown or dark blackish grey, the bases of the hairs more greyish, the extreme tips somewhat more light or yellowish brown; the colour of the ventral surface a shade lighter than that of the upper parts, because here a longer part of the tips of the hairs is yellowish brown or greyish; wings dark to blackish brown, the ends usually broadly tipped with white.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors completely filling the space between the canines; the inner incisors much larger than the outer, the latter hardly attaining the level of the cingulum of the canine; first upper premolar smaller than the second, rising to about half the height of the latter, touching this tooth as well as the canine. Lower incisors about equal in size, forming a nearly straight continuous row between the canines; the outer incisors slightly wider than the inner; the cutting edges of both, if unworn, faintly trifid; the first lower premolar distinctly wider than the second, the shafts of both teeth are of about equal length and measure half the length of the canine.

The external and skull measurements of the examined specimens from Suriname are given in Table 12

Remarks. — According to the collector's note the Tempati specimen was caught with a nylon net in a dry forest.

Phyllostomus elongatus is closely related to *Ph. latifolius*, described by Thomas (1901: 142-143) from the Kanuku Mountains, British Guiana. Thomas's species seems to be very rare, since to my knowledge it is known from the type locality only. Husson (1962: 104-106) provided some data of six paratypes of *Ph. latifolius* received on loan from the British Museum (Natural History), with external and skull measurements given in his Table IX; of the specimens there dealt with, BMNH no. 1.6.4.155 is in spirit, the rest are dried skins with folded wings. From the table it appears that *Phyllostomus elongatus* is larger than *Ph. latifolius*: the length of the forearm of the former species varies from about 61 to 69 mm, of the latter from 58 to 60 mm, while the length of the tibia varies from 24 to 30 mm and from 21 to 23 mm, respectively. The skull measurements of *Ph. elongatus* are greater than those of *Ph. latifolius* in specimens of comparable age. However, not only absolutely but also relatively some dimensions of *Ph. elongatus* are larger than in

TABLE 12

External and skull measurements of six specimens of
Phyllostomus elongatus (E. Geoffroy) from Suriname.

Museum		ZMB	ZMB	ZMB	ZMB	ZMA	ZMA
Reg. number		3985a	3217	3985b	3359	1648	4467
Sex		♀	♀	♂	♂	♂	♂
Forearm		66.3	66.2	64.3	67.9	67.0	65.7
Third digit,	metacarpal	58	60.5	56.5	61.5	61.5	61
	1st phalanx	16.5	17.5	18	18.5	17	17.5
	2nd phalanx	31	30	29	33	31.5	32
	3rd phalanx	20	21	20	19	23	16
Fourth digit,	metacarpal	57	59	55.5	61.5	60	59
	1st phalanx	14	14	15.5	15.5	15	14
	2nd phalanx	21	19	19	20	20	22.5
Fifth digit,	metacarpal	57.5	60.5	57	63	61.5	61
	1st phalanx	15	13	14.5	15.5	14.5	13.5
	2nd phalanx	16	16	19	18.5	14.5	18
Tibia		27	27	26	27.5	28	27
Hind foot		16.5	16	17	-	16	16
Calcar		20	18	18	16.5	19	22
Skull:							
	greatest length	28.6	29.3	28.3	29.7	30.0	30.1
	condylobasal length	25.5	25.6	25.4	26.1	26.2	26.2
	condyle to front of canine	24.9	25.0	24.6	25.4	25.8	25.3
	basal length	-	22.8	22.2	23.0	22.8	-
	palatal length	12.3	12.7	12.2	12.5	12.4	12.3
	zygomatic breadth	-	16.5	15.9	16.9	16.9	16.7
	breadth of braincase	11.0	10.9	11.3	11.1	11.3	11.3
	height of braincase	10.3	10.2	10.8	10.4	11.0	11.1
	mastoid breadth	13.0	14.1	14.5	14.5	14.8	14.6
	postorbital constriction	5.6	5.6	5.4	5.5	5.6	5.8
	width across molars	10.7	11.4	11.1	11.8	11.1	11.3
	width across cingula canines	7.2	7.6	7.5	8.1	7.8	7.8
	upper tooth-row, c - m ³	10.8	10.7	10.9	11.1	11.1	10.8
	lower tooth-row, c - m ₃	12.0	12.2	12.1	12.6	12.3	12.0
	length of mandible	19.5	19.4	19.5	20.0	20.3	20.0
	coronoid height	7.6	8.2	7.6	8.0	8.6	8.3

Ph. latifolius; e.g., the ratio between the length of the forearm and the tibia is smaller in *Ph. elongatus* than in *Ph. latifolius*. The coronoid height of the mandible is not only absolutely but also relatively greater in *Ph. elongatus* than in *Ph. latifolius*, when compared with the length of the mandible.

Thomas (1901: 142-143) noted that the length of the nose leaf of *Ph. latifolius* exceeds that of *Ph. elongatus*, and that in the former species scarcely a trace of a central rib is visible, which is so distinct in the latter species. As far as I can see in the material of the two species at hand these characters are not of diagnostic value: (a) the length of the nose leaf in both species is equal or the ranges overlap each other, while (b) the distinctness of the central rib of the lancet is subject to considerable variation in *Ph. elongatus*: in eight spirit specimens the rib is narrow and pronounced, in twelve broad and vague.

***Phyllostomus hastatus hastatus* (Pallas, 1767)**

Text-figs. 16g (head), 19f (interfemoral membrane), pl. 21 (skull)

Vespertilio hastatus Pallas, 1767, *Spicilegia Zoologica*, 1 (3): 7.

Type locality. — "Amérique" (Buffon, 1765: 227). Restricted to Suriname by J. A. Allen (1904: 233).

Synonymies. — Cabrera, 1958: 68; Husson, 1962: 106.

Vernacular names. — (E) Greater Spear-nosed Bat.

Distribution. — From Peru, Bolivia and south-eastern Brazil north to Central America (Honduras). The nominate subspecies is known from Venezuela, Trinidad and Tobago, the Guianas and Brazil.

Occurrence in Suriname. — This species has been reported from Suriname by several authors. As shown by Husson (1962), some old records (e.g., by Stedman, 1796, and Von Sack, 1810, 1821) may pertain to this species, but the information is insufficient to decide this with certainty. Lammens (1844: 107-108) was the first author who definitely reported this species from Suriname, be it that he used the incorrect name *Vespertilio perspicillatus* for it. Jentink (1888) and Husson (1962) were the first to report the species from accurate localities within Suriname. Husson's material consisted of the specimens listed below under 1, 2, 5, 6, and 7. I examined the following material:

1. Paramaribo, Suriname District, 4 males (nos. 15891, 15892, ZMA nos. 1289, 1650, skins and skulls).
2. Plantation "Ma Retraite", northern part of Paramaribo, 1 specimen (no. 17647, skin and skull).
3. Lelydorp, about 15 km south of Paramaribo, Suriname District, 3 males (no. 24876, 25366, 25367, skins and skulls), 1 female (no. 24877, skin and skull).
4. Moeroemoeroe Creek, tributary of Saramacca River, north-west of Brokopondo Lake, Brokopondo District, 1 male (no. 24875, skin and skull).
5. Plantation "Charlottenburg" on the Cottica River at about 54°50'W, Commewijne District, 1 female (no. 15895, skin and skull).
6. Marowijne region, Marowijne District, 1 male (no. 15883, skull).
7. Suriname, without more precise locality indication, 4 males (no. 15887, skull; nos. 15893, 15894, SMN no. 240, skins and skulls), 1 female (no. 15884, skull), 5 skulls (nos. 15885, 15886, 15888-15890).

Description. — *Phyllostomus h. hastatus* is, with the exception of *Vampyrum spectrum*, the largest bat in Suriname. The length of the forearm varies from 83 to 87.8 mm in seventeen specimens from Suriname; nose leaf well developed, about 18 mm long, lancet about 9 mm broad; ears about 27 mm long and about 17 mm broad, shorter than the head; tragus about one-third the length of the ear, sub-acutely pointed; interfemoral membrane large, when stretched reaching about to the toes; calcar about 23 mm, slightly longer than the hind foot, but distinctly shorter than the tibia (about two-thirds that length); tail short, about one-third the width of the interfemoral membrane, perforating it on its dorsal surface, the extreme tip of the tail free for about 3 mm; wing membrane from the ankles or slightly below them. Fur short, dense and velvety; dorsally the fur extends to basal

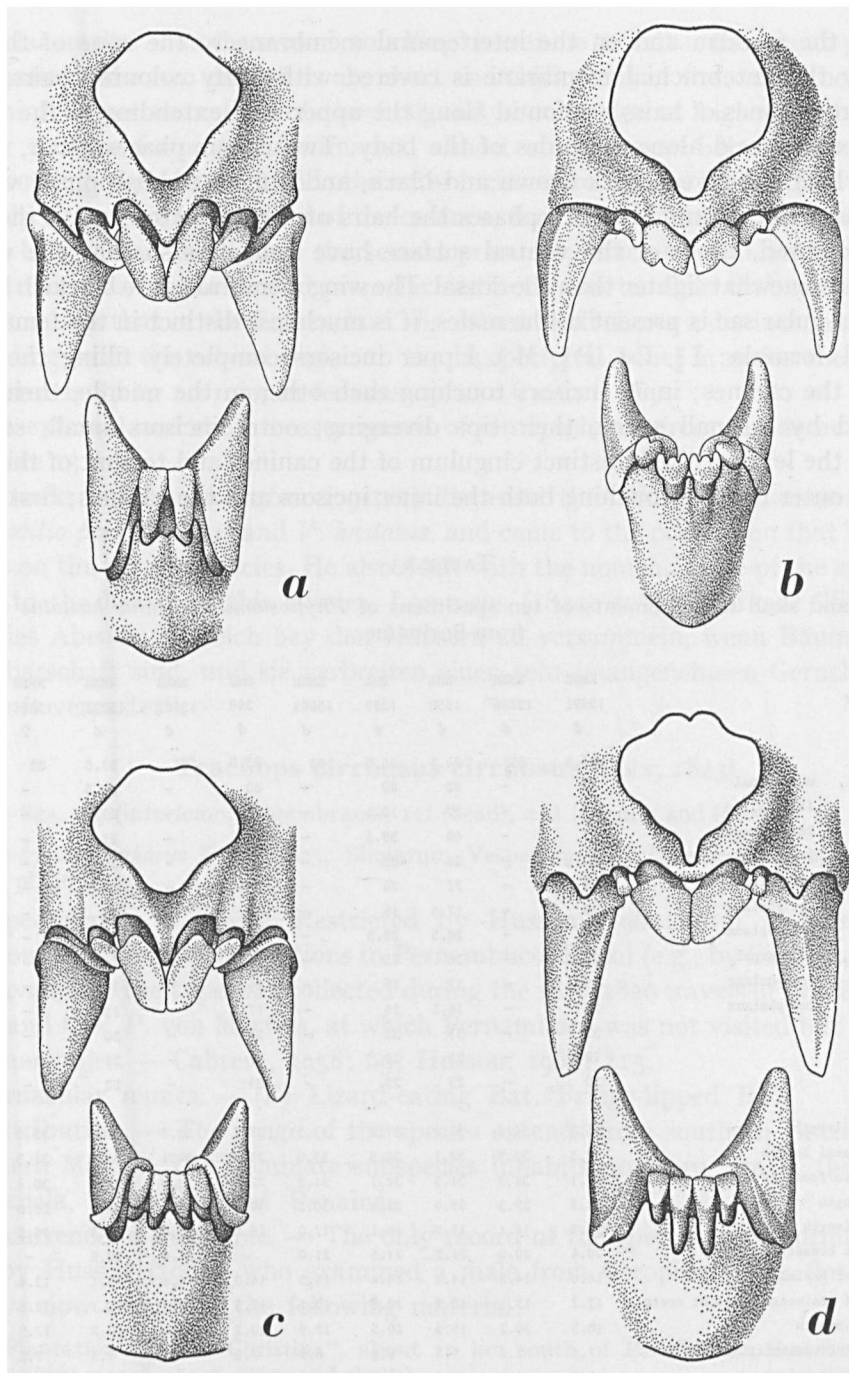


Fig. 22. Canines and incisors in front view. a, *Tonatia silvicola laephotis* Thomas, no. 15785; b, *Chilonycteris rubiginosa rubiginosa* Wagner, no. 16420; c, *Micronycteris megalotis megalotis* (Gray), no. 17295; d, *Trachops cirrhosus cirrhosus* (Spix), no. 13127. Width across cingula canines, in mm: a, 5.8; b, 6.2; c, 3.3; d, 6.5.

third of the forearm and on the interfemoral membrane to the zone of the tail; ventrally the antebrachial membrane is covered with buffy coloured hairs, while rather broad zones of hairs are found along the upper arm, extending to the middle of the forearm and along the sides of the body. Two colour phases occur, a dark phase, which is between dark brown and black, and a more reddish phase varying from tawny to chestnut. In both phases the hairs of the dorsal surface of the body are unicoloured, those of the ventral surface have light tips so that the ventral surface is somewhat lighter than the dorsal. The wing membranes are blackish brown. A distinct gular sac is present in the males, it is much less distinct in the females.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors completely filling the space between the canines; inner incisors touching each other in the middle, their bases separated by a small space, their tips diverging; outer incisors small, scarcely rising to the level of the indistinct cingulum of the canines and to that of the inner incisors; outer incisors touching both the inner incisors and the canines; first upper

TABLE 13

External and skull measurements of ten specimens of *Phyllostomus hastatus hastatus* (Pallas) from Suriname.

Museum	RMNH	RMNH	ZMA	ZMA	RMNH	SMN	RMNH	RMNH	RMNH	RMNH
Reg. number	15891	15886	1650	1289	15883	240	15887	15892	15884	15895
Sex	♂	♂	♂	♂	♂	♂	♂	♂	♀	♀
Forearm	84.8	85	84.5	85.0	83	85.0	86	87.8	83	85.0
Third digit, metacarpal	77	-	80	80	-	80	-	80.5	-	78
1st phalanx	19	-	20	19.5	-	20	-	21	-	21
2nd phalanx	37	-	40	39.5	-	38	-	39	-	38
3rd phalanx	30	-	28	29	-	28	-	30	-	29
Fourth digit, metacarpal	70	-	77	76	-	75	-	77.5	-	76
1st phalanx	16	-	17.5	16	-	17	-	17	-	16
2nd phalanx	26	-	28.5	28.5	-	27	-	29	-	27
Fifth digit, metacarpal	70	-	76	75	-	75	-	76.5	-	75
1st phalanx	15	-	17	16	-	16	-	16	-	16
2nd phalanx	20	-	18.5	19	-	17	-	19	-	17
Tibia	33	-	31	31	-	31	-	30	-	31
Hind foot	19	-	21	20	-	21	-	21	-	20
Calcar	20	-	23	25	-	24	-	22	-	22
Skull:										
greatest length	36.2	36.8	37.1	37.2	37.5	37.7	38.7	38.8	35.0	36.3
condylobasal length	32.3	32.9	32.1	32.8	33.0	33.5	34.1	33.9	31.3	32.5
condyle to front of canine	31.1	31.7	31.5	32.1	31.8	32.4	33.0	33.0	30.4	31.8
basal length	28.5	29.3	29.9	29.6	30.2	30.1	30.5	30.3	28.0	29.2
palatal length	16.4	16.1	17.2	16.1	17.0	16.5	17.0	16.5	15.5	16.0
zygomatic breadth	20.4	20.5	21.2	21.5	21.0	-	21.8	20.6	-	19.3
breadth of braincase	14.0	14.3	14.1	14.4	14.5	14.0	14.6	14.1	13.6	13.8
height of braincase, without crest	12.2	13.1	13.8	12.8	13.1	12.5	12.9	12.7	12.1	12.7
mastoid breadth	18.9	20.2	19.9	20.5	19.9	20.2	20.4	20.2	17.9	18.5
postorbital constriction	7.1	7.1	7.2	6.9	6.9	7.2	7.5	7.3	7.2	7.3
width across molars	13.8	13.2	13.3	13.7	13.7	13.4	13.9	13.6	13.3	13.2
width across cingula canines	9.2	9.8	9.5	9.6	10.0	9.9	10.1	10.0	8.8	9.1
upper tooth-row, c - m ³	13.0	13.1	13.1	13.1	13.4	13.2	13.8	13.6	12.5	13.3
lower tooth-row, c - m ₃	14.7	14.5	14.4	14.9	15.2	14.9	15.5	15.0	13.9	15.0
length of mandible	25.0	25.1	25.2	25.6	25.2	25.6	26.1	26.3	23.9	25.0

premolar smaller than the second, touching the canine as well as the second premolar; the shafts of the two premolars are short and thick, that of the second being about one-third longer than that of the first and about twice as high as either molar. Lower incisors forming a continuous, almost straight row between the canines, their cutting edges faintly trifid; the outer incisors are slightly higher than the inner, scarcely rising to the cingulum of the canines; first lower premolar triangular with a broad base, about as high as the second premolar, touching that tooth as well as the canine; base of the second premolar distinctly shorter than that of the first, its height equals that of the first molar. The robust skull shows a distinct sagittal crest extending from the orbital region to the basioccipital bone, in males the height of this crest is up to 1.2 mm, in females up to 0.6 mm.

The external and skull measurements of ten specimens from Suriname are given in Table 13.

Remarks. — Husson (1962: 109-111) discussed the identity of Lammens' (1844) *Vespertilio perspicillatus* and *V. hastatus*, and came to the conclusion that both were based on the present species. He also dealt with the nomenclature of the species.

As to the habits of this species, Lammens (1844: 108) remarked: "Sie pflegen sich des Abends zahlreich bey den Häusern zu versammeln, wenn Bäume in ihrer Nachbarschaft sind, und sie verbreiten einen sehr unangenehmen Geruch, welcher die Luft verpestet".

Trachops cirrhosus cirrhosus (Spix, 1823)

Text-figs. 19g (interfemoral membrane), 21f (head), 22d (canines and incisors), pl. 20 (skull)

Vampyrus cirrhosus Spix, 1823, Simiarum Vespertilionum Brasiliensium species novae: 64-65, pl. 36 fig. 3.

Type locality. — Brazil. Restricted by Husson (1962: 115) to Pará, Brazil. Previous type locality restrictions to Pernambuco, Brazil (e.g., by Cabrera, 1958: 69) are invalid, as the type was collected during the 1817-1820 travels in Brazil by J. von Spix and C. F. P. von Martius, at which Pernambuco was not visited but Pará was.

Synonymies. — Cabrera, 1958: 69; Husson, 1962: 115.

Vernacular names. — (E) Lizard-eating Bat, Fringe-lipped Bat.

Distribution. — The range of the species extends from southern Brazil north to southern Mexico. The nominate subspecies inhabits northern Brazil, the Guianas, Venezuela, Colombia and Panamá.

Occurrence in Suriname. — The only record of the species from Suriname is the one by Husson (1962), who examined a male from Coropina Creek (lot 2 below). I have now examined the following material:

1. Plantation "Helena-Christina", about 10 km south of Paramaribo, Suriname District, 3 males (nos. 25244-25246, skins and skulls).
2. Coropina Creek between Zanderij and Republick, about 30 km south of Paramaribo, Para District, 1 male (no. 13127, skin and skull).
3. Gros gold placer at railroad about 100 km south of Paramaribo, Brokopondo District, 1 male (no. 25247, skin and skull).

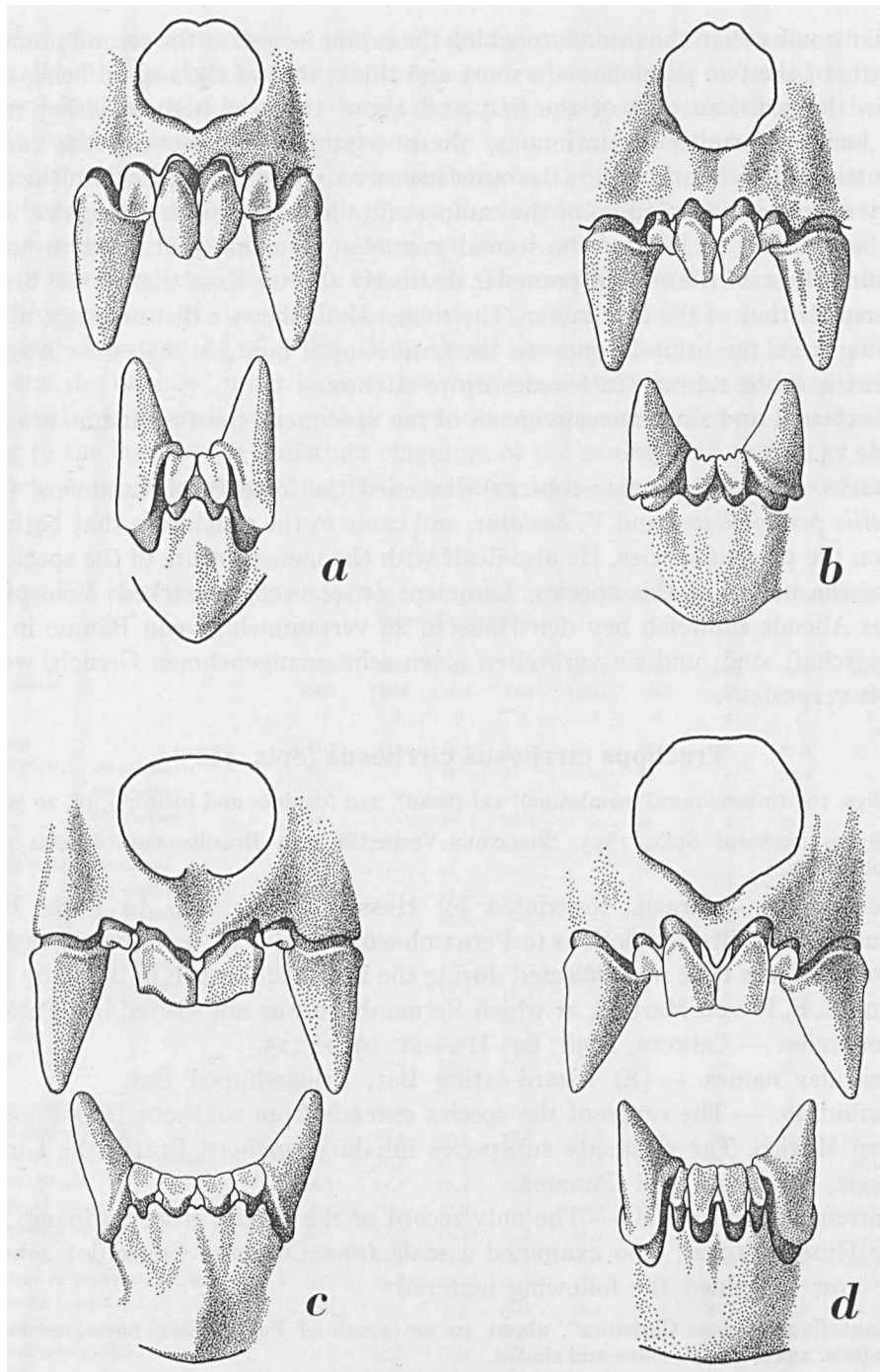


Fig. 23. Canines and incisors in front view. a, *Mimon bennettii* (Gray), ZMB no. 3350b; b, *Anihorhina crenulata* (E. Geoffroy), no. 12089; c, *Phyllostomus discolor discolor* (Wagner), no. 15903; d, *Phylloderma stenops* Peters, no. 16843. Width across cingula canines, in mm: a, 5.5; b, 5.4; c, 7.4; d, 5.9.

Description. — The most striking characters of *Trachops cirrhosus* are (1) the finely toothed margins of the lancet of the nose leaf, and (2) the lips, which are studded with small cylindrical wart-like protuberances.

Length of forearm varying from 58 to 64.2 mm; nose leaf ovate-lanceolate, about 12 mm long and 8 mm broad, the margins of the lancet being finely toothed; ears large and broad, up to 29 mm in length; tragus about one-third the ear length; lips conspicuously studded with small conical wart-like protuberances becoming fewer in number and smaller towards the angle of the mouth; interfemoral membrane extending to about the ankles; calcar about half the length of or slightly shorter than the tibia; tail enclosed in the membrane, the tip appearing on its dorsal surface, about as long as the calcar; wing membranes from the proximal end of the ankles; upper parts chestnut to dark reddish brown, under parts more greyish.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{2}$, $P \frac{2}{3}$, $M \frac{3}{3}$. Outer upper incisors minute, their cutting edges not reaching to the cingulum of the canines. The second lower premolar very minute (smaller than the minute outer upper incisors), crowded completely out of the tooth-row on the inner side, invisible from the outer side, the two functional premolars being almost in contact.

External and skull measurements of the examined adult male from Suriname. Forearm, 64.2; length of third metacarpal, 54; first phalanx, 23; second phalanx, 34; third phalanx, 19; length of fourth metacarpal, 55; first phalanx, 19; second phalanx 21; length of fifth metacarpal, 59; first phalanx, 19; second phalanx, 21; length of ear, 28; breadth of ear, 18.5; tibia, 31; hind foot, 17; calcar, 12; tail, 16; nose leaf, length, 12; nose leaf, breadth, 8 mm. — Skull: greatest length, 29.8; condylobasal length, 27.2; condyle to front of canine, 26.6; basal length, 24.5; palatal length, 13.8; zygomatic breadth, 15.7; breadth of braincase, 12.1; height of braincase, 12.0; mastoid breadth, 13.9; postorbital constriction, 5.5; width across molars, 10.8; width across cingula canines, 6.5; upper tooth-row, c-m³, 10.9; lower tooth-row, c-m₃, 11.8; length of mandible, 20.5 mm.

Vampyrum spectrum (Linnaeus, 1758)

Text-figs. 16h (head), 19h (interfemoral membrane), 24a (canines and incisors), pl. 13 (animal), pl. 23 (skull)

Vespertilio Spectrum Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 31.

Type locality. — "Habitat in America australi". Restricted by Thomas (1911: 130) to Suriname.

Synonymies. — Cabrera, 1958: 70; Husson, 1962: 177.

Vernacular names. — (E) Giant Spear-nosed Bat, Linnaeus' False Vampire; (N) Grootste Surinaamse Vleermuis, Onechte Vampier.

Distribution. — From central and northern Brazil, Peru and Ecuador north to Mexico, including Trinidad and perhaps Jamaica.

Occurrence in Suriname. — *Vampyrum spectrum* has been reported from Suriname in many of the ancient narratives. In these old accounts it is generally stated that

the species does suck blood from man and animals; though the description given of the species, judging by the size indicated, clearly is that of *Vampyrum*, the habits ascribed to it are those of the Desmodidae. The difficulty to actually observe the Desmodidae in action, combined with the size of *Vampyrum*, which makes it a fierce looking animal, evidently are the causes that the blood-sucking habit has been ascribed to the wrong species, which thereby became an almost legendary animal.

The first account of *Vampyrum* in Suriname known to me is that by Warren (1667: 21-22; 1669: 17). Warren begins to state that the bats in Suriname are harmful because they suck blood of man and beasts, and after dealing with this habit continues "Some seem as big as *Pigeons* in their flight". In the Dutch translation the word "some" is left out: "Zy gelijcken in de vlucht soo groot te sijn als Duyven" and the impression is given that the big bat is the only species present. The Dutch translation of Warren's account was practically literally copied by Van Berkel (1695: 129), Herlein (1718: 178), and Pistorius (1763: 73); all of these authors mention the large size of the species and that it sucks blood.

Original information on the species was given by Fermin (1765: 8), who described the species as follows: "Chauve-souris (Grande) à Tête de Chien, en Latin *Vespertilio Cynocephalus*, *Maximus*, *Auritus*, *facie Canina*, en Hollandois *Vleder-Muys*, en Nègre Anglois *Fleder-Muysi*. Lorsque les ailes de cet Animal sont étenduës, elles ont chacune dix huit à vingt pouces de longueur, ses dents sont des plus considérables; tout son corps est couvert d'un très-long poil roussâtre, ses ailes sont marbrées avec des petites taches blanches; ses oreilles sont extrêmement grandes & comme doubles. Son nez est aussi double, avec une double crête au dessus. Cette espèce de chauve-souris est fort rare, à cause de sa grandeur extraordinaire; elles font leur séjour dans les bois les plus éloignés: elles sont très-dangereuses par le dégât qu'elles peuvent faire; elles succent sans beaucoup de peine, le sang des Chevaux & d'autres Animaux; & même celui des hommes, quand ils ne se mettent pas à l'abri de leur attaque".

Fermin's description without doubt is that of *Vampyrum spectrum*, but he adds the erroneous information of the blood-sucking habit of the species. In 1769 (vol. 2: 139) Fermin gives a similar though slightly different account: "Les grandes *Chauve-Souris* habitent les bois. Il y en a d'une grandeur prodigieuse: celles qu'on nomme à tête de chien, sont de la plus grande Espece"; a Dutch translation was published one year later (Fermin, 1770: 120-121).

Bancroft (1769: 146-147) also mentioned the present species: "The bats of *Guiana* are the same with those near the river of the *Amazone*, being twice as large as those in *England*, and having no tail. The head and body are covered with a soft fine downy hair, of a brown colour", and like the previous authors states that "They are very expert at bleeding". Hartsinck's remark (1770: 98) is largely based on that of Fermin (1765), no original observations are given. Stedman (1796: 142-144) gave a vivid description of how he was bitten by a vampire bat in his sleep; when he awoke the bat was gone. That he did not observe the animal that attacked him

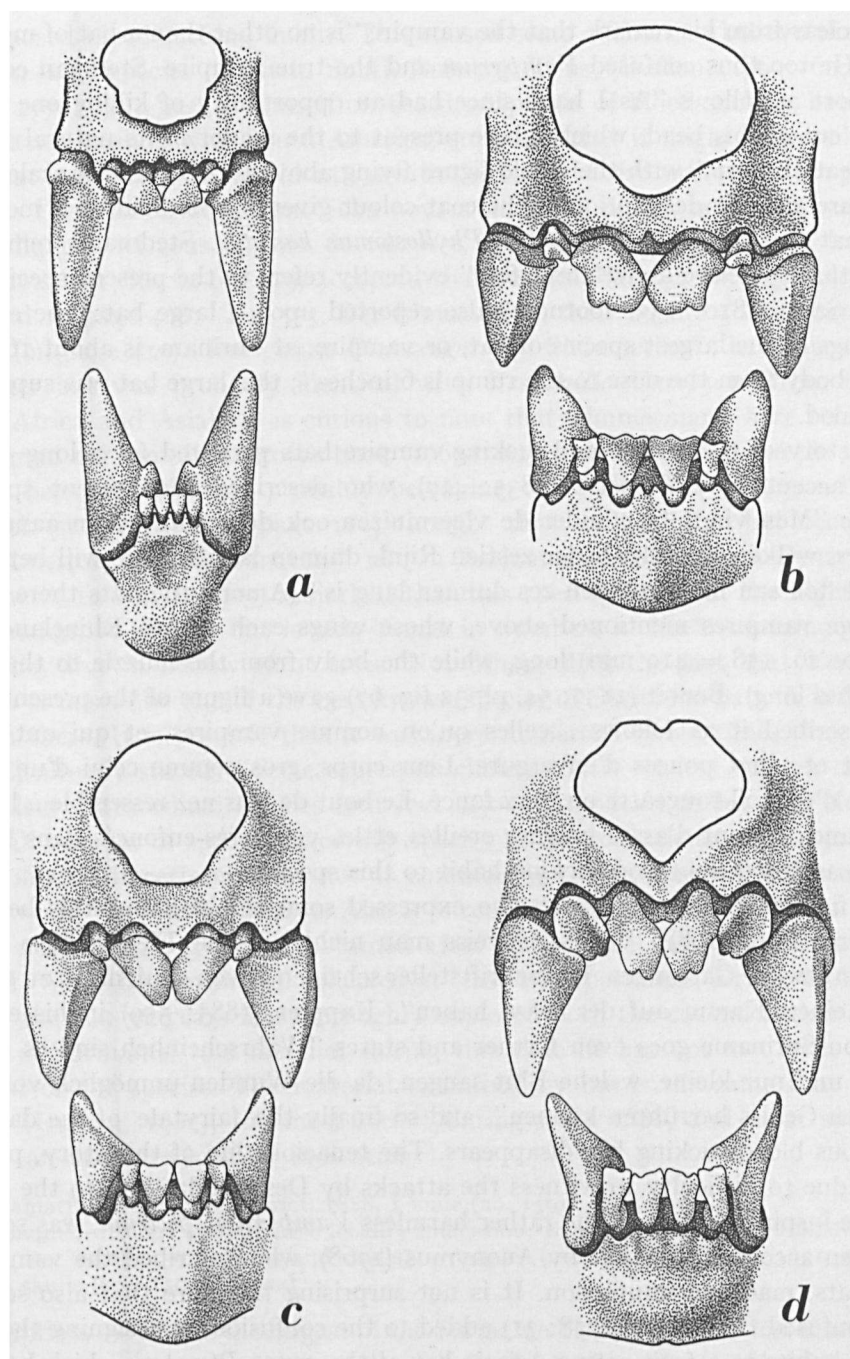


Fig. 24. Canines and incisors in front view. a, *Vampyrum spectrum* (L.), SMN no. 1631; b, *Rhinophylla pumilio* Peters, no. 12510; c, *Carollia perspicillata perspicillata* (L.), no. 17565; d, *Sturnira lilium lilium* (E. Geoffroy), SMN no. 1064-1. Width across cingula canines, in mm: a, 9.8; b, 4.6; c, 4.9; d, 6.3.

is also clear from his remark that the vampire "is no other than a bat of monstrous size". He too thus confused *Vampyrum* and the true vampire. Stedman continued his report as follows "As I have since had an opportunity of killing one of these bats, I cut off his head, which I here present to the reader in its natural size, and as a great curiosity, with the whole figure flying above it on a smaller scale". From the figure and the description of the coat colour given by Stedman it is most probable that the specimen belongs to *Phyllostomus hastatus*. Stedman's remark: "it is said that some are above three feet" evidently refers to the present species.

Von Sack (1810: 153, footnote) also reported upon a large bat: "the extent of the wings of the largest species of bat, or vampire, at Surinam, is about 16 inches; but its body from the nose to the rump is 6 inches"; this large bat was supposed to suck blood.

The story of the large blood-sucking vampire bats persisted for a long time; so it was accepted by Teenstra (1835: 417), who described the present species as follows: "Men vindt hier onder de vleermuizen ook de groote boven aangehaalde *vampyr*s, welker vleugelen ieder zestien Rijnl. duimen lang zijn, terwijl het lijf van den bek tot aan het stuitbeen zes duimen lang is" (Among the bats there are also the large vampires mentioned above, whose wings each are 16 Rhineland inches (= $16 \times 26.158 = 419$ mm) long, while the body from the muzzle to the coccyx is 6 inches long). Benoît (1839: 54, pl. 32 fig. 67) gave a figure of the present species and described it as follows: "celles qu'on nomme vampires, et qui ont jusqu'à dix-huit et vingt pouces d'envergure. Leur corps, gros comme celui d'un rat, est couvert d'un poil rougeâtre ou roux foncé. Le bout de leur nez ressemble à la pointe d'une lance. Ils ont d'assez longues oreilles, et les yeux très-enfoncés dans la tête". He also assigned the blood-sucking habit to this species.

The first author in Suriname who expressed some doubt about this belief was Lammens (1844: 108): "Indessen weiss man nicht, ob alle Fledermäuse saugen, oder nur gewisse Gattungen. Die Schriftsteller scheinen es von denjenigen zu glauben, welche einen Kamm auf der Nase haben". Kappler (1885: 559) in his excellent works on Suriname goes even farther and states "Wahrscheinlich sind es mehrere Spezies und nur kleine, welche Blut saugen, da die Wunden unmöglich von einem grösseren Gebiss herrühren können", and so finally the fairytale of the dangerous monstrous blood-sucking bat disappears. The tenacious life of this story, probably mainly due to difficulty to witness the attacks by Desmodidae and to the scarcity and awe-inspiring shape of the rather harmless *Vampyrum spectrum*, was so strong that even accounts like that by Anonymus (1768), who described the vampires as small bats, made no impression. It is not surprising therefore that also scientists were confused. Linnaeus (1758: 31) added to the confusion by assigning the blood-sucking habits to a fruit-eating Asiatic bat of the genus *Pteropus*, which he named *Vespertilio Vampyrus* and of which he noted: "Noctu haurit sanguinem dormientium, cristas Gallorum & lacrymas palmarum". The large South American bat was described as *Vespertilio Spectrum* by Linnaeus, who did not make any mention of

the supposed blood-sucking habits. This caused some authors to believe that there were two large species of bat in South America. Thus, Buffon (1763: 60; Dutch version 1778: 36), basing himself on the descriptions of blood-sucking bats found in narratives dealing with South America, supposed that it might be possible that Seba's bat (see pl. 13) was not identical with the bats of these authors: "Il se pourroit donc que l'animal étrange, dont Seba nous a donné la figure, ne fût pas celui que nous indiquons ici sous le nom de *vampire*, c'est-à-dire, celui qui suce le sang". Zimmermann (1780: 62-66, 419) accepted that besides *Vampyrum spectrum*, which he named on page 408: "Nr. 353. Der Blutsauger", there occurs a large bat named by him (on page 419) "Der grosse Blutsauger von Südamerika"; he supposed that this latter bat was probably identical with *Vespertilio Vampyrus* from the Old World (Africa and Asia). It is curious to note that Zimmermann here referred to the German version of Bancroft's book (1769a: 80), where in a footnote the vampire bat has been identified as probably belonging to "*Vespertilio Spectrum?*". Also Von Sack (see citation on page. 110) thought that such a large bat occurred in South America, but "fortunately" not in Suriname. The brothers Penard ("De Surinamer", 12 March 1905) remarked that this species occurs in the higher parts of the mangrove region, but is only found in numbers in the mountainous areas, where they live in hollow giant trees. Notwithstanding the fact that *Vampyrum spectrum* seems to be one of the best known species of Suriname bats, it is far from common there. It is possible that it was more numerous in old times, but Fermin (1765: 8) already stated: "Cette espèce de chauve-souris est fort rare, à cause de sa grandeur extraordinaire; elles font leur séjour dans les bois les plus éloignés". The small number of specimens of this species in the collections studied is also an indication that it certainly was not as common as the extensive literature on the species would lead one to believe. Also it is remarkable that the collections studied contain not a single specimen obtained after 1900, while most of the material is very old. While Dieperink still collected at least two specimens, Dr. D. C. Geijskes, who for the last 36 years has thoroughly explored both the coastal region and the interior of Suriname, told me that during this time he has not met with a single specimen of the species. The material examined by me is the same that I listed in 1962 (Husson, 1962), the most recent dating from 1888, and most specimens without an accurate locality indication:

1. Paramaribo, Suriname District, 1888, 1 male (no. 15911, skin and skull).
2. Suriname, without more precise locality indication, 1824-1836, 1877 and unknown dates, 2 males (nos. 15908, 15910, skins and skulls), 2 females (no. 15909, SMN no. 1631, skins and skulls), 2 skulls (nos. 15913, 15914).

Description. — This is the largest of the Suriname bats. Length of forearm varying from 100 to 113.3 mm; nose leaf well developed, about 18 mm long and 11 mm broad; ears large and broad, up to 40 mm long and 26 mm broad; tragus small; interfemoral membrane large, when expanded reaching to the toes; calcar more than half the length of the tibia, and always somewhat larger than the foot; no external tail;

wing membranes from the basal third of the outer toes; fur dorsally rather long and soft, ventrally short, extending to the middle of the forearm; upper parts reddish brown, the basal part of the hairs being reddish yellow, the terminal part reddish brown; under parts uniformly light reddish yellow or yellowish.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. The most striking skull characters are (1) the large canines, which are relatively much larger than those of other Phyllostomidae, and (2) the width of the molars, which is greater than that of the palate.

The external and skull measurements of the 7 examined specimens from Suriname are given in Table 14.

TABLE 14

External and skull measurements of seven specimens of *Vampyrum spectrum* (Linnaeus) from Suriname.

Museum	RMNH	RMNH	RMNH	RMNH	SMN	RMNH	RMNH
Reg. number	15911	15908	15910	15909	1631	15914	15913
Sex	♂	♂	♂	♀	♀	?	?
Forearm	103.5	104	104	106	101	-	-
Third digit, metacarpal	78	78	78	76.5	73	-	-
1st phalanx	42	40	42	41	41	-	-
2nd phalanx	48	46	48	49	48.5	-	-
3rd phalanx	41	37	40	41	33	-	-
Fourth digit, metacarpal	82	83	85	82	79.5	-	-
1st phalanx	33.5	32	32	31	32	-	-
2nd phalanx	39	35	38.5	39	37	-	-
Fifth digit, metacarpal	89	91	91.5	90.5	87	-	-
1st phalanx	32.5	31	31	30	30	-	-
2nd phalanx	38	35	38	40	34	-	-
Ear, length x breadth	40x25.5	-	37x25	39x27	35x26	-	-
Tibia	56	51	53	56	53	-	-
Hind foot	30	29	31	31	29	-	-
Calcar	36	30	35	36.5	33	-	-
Nose leaf, length x breadth	16x11	-	18.5x12.5	18x10.5	16x10	-	-
Skull:							
greatest length	51.0	51.1	-	51.7	49.2	50.1	52.2
condylobasal length	42.8	44.0	-	43.3	41.6	43.2	43.8
condyle to front of canine	42.6	43.7	-	43.2	41.8	43.0	43.7
basal length	38.2	-	-	39.1	37.9	37.7	39.1
palatal length	24.3	24.6	-	25.0	24.8	23.7	25.3
zygomatic breadth	23.4	23.2	-	23.8	23.7	23.8	24.9
breadth of braincase	15.8	16.1	-	15.8	15.9	16.0	16.3
height of braincase without crest	15.5	15.2	-	16.4	15.6	16.2	16.2
mastoid width	21.5	21.5	-	21.3	20.5	21.2	21.5
postorbital constriction	7.3	7.7	-	7.9	7.9	8.0	8.6
width across molars	15.0	15.0	-	14.7	15.0	14.6	15.2
width across cingula canines	9.4	9.1	9.3	8.8	9.8	9.2	9.4
upper tooth-row, $c - m^3$	20.6	21.2	20.6	20.8	20.8	20.3	21.2
lower tooth-row, $c - m_3$	23.0	23.1	23.0	22.4	23.1	22.4	23.6
length of mandible	35.7	36.3	35.6	36.0	34.7	35.3	37.1

Remarks. — Due to the scarcity of the species very little can be said about its habitats in Suriname, any additional information on this point would be most valuable. In the countries near Suriname *Vampyrum spectrum* was observed to live in hollow trees and abandoned houses. Though it has been known for quite a long time that the belief of the old authors that this bat is blood-sucking is erroneous, there is still some diversity of opinion on what actually is the main food of the big false vampire. Ditmars (1935), who based his observation on *Vampyrum* from Trinidad, W. I., has shown that it does eat birds and rats; according to Goodwin & Greenhall (1961: 243) the species is "largely, if not entirely, carnivorous". Waterton (1825: 175), though being convinced of the blood-sucking habits of *Vampyrum* (of course he never witnessed this), made the following interesting observations in British Guiana: "He does not always live on blood. When the moon shone bright, and the fruit of the Banana-tree was ripe, I could see him approach and eat it. He would also bring into the loft, from the forest, a green round fruit, something like the wild Guava, and about the size of a nutmeg. There was something also, in the blossom of the Sawarri nut-tree, which was grateful to him; for on coming up Waratilla creek, in a moonlight night, I saw several Vampires fluttering round the top of the Sawarri tree, and every now and then the blossoms, which they had broken off, fell into the water. They certainly did not drop off naturally, for on examining several of them, they appeared quite fresh and blooming. So I concluded the Vampires pulled them from the tree, either to get at the incipient fruit, or to catch the insects which often take up their abode in flowers". Also Quelch (1892: 99), who gave a vivid description of his efforts to catch *Vampyrum* in British Guiana, stated: "Though these bats are to a great extent insectivorous, yet from their size they must devour a large quantity of the mangoes, star-apples, sapodillas and other soft fruits where they occur, since their stomachs, when full, contain a considerable amount of pulpy matter. And indeed their great canine teeth, as in our bats generally, seem especially adapted for piercing and tearing open the skin, rind and fleshy parts of fruits, the power for the tear being derived from the force of their flight after they have seized the fruit with their teeth".

Subfamily GLOSSOPHAGINAE

The most striking characters of the Suriname Glossophaginae are: (1) the elongated muzzle, (2) the long and highly extensile tongue, and (3) the narrow premolars and molars, the latter without a W-shaped pattern (see pls. 24-26). The nose leaf is small but distinct. At present six species are known from Suriname, but it is almost certain that also *Lionycteris spurrelli*, described by Thomas (1913: 270-271) from Condoto, Choco, Colombia, occurs there since Sanborn (1941: 376) reported the species from Itabu Creek Head, Corantijn River, British Guiana, close to the Suriname border. This species is therefore included in the following key.

If in the following text the zygomatic arch is stated to be absent or incomplete, this means that the zygomatic arch is cartilaginous or imperfectly ossified and therefore was lost during cleaning of the skull.

Key to the Suriname Glossophaginae

- 1a. Interfemoral membrane very narrow, extending to about the knee; inner upper incisors smaller than the outer (fig. 25c). Dental formula: $I \frac{2}{0}, C \frac{1}{1}, P \frac{3}{3}, M \frac{3}{3}$. . . 2
- b. Interfemoral membrane larger, extending to about the ankles 3
- 2a. Length of forearm varying from 40.5 to 44 mm; calcar rudimentary; interfemoral membrane densely haired *Anoura geoffroyi geoffroyi*, p. 123
- b. Length of forearm varying from 34 to 36.5 mm; calcar small but distinct; interfemoral membrane thinly pubescent *Anoura caudifer caudifer*, p. 120
- 3a. Lower incisors, at least in adults, absent. 4
- b. Lower incisors present. Dental formula: $I \frac{2}{2}, C \frac{1}{1}, P \frac{2}{3}, M \frac{3}{3}$ 5
- 4a. Upper incisors evenly and widely spaced between the canines (fig. 25d); wing membrane from the base of the outer toe. Dental formula: $I \frac{2}{0}, C \frac{1}{1}, P \frac{2}{3}, M \frac{2}{2}$ *Lichonycteris obscura*, p. 119
- b. Upper incisors in pairs separated by a distinct space from each other as well as from the canines; wing membrane from the foot above the base of the outer toe. Dental formula: $I \frac{2}{0}, C \frac{1}{1}, P \frac{2}{3}, M \frac{3}{3}$ *Choeroniscus minor*, p. 118
- 5a. Upper incisors of about equal size, forming a continuous row almost from canine to canine (fig 25a); zygomatic arch complete *Glossophaga soricina soricina*, p. 114
- b. Upper outer incisors conspicuously smaller than the inner, separated by spaces both from these and from the canines (fig. 25b); zygomatic arch incomplete 6
- 6a. Bases of the hairs darker than the tips *Lionycteris spurrelli* Thomas
- b. Basal two-thirds of the hairs light buffy whitish, distinctly lighter than the brown tips *Lonchophylla thomasi*, p. 125

***Glossophaga soricina soricina* (Pallas, 1766)**

Text-figs. 21g (head), 25a (canines and incisors), 27a (interfemoral membrane), pl. 24 (skull)

Vespertilio soricinus Pallas, 1766, *Miscellanea Zoologica*: 48-53, pl. 4 figs. 16-18, pl. 5.

Type locality. — "Surinamo & e Caribaeis insulis". Restricted to Suriname by Miller (1912: 39).

Synonymies. — Cabrera, 1958: 72; Husson, 1962: 127.

Vernacular names. — (E) Common Long-tongued Bat.

Distribution. — The range of the species extends from Paraguay, northern Argentina and Peru north through northern South America and Central America to central Mexico; it is also found on the islands of Trinidad and Jamaica and in the Bahamas. The nominate subspecies occurs in the larger part of South America: northern Argentina and Peru to the Guianas, Trinidad, Venezuela and Colombia.

Occurrence in Suriname. — *Glossophaga soricina* is one of the most common species of bat of Suriname. According to the collector's notes on the labels of my material the bats are found under bridges, in culverts, as well as inside houses and sheds; usually they occur in colonies. The first record of the species from Suriname was by Pallas (1766), who reported the species from Suriname and the Caribbean Islands. There are a few later records of the species from Suriname, but the first

more precise localities were provided by Husson (1962), who mentioned material from the localities listed below under 1, 2, 6, 9, 15-17 and 19. I have now examined the following Suriname specimens:

1. Frederik Willem IV Falls, Corantijn River, about 3°30'N, Nickerie District, 3 males and 6 females (nos. 17609-17617, skins and skulls).
2. Tijger Creek, lower Samaracca River between Groningen and Calcutta, Saramacca District, 3 females (nos. 7487-7489, skins and skulls).
3. Plantation "Clevia", north-east of Paramaribo on the west bank of the Suriname River, Suriname District, 1 male (no. 17620, skin and skull).
4. Plantation "Geijersvlijt", north-east of Paramaribo, but south-west of "Clevia" on the west bank of the Suriname River, 1 male (no. 13518, skin and skull).
5. Garnizoenspad, west of Paramaribo, 2 males (nos. 17603, 17608, skins and skulls), 4 females (nos. 17604-17607, skins and skulls).
6. Paramaribo and surroundings, 7 males (nos. 13512, 13518, 16548, 17281, 17620, 21750, ZMH no. 33804a, skins and skulls), 12 females (nos. 13511, 13515a-d, 16549-16551, 17559, 17619, ZMH nos. 1860b, 33863, skins and skulls), numerous (100+) specimens (nos. 25280, 25281, skins and skulls).
7. Plantation "Welgedacht C", just south of Paramaribo, 1 female (no. 17619, skin and skull).
8. Lelydorp, 15 km south of Paramaribo, Suriname District, 2 males (nos. 25361, 25364, skins and skulls).
9. Republiek, about 35 km south of Paramaribo, Para District, 1 female (no. 13514, skin and skull).
10. Zanderij, 40 km south of Paramaribo, Para District, 1 male (no. 17541, skin and skull), 1 female (no. 17542, skin and skull).
11. Southern margin of savanna near Gros on railroad about 100 km south of Paramaribo, Brokopondo District, 2 specimens (no. 25310, skins and skulls).
12. Brownsweg, north-west corner of Brokopondo Lake, 1 male (no. 16548, skin and skull), 3 females (nos. 16549-16551, skins and skulls), 1 juvenile (no. 25283, skin and skull).
13. Brokopondo on Suriname River north of Brokopondo Lake, 4 specimens (nos. 25184, 25273, skins and skulls).
14. Maripaheuvel near Dam on Sara Creek, now covered by Brokopondo Lake, Brokopondo District, 2 males (nos. 17381, 17382, skins and skulls).
15. Djai Creek, north of Moengotapoe, Marowijne District, 1 male (no. 13519, skin and skull), 1 specimen (no. 17618, skin and skull).
16. Coastal region between Moengotapoe and Wiawia Bank, 1 female (no. 13520, skin and skull).
17. Galibi, mouth of Marowijne River, 12 males (no. 16042, ZMA nos. 9353-9363, skins and skulls), 21 females (nos. 16040, 16041, 16043-16046, 17594-17602, ZMA nos. 9347-9352, skins and skulls), 20 specimens (no. 18259, skins and skulls).
18. Albina on Marowijne River, south of Galibi, Marowijne District, 1 male (ZMA no. 9212, skin and skull).
19. Suriname, without more precise locality indication, 7 males, 22 females (nos. 13504a-k, 13505a-e, 13506a-c, 13513, 13515a-d, 13516, 13517, 17294, SMN no. 264-1410a-e, ZMH no. 38984b, skins and skulls).

Description. — In 46 specimens from Suriname the length of the forearm varies from 33.0 to 36.4 mm; nose leaf small but distinct, lancet about 4 mm long and 3.8 mm broad; ears short and broad, broadly rounded, about 14 mm long and 10 mm broad; tragus acutely pointed, about 4.5 mm long; tongue very long and extensible; lower lip with a deep groove in the centre, the groove bordered by small warts; interfemoral membrane well developed, when stretched extending to the level of the distal third of the tibia; tail short, about one-third the width of the interfemoral

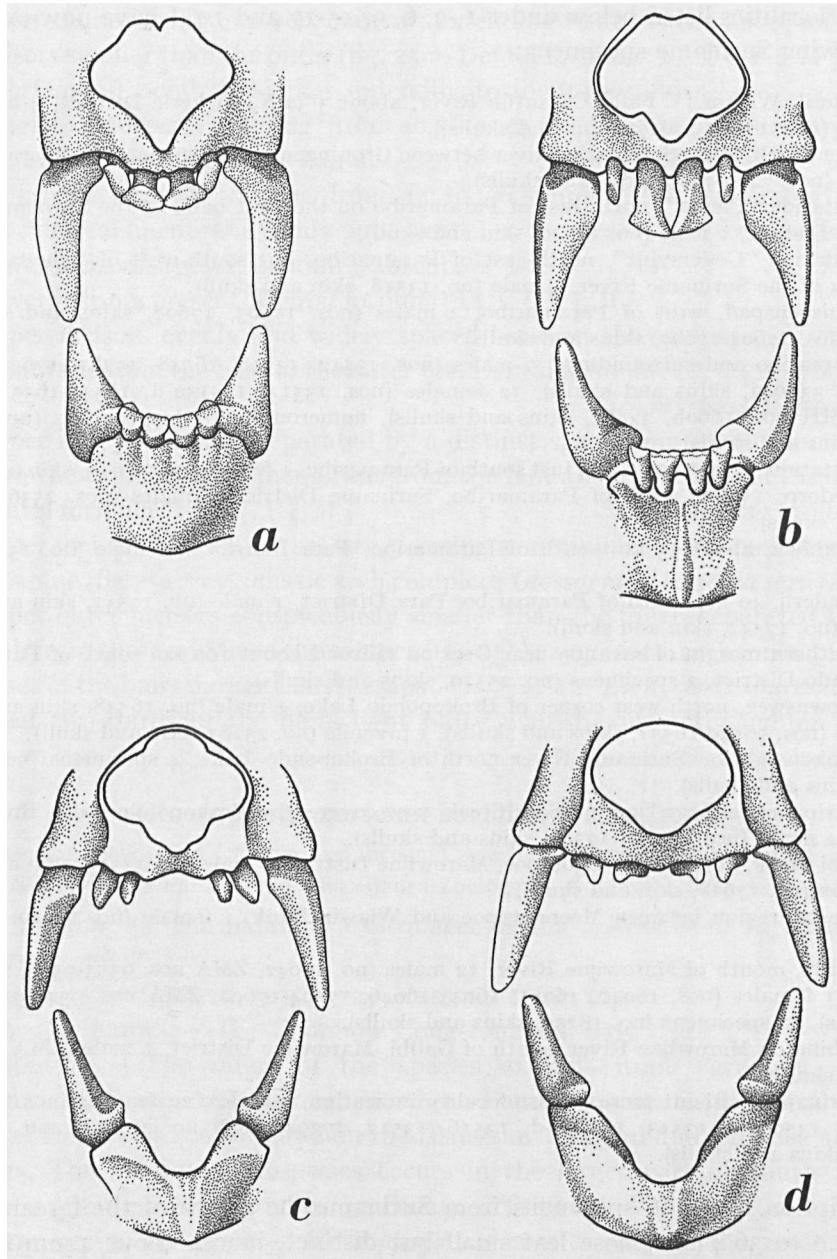


Fig. 25. Canines and incisors in front view. a, *Glossophaga soricina soricina* (Pallas), no. 13514; b, *Lonchophylla thomasi* J. A. Allen, SMN no. 264, 1410-6; c, *Anoura caudifer caudifer* (E. Geoffroy), no. 13487; d, *Lichonycteris obscura* Thomas, BMNH no. 96.10.1.20. Width across cingula canines, in mm: a, 3.4; b, 3.7; c, 4.0; d, 3.3.

membrane, the extreme tip appearing on the dorsal surface of the membrane; calcar short but distinct, varying from 4 to 5 mm, about half as long as the hind foot; hind foot more than half as long as the tibia; wing membranes from the ankles. Fur soft and dense, extending on the wing membrane to about the distal third of the upper arm and to the basal third of the thigh. Two colour phases occur, the one more dark brown and the other more reddish brown. In both phases the hairs of the dorsal surface are bicoloured, the basal two-thirds are whitish or light buffy, the distal third is dark brown or reddish brown; the extreme tips are somewhat lighter. Ventrally the basal two-thirds of the hairs are whitish, while the distal third is light greyish brown with a still lighter tip. The colour of the wings is dark to blackish brown.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors forming an almost continuous row between the canines, the cutting edges of the inner are slightly longer than those of the outer; the incisors are longer than high; the upper premolars longer than high, triangular in outline when viewed from the side, the first slightly smaller than the second; the first premolar is separated by a small but distinct space from the canine, nearly or actually touching the second premolar; the second premolar is placed close to the first molar or even touches it, its shaft is somewhat higher than the crown of the molars. Lower incisors completely filling the space between the canines, about equal in size, their cutting edges scarcely rising to the level of the indistinct cingulum of the canines; canines, premolars, and molars forming a continuous row in which the teeth are in contact with each other; first lower premolar slightly longer and higher than the second; the second and third premolars are of equal size and height, they are almost or fully as high as the molars; the molars are narrow, longer than wide. The zygomatic arches are terete, though completely ossified.

The external and skull measurements of ten specimens from Suriname are given in Table 15.

Remarks. — Externally *Glossophaga* can be easily confused with *Carollia perspicillata*. In all its dimensions *Glossophaga soricina* is smaller than *Carollia perspicillata*; in the latter species the length of the forearm is usually more than 37 mm, while in the former the forearm only rarely attains this length. In *G. soricina* the lower lip is deeply grooved over its full length above and in front, this groove being margined with small warts; in *Carollia* the lower lip shows a central large wart bordered by a row of small warts, while the tongue in that species is of normal size instead of being remarkably long and extensile as in *Glossophaga*.

Externally *Glossophaga* also closely resembles *Rhinophylla pumilio*, of which the maximum length of the forearm is about 35 mm. In *Rhinophylla*, however, the external tail is absent, the tongue is of normal size, and the lower lip shows a central wart with a larger longitudinal wart on either side.

Although some older authors supposed that the species sucks blood, new researches have shown that the main food of the species is of a vegetable nature, consisting of nectar and soft pulpy fruit; also insects are found in the stomach contents of these animals.

TABLE 15

External and skull measurements of ten specimens of *Glossophaga soricina soricina* (Pallas) from Suriname.

Museum	RMNH	RMNH	RMNH	RMNH	SMN	RMNH	RMNH	RMNH	RMNH	RMNH
Reg. number	13506b	13506a	13517	13506c	264-1410a	13504f	13505b	13505e	13504a	13504g
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm	34.7	34.1	34.0	35.2	33.5	34.2	35.4	35.4	33.5	36.0
Third digit, metacarpal	33	34	33	33	34	32.5	35	34.5	33	34.5
1st phalanx	12.5	12	12	13.5	13	12.5	13	13	12.5	13
2nd phalanx	15	15	15	15.5	16	15.5	15.5	16	15	16
3rd phalanx	11	10	9	10	9	10	10	10	10	10
Fourth digit, metacarpal	31.5	31	28.5	30.5	30.5	31	32	32	31	31.5
1st phalanx	10	9.5	9.5	10	10	9.5	9.5	9.5	9	10
2nd phalanx	11	10	10	10.5	11.5	10.5	11	10.5	10	10.5
Fifth digit, metacarpal	29.5	29.5	28	30	30	30.5	31.5	31.5	30.5	30.5
1st phalanx	8.5	8.5	8.5	9	9	8	8.5	9	8	8.5
2nd phalanx	10	10	10	10	9.5	9	10	9.5	10	10
Tibia	13	13	13.5	13.5	13	13	13.5	13.5	13	13
Hind foot	10	8.5	8.5	9.5	9	9.5	10	9	10	9
Calcar	4.5	4	4.5	4	4.5	5	5	4.5	4	4.5
Skull:										
greatest length	18.8	19.3	19.8	20.0	20.1	19.6	19.8	20.1	20.3	20.3
condylobasal length	17.7	18.0	18.5	18.4	19.4	18.4	18.6	18.9	18.6	19.1
condyle to front of canine	17.2	17.4	17.7	17.5	18.3	17.7	17.7	18.2	17.7	18.2
basal length	15.5	15.8	16.2	16.4	16.8	15.5	16.2	16.8	16.2	16.8
palatal length	10.0	10.3	9.9	10.5	10.7	10.0	10.5	10.6	10.4	10.6
zygomatic breadth	8.7	9.0	8.9	8.7	8.9	-	9.0	8.8	-	8.9
breadth of braincase	8.4	8.4	8.4	8.3	8.4	8.3	8.5	8.2	8.7	8.6
height of braincase	7.1	7.3	7.3	7.3	7.3	6.8	7.2	7.1	7.4	7.3
mastoid breadth	8.5	8.5	8.7	8.7	8.6	8.6	8.7	8.5	8.8	8.9
interorbital constriction	3.7	3.8	3.9	3.7	3.8	3.6	3.9	4.0	4.0	4.0
postorbital constriction	4.4	4.5	4.7	4.6	4.4	4.5	4.6	4.5	4.6	4.6
width across molars	5.0	5.0	5.2	5.0	5.1	4.9	5.1	5.0	5.1	5.2
width across canines	3.3	3.5	3.5	-	3.5	3.4	3.7	3.5	3.6	3.6
upper tooth-row, c - m ³	6.4	6.4	6.7	6.5	6.8	6.6	6.5	6.6	6.5	6.8
lower tooth-row, c - m ₃	6.9	6.8	7.1	6.9	7.2	7.0	6.9	7.2	6.9	7.2
length of mandible	12.4	12.6	12.8	13.1	13.2	13.1	12.4	13.3	13.1	13.2

Choeroniscus minor (Peters, 1868)

Text-fig. 27b (interfemoral membrane), pl. 24 (skull)

Chaeronycteris minor Peters, 1868, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1868: 366-367.

Type locality. — "Surinam".

Synonymies. — Cabrera, 1958: 73; Husson, 1962: 133.

Vernacular names. — (E) Long-nosed Tailed Bat.

Distribution. — The species has been reported from Suriname, Brazil and Ecuador. The taxonomy of the genus, however, is far from settled.

Occurrence in Suriname. — So far the holotype, an adult male (SMN no. 441) is the only known Suriname specimen of this species. It was collected by A. Kappler (who lived in Albina, but also obtained material from near Paramaribo), but no accurate locality is known.

Description. — The following description is based on the holotype specimen. Length of forearm 34.8 mm; nose leaf well developed, lancet about 4 mm high and 3.4 mm broad; ears rounded above, the outer margin of the ear conch slightly concave in its upper half, about 10.5 mm long and 7 mm broad; tragus small, pointed, notched at the apex; interfemoral membrane well developed, extending in the middle to about the level of the ankles, about 15 mm wide, the posterior margin somewhat concave; calcar distinct, nearly 6 mm, much shorter than the foot, which is about 7.5 mm; tail about one-third the width of the interfemoral membrane, the extreme tip appearing on the dorsal surface of the membrane; wing membrane from the foot above the base of the outer toe; the fur extends on both surfaces of the elbows and more sparsely on the basal third of the forearm on both surfaces; the type is too bleached to allow anything to be said about the colour of the fur. Some additional external measurements are (in mm): length of third metacarpal 35.3; first phalanx, 12; second phalanx, 17.5; third phalanx, tip included, 9.5; length of fourth metacarpal, 32.6; first phalanx, 8.5; second phalanx, 11; length of fifth metacarpal, 31.0; first phalanx, 7.5; second phalanx, 10; tibia, 12.2.

Dental formula: $I \frac{2}{0}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{3}{3}$. In *Choeroniscus* the upper incisors occur in pairs, the pairs separated from each other as well as from the canines, like in *Anoura* (see fig. 25c); in the holotype of *Ch. minor*, however, the anterior margin of the praemaxilla is somewhat damaged, with the result that the upper incisors have fallen out, except for the left outer incisor. The cheek-teeth of the upper and lower jaws are more or less distinctly spaced; there is a distinct diastema between the canines and the first upper premolars. However, between the canine and the first upper premolar on the left side of the holotype, a very minute conical tooth is present; as this supernumerary tooth is widely separated from the following premolar, it is improbable that this tooth is a persistent milk-tooth of that premolar. Some cranial measurements are as follows: greatest length, 21.9; condylobasal length, 21.6; condyle to front of canine, 21.4; basal length, 20.0; palatal length, 14.0; zygomatic breadth, 8.5; breadth of braincase, 8.8; height of braincase, 7.2; mastoid breadth, 8.6; interorbital constriction, 3.3; width across molars, 4.6; width across cingula canines, 3.4; upper tooth-row, $c-m^3$, 7.7; lower tooth-row, $c-m_3$, 8.0; length of mandible, 16.1 mm.

Lichonycteris obscura Thomas, 1895

Text-figs. 25d (canines and incisors), 27c (interfemoral membrane), pl. 25 (skull)

Lichonycteris obscura Thomas, 1895, *Annals Magazine Nat. Hist.*, (6) 16: 56-57.

Type locality. — "Managua, Nicaragua".

Synonymies. — Cabrera, 1958: 73; Husson, 1962: 135.

Vernacular names. — (E) Brown Long-nosed Bat.

Distribution. — The species has been reported from Nicaragua, Costa Rica, and Suriname.

Occurrence in Suriname. — *Lichonycteris obscura* has only once been reported from Suriname, namely by Miller (1900: 156), who noted: "While identifying some old skins in the United States National Museum I recently found a specimen labeled

"Surinam, Edw. Koebel". It is without further history except that it was entered in the Museum register, as No. 14815 on March 6, 1885". Husson (1962) mentioned Miller's specimen, but could not add any more information on the occurrence of the species in Suriname. Also since 1962 I have seen no Suriname specimens of the species, and the following description is based on data from the literature and a specimen from Costa Rica.

Description. — Length of forearm varying from 31.5 to 33.5 mm; nose leaf small but distinct, about as broad as high, evenly rounded above, about 9.5 mm in length; tragus about one-third the length of the ear; interfemoral membrane well developed, extending to the level of the ankles; wing attached at the base of the outer toe; calcar, about 7 mm, shorter than the foot; tail reaching to about the middle of the interfemoral membrane, its tip appearing on the dorsal surface of the membrane; basal third of forearm hairy; colour of the dorsal surface as well as that of the ventral surface dark brown.

Dental formula: $I \frac{2}{0}$, $C \frac{1}{1}$, $P \frac{2}{3}$, $M \frac{2}{2}$. Upper incisors evenly and widely spaced between canines (see fig. 24d); zygomatic arch incomplete; lower incisors, at least in adult specimens, absent.

The following external and skull measurements were taken from the examined Costa Rica specimen. Forearm, 31.5; length of third metacarpal, 33.2; first phalanx, 13; second phalanx, 17; third phalanx, 11.5; length of fourth metacarpal, 30; first phalanx, 8.5; second phalanx, 11; length of fifth metacarpal, 27.5; first phalanx, 7.5; second phalanx, 10; length of ear, 9.5; tragus, about 3; tibia, 12; hind foot, 8.5; calcar, 7 mm. — Skull: greatest length, 18.2; condylobasal length, 17.2; condyle to front of canine, 16.7; basal length, 15.1; breadth of braincase, 7.7; height of braincase, 6.6; interorbital constriction, 3.8; width across molars, 4.2; width across cingula canines, 3.3; upper tooth-row, c-m², 5.3; lower tooth-row, c-m₂, 5.8; length of mandible, 12.0 mm.

Anoura caudifer caudifer (E. Geoffroy, 1818)

Text-figs. 20f (interfemoral membrane), 25c (canines and incisors), 26 (animal), pl. 26 (skull)

Glossophaga caudifer E. Geoffroy, 1818, Mém. Mus. Hist. Nat. Paris, 4: 418, pl. 17.

Type locality. — "Le Brésil, aux environs de Rio-Janeiro".

Synonymies. — Cabrera, 1958: 74; Husson, 1962: 136 (as *Lonchoglossa c. caudifer*).

Vernacular names. — (E) Tailless Long-nosed Bat.

Distribution. — South America from eastern and central Brazil and Peru north to the Guianas, Venezuela and Colombia. The nominate subspecies has been reported from Brazil, the Guianas, Venezuela and Colombia.

Occurrence in Suriname. — Jentink (1888) was the first author to mention the present species from Suriname. Husson (1962) provided the first accurate locality within Suriname. The material that I examined consists of the following specimens:

1. Jodensavanne on the Suriname River, about 60 km above Paramaribo, Suriname District, 1 female (no. 13487, skin and skull).
2. Suriname, without more precise locality indication, 1 specimen (no. 17348, skin and skull).

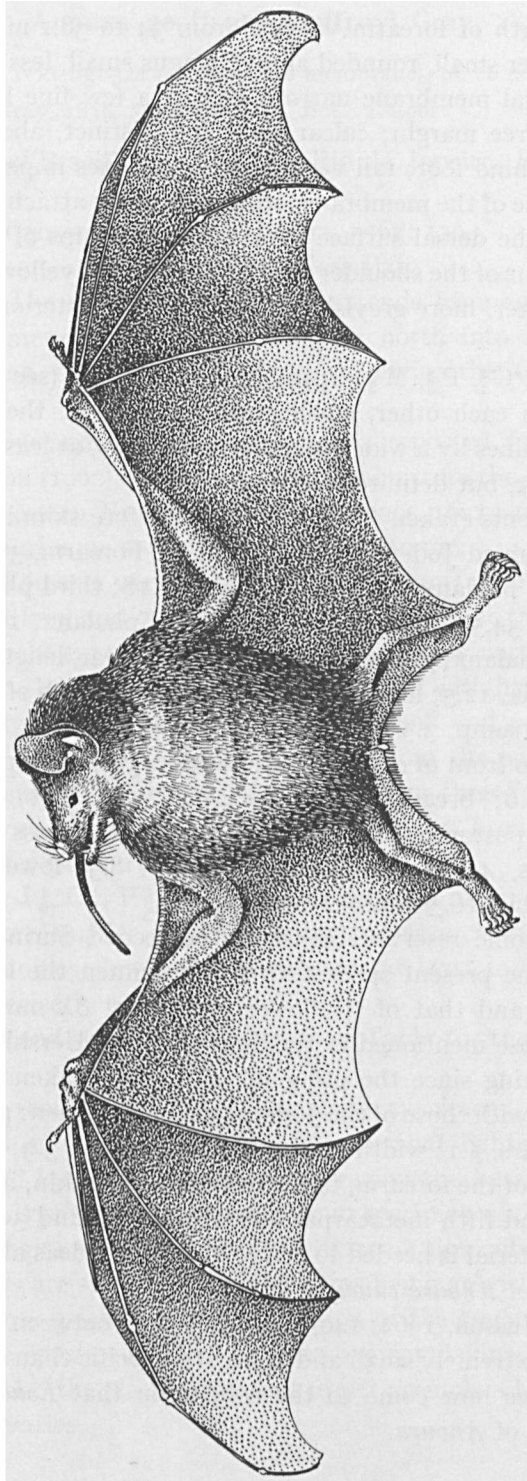


Fig. 26. *Anoura caudifer caudifer* (E. Geoffroy), after E. Geoffroy, 1818.

Description. — Length of forearm varying from 34 to 38.1 mm; nose leaf small but distinct; ears rather small, rounded above; tragus small, less than one-third the ear length; interfemoral membrane narrow, having a few fine hairs which form a thin fringe along its free margin; calcar short but distinct, about 4.5 mm, nearly half the length of the hind foot; tail very short, sometimes imperfectly ossified and often hidden in the base of the membrane; wing membrane attached at the basal part of the ankles; fur of the dorsal surface dark brown, the tips of the hairs are more yellowish brown; the fur of the shoulder region is more light yellowish brown; ventral surface somewhat darker, more greyish brown than the posterior part of the dorsal surface.

Dental formula: $I \frac{2}{0}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{3}{3}$. Upper incisors in pairs (see fig. 25c), the inner widely separated from each other, smaller than the outer; the outer incisors are separated from the canines by a wide space; lower incisors, at least in adults, absent; zygomatic arch slender, but definitely ossified.

External measurements (taken from the animal before skinning) and skull measurements of the examined Jodensavanna specimen. Forearm, 36.2; length of third metacarpal, 36.6; first phalanx, 12; second phalanx, 18; third phalanx, 10.5; length of fourth metacarpal, 34.5; first phalanx, 9; second phalanx, 12.5; length of fifth metacarpal, 30; first phalanx, 7.5; second phalanx, 11.5; ear, length, 10; ear, breadth, 7; tragus, about 3; tibia, 12.5; hind foot, 11; calcar, 4.5; depth of interfemoral membrane from middle of rump, 3.5 mm. — Skull: greatest length, 23.2; condylobasal length, 22.3; condyle to front of canine, 21.4; basal length, 20.2; palatal length, 12.0; zygomatic breadth, 9.6; breadth of braincase, 8.7; height of braincase, 7.1; mastoid breadth, 9.2; postorbital constriction, 4.5; width across molars, 5.4; width across cingula canines, 4.0; upper tooth-row, c-m³, 8.5; lower tooth-row, c-m₃, 8.9; length of mandible, 16.3 mm.

Remarks. — With some reserve I consider the second Suriname specimen (no. 17348) to belong to the present species. In this specimen the length of the upper tooth-row is 7.5 mm, and that of the lower tooth-row, 8.2 mm; these values are much smaller than those mentioned in the literature (see Hershkovitz, 1949a: 439). This is the more striking since the other measurements taken from the damaged skull agree rather well with those of the Jodensavanne specimen: postorbital breadth, 4.3; width across molars, 5.1; width across cingula canines, 3.9; length of the mandible, 15.9; the length of the forearm, taken from the dried skin, is 36 mm, while that of the third, fourth and fifth metacarpal bones is 36, 34, and 30 mm, respectively. However, far more material is needed to arrive at definite ideas about the variability of Suriname material of *Anoura caudifer*.

. As I pointed out (Husson, 1962: 140) the differences between the genera *Anoura* and *Lonchoglossa* are extremely small and more of a specific than of a generic nature. For that reason I have now come to the conclusion that *Lonchoglossa* should be considered a synonym of *Anoura*.

Anoura geoffroyi geoffroyi Gray, 1838

Text-fig. 32a (interfemoral membrane), pl. 26 (skull)

Anoura Geoffroyi Gray, 1838, Magazine Zool. Bot., 2: 490.

Type locality. — "Brazil", restricted to Rio de Janeiro, Brazil, by Vieira (1942: 324).

Synonymies. — Cabrera, 1958: 75; Husson, 1962: 139.

Vernacular names. — (E) Geoffroy's Tailless Bat.

Distribution. — The range of the species extends from southern Brazil through northern South America and Central America north into Mexico. The nominate subspecies has been reported from Brazil, Bolivia, the Guianas, Trinidad and Venezuela.

Occurrence in Suriname. — The species was reported for the first time from Suriname by Husson (1962), who dealt with 6 males from the Anton van Aerde Cave, Tafelberg, south-western Brokopondo District (nos. 16413-16417, 16419, skins and skulls). No other Suriname specimens are known to me.

Description. — Forearm varying from 40 to 44.3 mm; nose leaf small but distinct; ears, about 10 mm long and 7 mm broad, rounded above; tragus small, about one-third the length of the ear; interfemoral membrane very narrow, about 2.5 to 4 mm wide, in the middle about 1 mm deep, wholly clothed with hair, which forms a fringe along the free margin of the membrane; calcar small and poorly developed, about 2.5 to 4 mm long; tail absent; wing membrane from the basal part of the ankles; hairs of the dorsal surface bicoloured, the basal half or three-fourths pale buff-brown, the tips dark brown; ventral surface more dark greyish brown, the tips of the hairs being a shade lighter (see further under Remarks).

Dental formula: $I \frac{2}{0}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{3}{3}$. Upper incisors in pairs, separated by a distinct space; inner incisors smaller than the outer; outer incisors separated by distinct spaces from the canines; lower incisors absent, at least in adults; zygomatic arch incomplete or imperfectly ossified.

For the external and skull measurements see Table 16; the former are taken from the dried skins.

Remarks. — In the six examined Suriname specimens the area between the shoulders, dorsally as well as ventrally, is somewhat lighter tinged than the rest of the body, caused by the fact that in this region the basal parts of the hairs are much lighter. This is particularly well shown in specimen no. 16413: on the neck and the shoulders the hairs are pure white, the extreme tips only being dark brown; on the throat the hairs are silvery white, their tips being greyish brown.

In these Suriname specimens the ossification of the zygomatic arch is subject to variation: in three specimens the zygomata are cartilaginous, in the three others they are ossified. Also the place of the first upper premolars between the canines and second premolars varies.

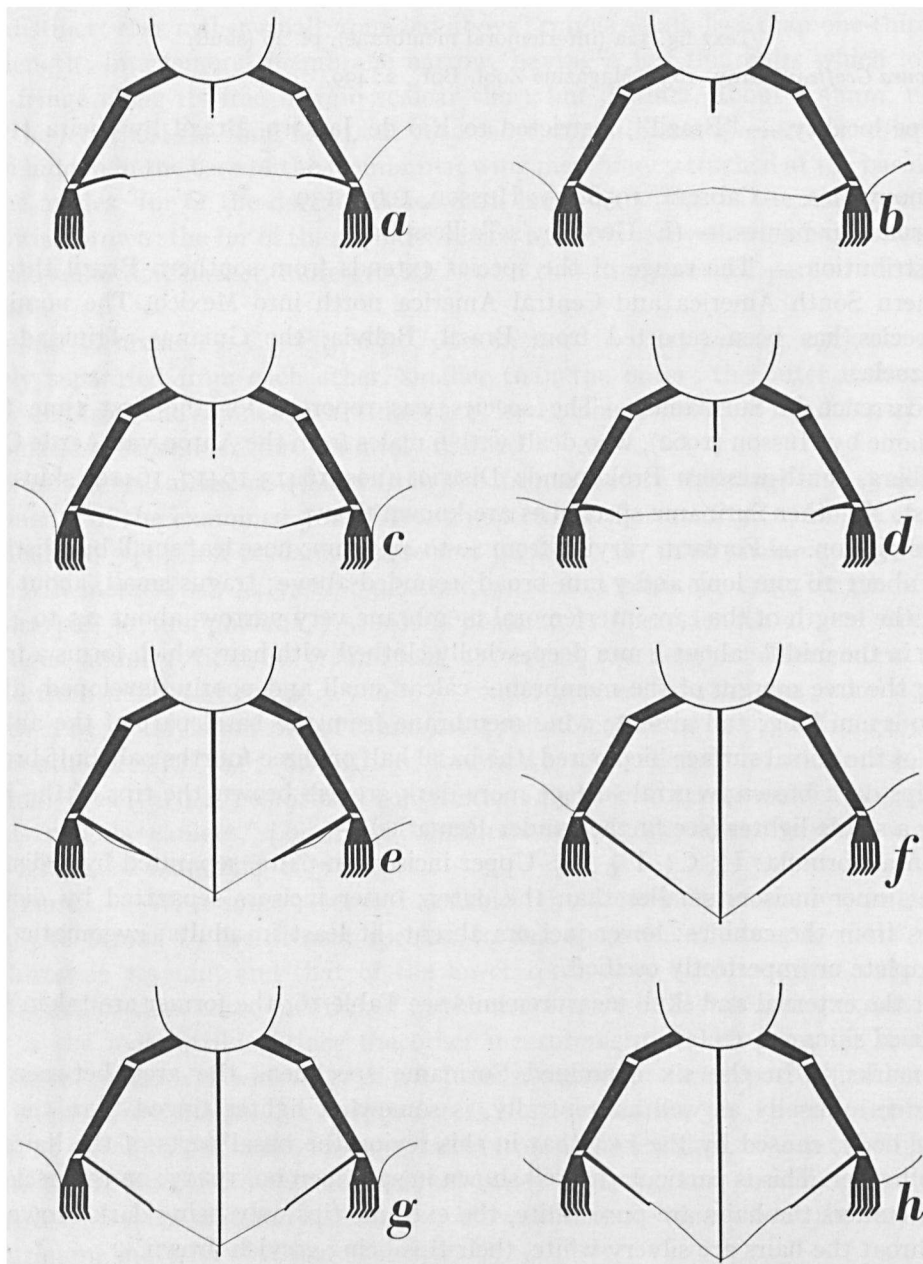


Fig. 27. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Suriname Glossophaginae (a-d), and Vespertilionidae (e-h). a, *Glossophaga soricina soricina* (Pallas); b, *Choeroniscus minor* (Peters); c, *Lichonycteris obscura* Thomas; d, *Lonchophylla thomasi* J. A. Allen; e, *Myotis albescens* (E. Geoffroy); f, *Myotis surinamensis* Husson; g, *Eptesicus melanopterus* (Jentink); h, *Dasypterus ega ega* (Gervais).

TABLE 16

External (dried skins) and skull measurements of six males of *Anoura geoffroyi geoffroyi* Gray from Suriname (first 6 columns) and of one male from French Guiana (last column) in the Leiden Museum.

Reg. number	16413	16414	16415	16416	16417	16419	13486
Forearm	41.2	43.8	41.4	43.2	40.5	42.2	42
Third digit, metacarpal	39	43	-	42	40	41.5	40.5
1st phalanx	12.5	14	-	13	13	12.5	12.5
2nd phalanx	21	23	-	22	22	21	21
3rd phalanx	14	15	-	14	14	15	-
Fourth digit, metacarpal	38	42	-	40	40	40	38.5
1st phalanx	9.5	10.5	-	10	10	9	10
2nd phalanx	13	15.5	-	14.5	14	13	13.5
Fifth digit, metacarpal	32.5	36	-	34.5	34.5	34.5	33.5
1st phalanx	8	8	-	8	8	8	7.5
2nd phalanx	11.5	15	-	14	12	13.5	12
Tibia	15	15	-	17	-	15	-
Hind foot	10	10.5	-	11	-	10	-
Calcax	2	3	2.5	4	2.5	4	-
Skull:							
greatest length	-	25.7	25.5	25.4	26.5	25.5	-
condylobasal length	-	24.8	24.8	24.6	25.3	25.0	-
condyle to front of canine	-	24.0	23.8	23.7	24.6	24.4	-
basal length	-	22.2	22.3	22.1	23.1	-	-
palatal length	-	14.1	13.5	14.2	14.8	-	-
zygomatic breadth	-	11.2	11.0	11.2	11.0	11.3	-
breadth of braincase	-	9.8	10.0	10.2	10.2	9.7	-
height of braincase	-	8.0	8.4	8.2	8.4	7.8	-
mastoid breadth	-	10.7	10.7	10.5	10.4	-	-
postorbital constriction	5.2	4.9	5.2	5.2	5.1	5.1	4.9
width across molars	6.4	6.4	6.5	6.4	-	6.4	6.2
width across cingula canines	-	5.2	5.2	5.1	4.8	5.1	4.5
upper tooth-row, c - m ³	9.2	9.7	9.8	9.6	-	9.9	9.4
lower tooth-row, c - m ₃	9.5	10.1	10.2	9.8	10.3	10.4	9.7
length of mandible	17.6	18.5	17.6	18.2	18.9	18.7	17.4

Lonchophylla thomasi J. A. Allen, 1904

Text-figs. 25b (canines and incisors), 27d (interfemoral membrane), pl. 25 (skull)

Lonchophylla thomasi J. A. Allen, 1904, Bull. American Mus. Nat. Hist., 20: 230.

Type locality. — "Ciudad Bolivar, Venezuela".

Synonymies. — Cabrera, 1958: 76; Husson, 1962: 141.

Distribution. — Venezuela; Suriname.

Occurrence in Suriname. — The species was first reported from Suriname by Husson (1962) and is still only known from there by the following material:

1. Nassau Mountains, west of the Marowijne River at about 4°45'N, Marowijne District, 1 male (no. 17346, skin and skull), 1 female (no. 17347, skin and skull).

2. Suriname, without more precise locality indication, 1 male (SMN no. 264, 1410, 6, skin and skull).

Description. — Length of forearm varying from 31 to 32.3 mm; nose leaf well developed, length × breadth about 6.5 × 4.5 mm; ears rounded, about 9 mm in

length; tragus small, about one-third the ear length; interfemoral membrane well developed, reaching to about the ankles; calcar short but distinct, about 5.5 mm; tail not reaching half-way the interfemoral membrane, the extreme tip terminating on the dorsal surface; wing membranes from the base of the ankles; colour of the upper parts russet brown, the basal two-thirds of the hairs being somewhat buffy whitish; colour of the under parts about of the same tint as the dorsal surface, the membranes and the ears are dark brown.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Inner upper incisors with broad cutting edges, conspicuously larger than the small conical outer incisors, which are separated by distinct spaces from the inner incisors as well as from the canines (see fig. 25b); zygomatic arch incomplete.

External and skull measurements of the examined three Suriname specimens: SMN (male), RMNH (male and female), respectively. Forearm, 31.2, 32.3, 32; length of third metacarpal, 32.8, 34, 32; first phalanx, 12.5, 14, 13; second phalanx, 15, 17, 15; third phalanx, 10, 8.5, 9; length of fourth metacarpal, 30, 30.5, 30; first phalanx, 9, 10, 9; second phalanx, 9.5, 10.5, 9.5; length of fifth metacarpal, 31, 30, 30; first phalanx, 8, 8, 8.5; second phalanx, 8.5, 8.5, 9; tibia, about 12.5; hind foot, about 8; calcar, about 5.5 mm. — Skull: greatest length, 19.6, 20.5, 19.7; condylobasal length, 19.1, 19.6, 18.8; condyle to front of canine, 18.6, 19.1, 18.2; basal length, 17.1, 17.4, 16.7; palatal length, 10.9, 11.1, 10.5; breadth of braincase, 8.5, 8.2, 8.2; height of braincase, 6.8, 6.8, 6.8; mastoid breadth, 8.7, 8.8, 8.5; postorbital constriction, 4.1, 3.9, 4.0; width across molars, 5.0, 5.0, 4.8; width across cingula canines, 3.7, 3.7, 3.5; upper tooth-row, c-m³, 6.4, 6.8, 6.4; lower tooth-row, c-m₃, 6.8, 7.1, 6.5; length of mandible, 13.7, 14.0, 13.2 mm.

Remarks. — The Nassau Mountains specimens were collected under the overhanging bank of a small forest stream.

Subfamily CAROLLIINAE

The external characters distinguishing the Suriname Carolliinae from the other Phyllostomidae are mentioned in the key on pages 77 and 78 of the present paper. Two of the most striking characters, however, by which the Carolliinae can easily be recognized, are those of the structure of the narrow upper molars, which do not show the W-pattern found in most other groups, and that of the incomplete zygomatica. In these characters, it is true, the Carolliinae resemble the Glossophaginae; as, however, all Suriname Glossophaginae have three lower premolars instead of two, they may be readily distinguished from the Carolliinae.

The Carolliinae are represented in Suriname by the genera *Carollia* and *Rhinophylla*. Besides the common *Carollia perspicillata perspicillata* I found among my Suriname material two specimens of which the length of the upper and lower tooth-rows is so much smaller than that of the other specimens, that I consider them, at least provisionally, to belong to *Carollia castanea castanea*.

Key to the Suriname Carollinae

- 1a. Length of forearm varying from about 38 to 44 mm; length of upper tooth-row, c-m³, 7.0 mm or more *Carollia perspicillata perspicillata*, p. 128
- b. Length of forearm less than 38 mm; length of upper tooth-row, c-m³, less than 7 mm 2
- 2a. Length of forearm varying from 30 to 35 mm; no external tail; length of upper tooth-row, c-m³, less than 6 mm. Lower lip with a rounded central wart flanked on each side by a large elongate wart (fig. 21c) *Rhinophylla pumilio*, p. 133
- b. Length of forearm varying from 34 to 38 mm; external tail slender; length of upper tooth-row, c-m³, varying from 6.1 to 6.7 mm. Lower lip with a large central rounded wart bordered by a row of small warts (like in *C. perspicillata*; see fig. 21e). *Carollia castanea castanea*, p. 127

Carollia castanea castanea H. Allen, 1890

Carollia castanea H. Allen, 1890, Proc. American Philos. Soc. Philadelphia, 28: 19-21, fig. 1.

Type locality. — "Costa Rica", Central America.

Synonymies. — Cabrera, 1958: 76; Husson, 1962: 149; Pine, 1972: 17.

Vernacular names. — (E) Allen's Short-tailed Bat.

Distribution. — North-western South America (Peru, Ecuador, the Guianas, and Colombia), Central America and southern Mexico. The nominate subspecies inhabits South America and south-eastern Central America as far north as Honduras.

Occurrence in Suriname. — The species was reported for the first time from Suriname by Husson (1962), who reported on material from the following localities:

1. Jodensavanne, on the east bank of the Suriname River about 50 km south of Paramaribo, Suriname District, 1 female (no. 17402, skin and skull).
2. Suriname, without more precise locality indication, 1 female (SMN no. 289 1/2, 1, skin and skull).

Description. — Judging by the data concerning the present species found in the literature, it seems that there is no good external character to separate *Carollia castanea* from *C. perspicillata* except for the smaller size of the former; also the skulls of both species show no other differences than the smaller size of *C. castanea*. For this reason the two Suriname specimens dealt with are considered, at least for the present, to belong to *C. castanea*. In *C. castanea* the length of the forearm varies from about 34 to 38 mm; in my specimens it is 36 and 38 mm. The skulls of my specimens are conspicuous by that the upper tooth-row, c-m³, is much shorter compared to the same feature in my rather large series of *C. perspicillata* from Suriname. The skull of the specimen collected by Kappler (lot 2) has the longitudinal axis of the second upper premolar not in line with the first premolar and the canine, making a distinct angle in the line of the tooth-row; this character is usually mentioned as

diagnostic for *C. castanea*. The Jodensavanne specimen does not show this peculiarity, but in all its dimensions it agrees better with *C. castanea* than with the typical *C. perspicillata*. Therefore, for the time being at least, both specimens are referred here to the typical *C. castanea*.

External and skull measurements of the specimens from the Stuttgart and Leiden Museums, respectively. Forearm, 36.0, 38.0; length of third metacarpal, 35.5, 36; first phalanx, 15, 16; second phalanx, 18.5, 20; third phalanx, 12, 14; length of fourth metacarpal, 34, 35; first phalanx, 12, 13.5; second phalanx, 12.5, 12; length of fifth metacarpal, 36, 36; first phalanx, 11, 11.5; second phalanx, 12, 12.5; tibia, 16, 16.5; hind foot, 11, 12.5; calcar, 6, 5 mm. — Skull: greatest length, 20.0, 20.8; condylobasal length, 18.2, 18.4; condyle to front of canine, 17.5, 18.0; basal length, 16.0, 16.1; palatal length, 8.7, 8.7; zygomatic breadth, 10.5, 10.4; breadth of braincase, 9.3, 9.2; height of braincase, 8.5, 8.3; mastoid breadth, 10.2, 10.6; interorbital constriction, 5.6, 5.8; postorbital constriction, 5.2, 5.6; width across molars, 7.6, 8.1; width across canines, 4.5, 4.9; upper tooth-row, c-m³, 6.4, 6.7; lower tooth-row, c-m₃, 6.9, 7.1; length of mandible, 12.9, 13.2 mm.

When comparing these measurements with those given in Table 17 of *C. perspicillata* the shortness of the tooth-rows of the two specimens is very striking.

Remarks. — Unfortunately, Pine's (1972) revision of the genus *Carollia* could not be taken into account anymore.

Carollia perspicillata perspicillata (Linnaeus, 1758)

Text-figs. 20g (interfemoral membrane), 21e (head), 24c (canines and incisors), 28 (animal), pl. 27 (skull)

Vespertilio perspicillatus Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 31.

Type locality. — "Habitat in America". Restricted to Suriname by Thomas (1911: 130).

Synonymies. — Cabrera, 1958: 76; Husson, 1962: 144; Pine, 1972: 44.

Vernacular names. — (E) Linnaeus' Short-tailed Fruit Bat; (N) Korttongige Rode Vleermuis.

Distribution. — The species has a wide range, which extends from southern Mexico and Guatemala south and east through Central America and the larger part of South America as far as Peru and southern Brazil; it has also been reported from the West Indian islands of Jamaica, Grenada, Trinidad and Tobago. The nominate subspecies inhabits the mainland of South America and the above West Indian Islands.

Occurrence in Suriname. — Together with *Glossophaga soricina*, this is one of the most common bats in Suriname. It is usually found roosting in colonies under bridges and in culverts. The Penard brothers ("De Surinamer", 12 March 1905) remarked that it is commonly found in hollow trees in the surroundings of Paramaribo; at night it is also observed within Paramaribo itself. Also Dr. D. C. Geijskes noted that it is common within Paramaribo, especially in the gardens.

The first certain Suriname record of the species is by Kappler (1881: 163, 164) who reported upon it both under the names *Phyllostoma brevicaudata* and *Carollia brevicaudata*. Also later authors (see Husson, 1962) mentioned the species from Suriname, but added little to the knowledge of its range within the country. Husson (1962), however, provided data which seem to indicate that the species is common in the coastal lowland area, no material from the interior (farther than 150 km south of the coast) being available to him. Pine (1972: 73), however, reported upon 3 specimens from Kayserberg airstrip near the Zuid River, at about 3°N 56° 30'W, far in the interior. The following material has been examined by me:

1. Frederik Willem IV Falls in Corantijn River at about 3°30'N, Nickerie District, 2 females (nos. 17615, 17616, skins and skulls).
2. Plantation "Clevia", west bank of Suriname River north-east of Paramaribo, Suriname District, 2 males (nos. 17533, 17534, skins and skulls).
3. Plantation "Morgenstond", just south-west "Clevia", 3 females (nos. 17522-17524, skins and skulls).
4. Plantation "Geijersvlijt", west bank of Suriname River south-west of "Morgenstond", north of Paramaribo, 1 male (no. 17531, skin and skull), 1 female (no. 17529, skin and skull).
5. Paramaribo, 7 males (nos. 17535, 17563, 17590, 17591, ZMH no. 2352a-c, skins and skulls), 8 females (nos. 17377, 17525, 17564, 17589, 17592, 17593, 21749, 21752, skins and skulls), 1 juvenile (no. 17526, skin and skull).
6. Plantation "Hanna's Lust", about 6 km south-west of Paramaribo, 2 males (nos. 17532, 17536, skins and skulls), 1 female (no. 17528, skin and skull).
7. Plantation "Welgedacht C", about 8 km south-west of Paramaribo, 1 male (no. 17530, skin and skull), 1 female (no. 17527, skin and skull).
8. Plantation "Peperpot", east bank of Suriname River, about 6 km south-east of Paramaribo, 6 males (nos. 17505, 17510, 17513, 17516, 17519, 17521, skins and skulls), 17 females (nos. 17499-17504, 17506-17509, 17511, 17512, 17514, 17515, 17517, 17518, 17520, skins and skulls).
9. Lelydorp, about 15 km south of Paramaribo, Suriname District, 1 male (no. 25363, skin and skull), 1 female (no. 25362, skin and skull).
10. Between Paramaribo and Zanderij, 1 male (ZMA no. 9211, skin and skull).
11. Zanderij, about 40 km south of Paramaribo, Para District, 16 males (nos. 12074, 25324, 25327, 25328, 25331, 25333, 25337, 25340-25343, 25345, 25346, 25349, 25356, 25359, skins and skulls), 39 females (nos. 12071-12073, 12075-12085, 25320-25323, 25325, 25326, 25329, 25330, 25332, 25334-25336, 25338, 25339, 25344, 25347, 25348, 25350-25355, 25357, 25358, skins and skulls).
12. Phedra, west bank of Suriname River, at about 5°20'N, Brokopondo District, 1 female (no. 21264, skin and skull).
13. Along highway between Paramaribo and Afobaka at 6 km S. of Kraka and about 66 km south of Paramaribo, 1 specimen (no. 25190, skin and skull).
14. Berg en Dal, west bank of Suriname River, about 75 km south of Paramaribo, 1 female (no. 18276, skin and skull).
15. Near Brokopondo, west bank of Suriname River, north of Brokopondo Lake, 16 specimens (nos. 25278, 25279, ZMA no. 9205, skins and skulls).
16. Southern margin of savanna near Gros, on railroad about 100 km south of Paramaribo, 1 female (no. 25311, skin and skull).
17. Brownsweg, about 115 km south of Paramaribo, near north-west corner of Brokopondo Lake, Brokopondo District, 6 males (nos. 16533, 16538, 16539, 16542, 18278, skins and skulls), 15 females (nos. 16512-16514, 16531, 16532, 16534-16537, 16540, 16541, 16543-16546, skins and skulls), 11 specimens (no. 25277a-k, skins and skulls).
18. Maripaheuvel near Dam on Sara Creek, now covered by Brokopondo Lake, Brokopondo District, 1 male (no. 17380, skin and skull).
19. Galibi, mouth of Marowijne River, Marowijne District, 3 males (ZMA nos. 9223-9225,

skins and skulls), 2 females (ZMA nos. 9226, 9227, skins and skulls), 4 specimens (no. 18258, skins and skulls).

20. Road from Albina to Moengotapoe, 10 specimens (no. 18251, skins and skulls).

21. Albina on west bank of Marowijne River, at about 5°30'N, 6 males (ZMA nos. 9232-9237, skins and skulls), 4 females (ZMA nos. 9228-9231, skins and skulls).

22. Marowijne River region, Marowijne District, 1 male (no. 17477, skull).

23. Suriname, without precise locality indication, 5 males (nos. 17561, 17565, 25451, SMN no. 289 1/2, 2, ZMH no. 38984a, skins and skulls), 5 females (nos. 17560, 17562, 17566, ZMA nos. 1524b, 1620, skins and skulls), 12 specimens (nos. 17480-17486, 17639, skins and skulls), 10 skulls (nos. 17478, 17479, 17487, 17488, 17639).

Description. — Length of forearm varying from about 38 to 44 mm; nose leaf well developed, about 10 mm long, the breadth of the lancet about 5 mm; ears rather short but broad, about 17 mm long and 12 mm broad, rounded above; tragus short, about one-fourth or one-fifth of the length of the ear, often hardly noticeable from the outside, with concave subterminal emargination; interfemoral membrane moderately developed, angularly emarginate behind, when stretched reaching to the distal part of the tibia; tail slender and short, scarcely reaching to the middle of the interfemoral membrane, perforating it, only the extreme portion of the tip appearing on the dorsal surface of the membrane (in dried skins the tail is often very indistinct); calcar distinct, about 6 mm long, equal to about half the length of the hind foot; wing membrane from the ankles. Fur soft and dense; dorsally extending on the wing membrane as far as a line connecting the middle of the upper arm with the distal third of the thighs; the proximal half of the forearm covered with very short hairs; short hairs also present on the basal part of the interfemoral membrane. Ventrally the membranes are less distinctly pubescent than dorsally. The general coat colour of the dorsal surface varies from dark greyish brown to a more reddish brown with all intermediate stages; the hairs are distinctly tricoloured, since the basal third is brownish followed by a band of light yellowish or light buff, while the distal third is of about the same colour as the basal third; in most specimens, at least in the dried skins, the back of the body shows a grizzled appearance, because of the light buffy parts of the hairs. The coat colour of the ventral surface is almost uniformly greyish or brownish, it is not grizzled; with the exception of the slightly paler tips, the hairs on the ventral surface are of the same colour throughout. The wings are dark to blackish brown or dark reddish brown.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors strongly contrasting in size. The minute outer ones scarcely rise to the level of the cingulum of the canines; they are in contact with the large inner incisors and usually also with the canines (in some skulls there is a small space between the outer incisor and the canine). The first upper premolar is somewhat larger and higher than the second, touching both the canine and the second premolar; sometimes, however, it is separated by small spaces from one or both of these teeth. The upper molars are narrow, without distinct W-pattern on the crowns. The lower incisors completely fill the space between the short canines, the outer is smaller than the inner. The first lower premolar is slightly larger than the second, touching both the canine and the second premolar, or is

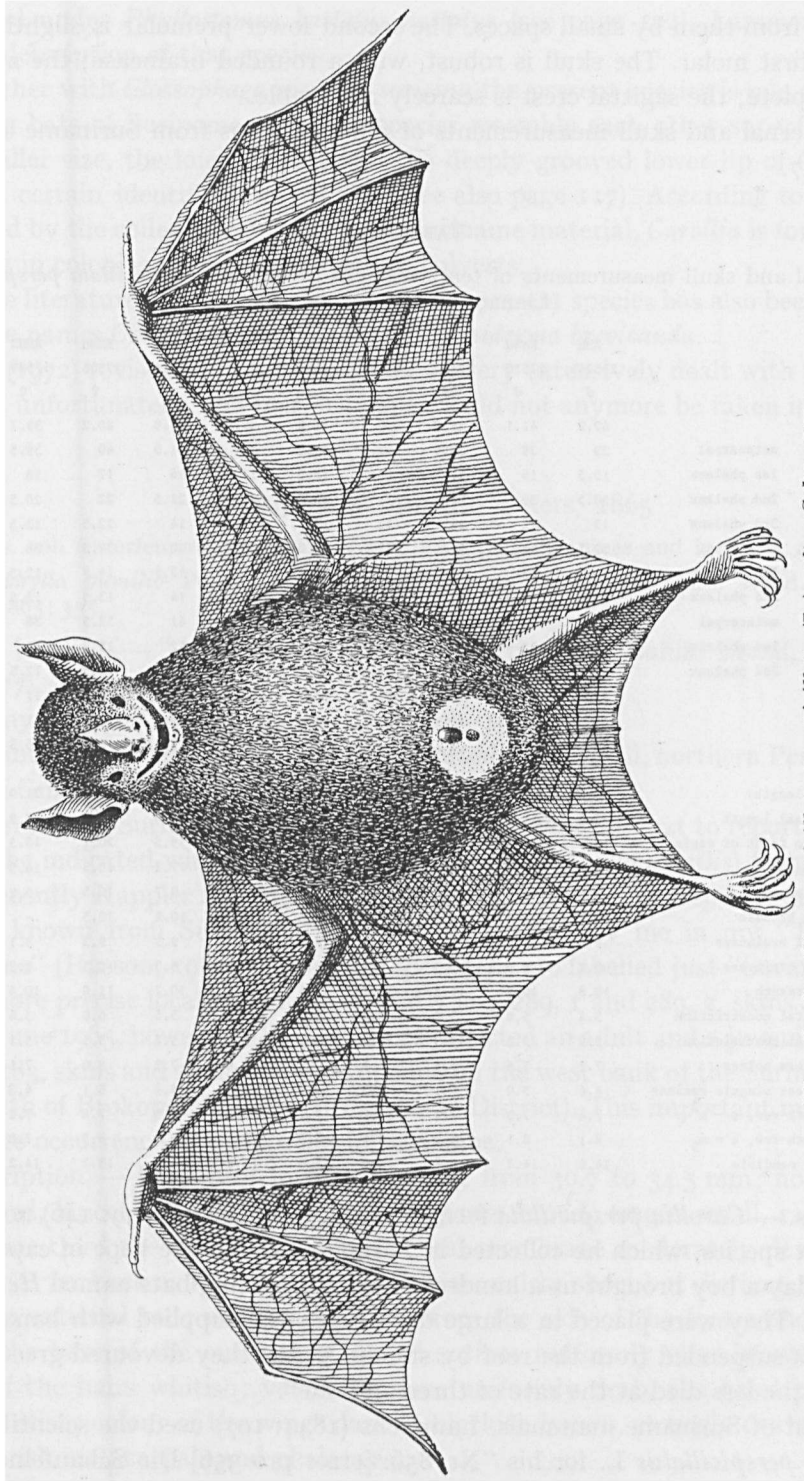


Fig. 28. *Carollia perspicillata perspicillata* (L.), after Seba, 1734.

separated from them by small spaces. The second lower premolar is slightly higher than the first molar. The skull is robust, with a rounded braincase; the zygomata are incomplete; the sagittal crest is scarcely noticeable.

The external and skull measurements of ten specimens from Suriname are given in Table 17.

TABLE 17

External and skull measurements of ten specimens of *Carollia perspicillata perspicillata* (Linnaeus) from Suriname.

Museum	ZMH	RMNH	RMNH	RMNH	ZMH	RMNH	RMNH	RMNH	RMNH	RMNH
Reg. number	23520b	17510	17513	17521	23520a	17501	17514	17506	17589	17592
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm	40.2	41.1	41.8	40.5	41.8	39.0	41.8	40.2	39.7	41.3
Third digit, metacarpal	39	39	39.5	40.5	39.5	39	41.5	40	39.5	39
1st phalanx	15.5	16	17	16.5	17.5	17	16	17	16	16
2nd phalanx	20.5	20	21	21	22.5	20.5	21.5	22	20.5	21.5
3rd phalanx	13	12	14	16	13	14.5	14	12.5	12.5	15
Fourth digit, metacarpal	37.5	38	36	39	37.5	37.5	40	37.5	36	38
1st phalanx	12	13	13.5	13.5	13	14	13.5	14.5	12.5	13
2nd phalanx	13.5	13.5	14	15.5	13	14	14	13.5	13.5	15
Fifth digit, metacarpal	38.5	40	39.5	40	39.5	39	41	39.5	38	38.5
1st phalanx	12	12	12	12	11.5	12.5	12	13	12	12
2nd phalanx	13	12.5	13	13.5	13	12	13	12.5	12.5	13
Tibia	17	16.5	18	19	16.5	16	18	17	17	17.5
Hind foot	11.5	12	13	13	12.5	11.5	13	12	11	13
Calcar	5	6	6	6	6	5.5	5.5	6	6.5	7
Skull:										
greatest length	21.4	21.5	21.8	22.0	22.6	21.3	21.6	22.8	21.0	21.8
condylobasal length	19.3	19.5	20.2	20.2	20.8	19.5	19.6	20.5	18.9	19.8
condyle to front of canine	19.0	19.0	19.8	19.5	20.2	19.2	19.5	20.1	18.5	19.5
basal length	17.4	17.5	17.7	17.9	18.4	17.1	17.2	18.3	16.5	17.8
palatal length	9.9	10.0	9.7	10.2	10.0	9.4	9.7	10.5	9.2	10.4
zygomatic breadth	10.1	10.8	11.3	11.4	11.2	10.8	10.2	10.5	-	11.0
breadth of braincase	9.3	9.4	9.2	9.6	9.5	9.4	9.5	9.5	9.1	9.5
height of braincase	8.1	8.5	8.3	8.7	8.8	8.2	8.3	8.5	8.3	8.7
mastoid breadth	10.8	10.9	11.2	11.1	10.6	10.8	10.7	11.0	10.4	10.7
interorbital constriction	5.4	5.8	5.8	5.9	6.1	5.8	5.5	6.0	5.4	6.2
postorbital constriction	5.2	5.3	5.3	5.4	5.5	5.5	5.2	5.5	5.1	5.9
width across molars	7.1	7.6	7.5	8.1	7.8	7.6	7.3	8.0	7.1	7.5
width across cingula canines	4.6	5.0	5.1	5.3	5.1	4.9	4.9	5.1	4.8	4.8
upper tooth-row, c - m ³	7.4	7.3	7.4	7.7	7.7	7.5	7.5	7.8	7.2	7.4
lower tooth-row, c - m ₃	8.1	8.1	8.2	8.6	8.5	8.1	8.3	8.5	7.8	8.1
length of mandible	14.3	14.2	14.8	14.9	15.0	14.3	14.3	15.2	14.2	14.3

Remarks. — *Carollia perspicillata* feeds on fruit. Sanderson (1939: 146) noted that the present species, which he collected in Suriname, cannot be kept in captivity at all: "One day a boy brought us a hundred small fruit-eating bats named *Hemiderma brevicauda*. They were placed in a large dark cage, well supplied with bananas and other fruits suspended from the roof by strings. These they devoured greedily, but they none the less died at the rate of three an hour".

In his list of Suriname mammals, Lammens (1844: 107) used the scientific name *Vespertilio perspicillatus* L. for his "Nr. 856. [error pro 356] Die Schaufelnase". As

discussed under *Phyllostomus hastatus hastatus* (see page 102), Lammens actually gave a description of that species.

Together with *Glossophaga soricina soricina* the present species is one of the most common bats of Suriname. The two species resemble each other superficially, but the smaller size, the long tongue, and the deeply grooved lower lip of *Glossophaga* make a certain identification possible (see also page 117). According to field notes provided by the collectors of the present Suriname material, *Carollia* is found usually roosting in colonies under bridges and in culverts.

In the literature on Suriname mammals the present species has also been indicated with the names *Carollia brevicaudata* and *Hemiderma brevicauda*.

Pine (1972) revised the genus *Carollia* and very extensively dealt with the present species; unfortunately, however, his paper could not anymore be taken into account here.

Rhinophylla pumilio Peters, 1865

Text-figs. 20h (interfemoral membrane), 21c (head), 24b (canines and incisors), pl. 27 (skull)

Rhinophylla pumilio Peters, 1865, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1865: 355.

Type locality. — “Angeblich Brasilien”. Restricted to Bahia, Brazil, by Cabrera (1958: 77).

Synonymies. — Cabrera, 1958: 77; Husson, 1962: 152.

Distribution. — The species has been reported from Brazil, northern Peru, Ecuador and the Guianas.

Occurrence in Suriname. — Kappler (1881: 163) was the first to report the species (which he indicated with the misspelled name *Rhynophylla cumilis*) from Suriname. Until recently Kappler's specimens, two females, were the sole representatives of the species known from Suriname, and were mentioned by me in my “The bats of Suriname” (Husson, 1962: 152). These specimens are labelled just “Surinam”, without a more precise locality indication (SMN nos. 289, 1 and 289, 2, skins and skulls). On 29 June 1965, however, Dr. G. F. Mees collected an adult and a juvenile specimen (no. 25183, skins and skulls) in Brokopondo on the west bank of the Suriname River, just north of Brokopondo Lake (Brokopondo District). This important material confirms the occurrence of the species in Suriname.

Description. — Length of forearm varying from 30.7 to 34.5 mm; nose leaf well developed, lancet up to 9 mm long and 4.5 mm broad; tragus small, rather broad, about one-third the ear length; interfemoral membrane moderately developed, extending as far back as the middle of the tibiae; calcar short but distinct, up to 5 mm long; no external tail; wing membranes from the side of the foot a short distance above the base of the outer toes; dorsal surface uniformly olive-brown, the basal parts of the hairs whitish; ventral surface uniformly drab, the basal parts of the hairs whitish; colour of the wings dark to blackish brown, strongly contrasting with the whitish metacarpals and phalanges.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper inner incisors in contact with each other, large, bilobed, contrasting strongly with the minute outer incisors; first upper pre-molar small, hardly larger than the outer upper incisor, smaller than the last upper molar. Lower inner incisors distinctly trifid, larger than the outer ones; the two lower premolars nearly equal in size; zygomatic arch incompletely ossified.

The external and skull measurements of four females from the Guianas are given in Table 18.

TABLE 18
External and skull measurements of four females of *Rhinophylla pumilio* Peters.

Locality	Suriname	Suriname	Guyana	Guyana
Museum	SMN	SMN	RMNH	RMNH
Reg. number	289,1	289,2	12510	12511
Forearm	34.4	33.4	33.7	33.2
Third digit, metacarpal	33.5	30.0	32	33
1st phalanx	14.5	14	14.5	15.5
2nd phalanx	18.5	17.5	19	18.5
3rd phalanx	11	11	11	12
Fourth digit, metacarpal	34	30.5	32.5	33
1st phalanx	12	11	12	12.5
2nd phalanx	11.5	11.5	11.5	12
Fifth digit, metacarpal	35.5	32.5	33	34.5
1st phalanx	9.5	9.5	9.5	9.5
2nd phalanx	10.5	9	11	10.5
Ear, length x breadth	14x9.5	11x8	14x10	13.5x9
Tibia	13	12	12	12
Hind foot	9	8	8	8.5
Calcar	5	3.5	3.5	3.5
Nose leaf, length x breadth	8.5x4.2	-	9x4.5	-
Skull:				
greatest length	18.2	18.0	18.7	-
condylobasal length	16.3	-	17.2	-
condyle to front of canine	15.9	-	16.6	-
basal length	14.8	-	15.3	-
palatal length	8.1	8.0	8.6	-
zygomatic breadth	9.6	-	10.0	-
breadth of braincase	8.1	8.0	8.3	-
height of braincase	7.4	-	8.2	-
mastoid breadth	8.9	-	9.2	-
postorbital constriction	5.3	5.2	5.3	-
width across molars	6.4	6.0	6.6	6.3
width across cingula canines	4.5	4.4	4.6	4.5
upper tooth-row, c - m ³	5.2	5.1	5.2	5.3
lower tooth-row, c - m ₃	5.6	5.5	5.8	5.8
length of mandible	12.0	11.4	12.0	12.3

Subfamily STURNIRINAE

The subfamily Sturnirinae differs from the other Suriname Phyllostomidae by the combination of the following characters: (1) the reduction of the interfemoral membrane to such an extent that it is hardly noticeable (fig. 8h), a fringe of long hairs indicating the place of the membrane; there is no external tail and neither is the

calcar noticeable; (2) the main portion of the crowns of the upper and lower molars is occupied by a deep longitudinal groove running from the second premolar to the last molar; (3) the hind extremities are distinctly hairy, this pubescence extends to the bases of the claws; in the males a distinct patch of stiff hairs is usually present at the front of the shoulders, its colour varying from light yellowish to dark reddish brown.

Only one genus, *Sturnira*, and two species of the present subfamily are known with certainty from Suriname. These species may be distinguished with the help of the following key (after Goodwin & Greenhall, 1961: 251):

- 1a. Pelage bicoloured, hair buffy from base and tipped with dark brown; crowns of upper molars occupied by a deep, longitudinal groove; length of forearm, 40.5 to 43.6 mm *Sturnira lilium lilium*, p. 135
- b. Pelage tricoloured, dusky at base, followed by a pale buffy band and tipped with dark brown; crowns of upper molars occupied by a shallow, longitudinal groove; length of forearm 45.1 to 46.0 mm *Sturnira tildae*, p. 137

***Sturnira lilium lilium* (E. Geoffroy, 1810)**

Text-figs. 8h (interfemoral membrane), 21d (head), 24d (canines and incisors), pl. 28 (skull)
Phyllostoma lilium E. Geoffroy, 1810, Ann. Mus. Hist. Nat. Paris, 15: 181-182, 186.

Type locality. — "Le Paraguay". Restricted by Cabrera (1958: 78) to Asuncion, Paraguay.

Synonymies. — Cabrera, 1958: 78; Husson, 1962: 155.

Vernacular names. — (E) Paraguayan Yellow-Shouldered Bat.

Distribution. — The species occurs from Mexico south through Central and the larger part of South America to Peru, Paraguay and northern Argentina, and on the West Indian islands of Jamaica and Dominica. The nominate subspecies is known from Venezuela, Trinidad, the Guianas and Brazil south to northern Argentina, Paraguay and Peru.

Occurrence in Suriname. — Kappler (1881: 163) and Jentink (1888: 210) reported this species from "Surinam". The first more detailed Suriname localities were provided by Husson (1962). I have examined the following Suriname specimens:

1. Kayserberg airstrip near Zuid River, Nickerie District, about 3°N 56°30'W, 2 females (CNHM nos. 93206, 93207, skins and skulls).
2. Suriname, without more precise locality indication, 1 male (SMN no. 1064, 2, skin and skull), 1 female (SMN no. 1064, 1, skin and skull), 1 specimen (no. 13125, skin and skull).

Description. — Length of forearm varying from 38 to 43.6 mm; nose leaf distinct, short and broad, about 7.5 mm long and 5 mm broad; ears rather short and broad, about 13 mm long and 9 mm broad; tragus short, about one-third the length of the ear; interfemoral membrane reduced to a fringe of long hairs; calcar hardly noticeable (or absent?); no external tail; wing membrane from the distal end of the tibia or from the ankles; fur dense and soft, extending to half the forearm and on the wing

membrane as far as a line connecting the elbow and the knee; hind extremities densely furred to the base of the claws, while a dense fur consisting of fine long hairs covers the very narrow interfemoral membrane. The coat colour is subject to great variation due to sex and age, but as a general characteristic can be given: upper parts dark brown, varying from greyish to more reddish brown, the anterior part (head, neck, and shoulders) lighter, more yellowish than the posterior part, the hairs are bicoloured, the tips are dark brown, the rest is more yellowish; under parts much lighter than the upper parts and with a more greyish tinge, the anterior part more yellowish. In the males the shoulders have usually a patch of stiff hairs, varying from yellowish to reddish brown. Membranes dark brown throughout.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. The most noticeable character is the deep, longitudinal groove on the crowns of the upper and lower molars. Upper incisors completely filling the space between the canines, the inner much larger than the

TABLE 19

External and skull measurements of one male and three females of *Sturnira lilium lilium* (E. Geoffroy) from Suriname.

Museum	SMN	SMN	CNHM	CNHM
Reg. number	1064,2	1064,1	93206	93207
Sex	♂	♀	♀	♀
Forearm	40.2	41.6	41	40
Third digit, metacarpal	39	41	-	-
1st phalanx	14	15	-	-
2nd phalanx	19	19	-	-
3rd phalanx	17	17	-	-
Fourth digit, metacarpal	38	40.5	-	-
1st phalanx	12	12.5	-	-
2nd phalanx	15	14.5	-	-
Fifth digit, metacarpal	39.5	41.5	-	-
1st phalanx	8.5	9	-	-
2nd phalanx	11.5	12	-	-
Ear, length x breadth	13x8.5	14x9	15x-	14x-
Tibia	16.5	15.5	-	-
Hind foot	11.5	12	-	-
Skull:				
greatest length	21.6	21.9	22.1	21.6
condylobasal length	19.3	-	20.5	19.6
condyle to front of canine	18.8	-	19.6	18.8
basal length	16.5	-	17.9	17.1
palatal length	8.3	-	9.4	9.0
zygomatic breadth	13.1	-	12.7	13.3
breadth of braincase	10.1	-	9.7	9.9
height of braincase	-	-	9.2	9.4
mastoid breadth	11.4	-	11.5	11.7
postorbital constriction	5.4	6.1	5.4	5.4
width across molars	7.9	8.2	7.5	7.4
width across cingula canines	6.2	6.3	5.9	5.6
upper tooth-row, c - m ³	6.3	6.7	6.3	6.2
lower tooth-row, c - m ₃	7.2	7.7	7.2	6.9
length of mandible	14.2	14.6	14.3	13.7

outer, the latter touching the inner incisors as well as the canines; inner incisors distinctly in contact near the middle; in young adults the cutting edges are distinctly bilobed; the first upper premolar is somewhat smaller than the second, both are much higher than the more or less quadrate molars, of which the last is the smallest. Lower incisors of equal size, completely filling the space between the canines, forming a continuous row, with faintly trilobate cutting edges in young adults; first lower premolar distinctly larger than the second, about half as high as the canine; lower molars gradually diminishing in length, the first being about five times as long as the last.

The external and skull measurements of four Suriname specimens are given in Table 19.

Remarks. — Dieperink's faded specimen (no. 13125) is in such a poor condition that extraction of the skull, which would cause further damage, was not advisable. The length of the forearm of this specimen is about 40 mm.

The coat colour of the species varies so strongly that the several colour phases have been described as distinct species. A synonymy of the present form was given by Cabrera (1958: 78).

The specimen from Tempati Creek that Husson (1962) with some doubt had assigned to the present species, proves to belong to *S. tildae* (see below).

***Sturnira tildae* De la Torre, 1959**

Text-fig. 29 (head), pl. 38 (skull)

Sturnira tildae De la Torre, 1959, Nat. Hist. Miscellanea Chicago Acad. Sci., 166: 1-6, pl. 1, pl. 2 figs. 4-6.

Type locality. — "Arima Valley, Trinidad", West Indies.

Synonymies. — Goodwin & Greenhall, 1961: 252; Marinkelle & Cadena, 1971: 235.

Vernacular names. — (E) Trinidadian Yellow-shouldered Bat.

Distribution. — Colombia, Trinidad, Guyana, Suriname, Brazil.

Occurrence in Suriname. — Husson (1962: 156, 157) assigned a specimen from Tempati Creek with some doubt to *Sturnira lilium*, pointing out that the length of its forearm (45.7 mm) fitted better for *S. tildae* De la Torre, 1959 or *S. ludovici* Anthony. Later publications concerning *Sturnira tildae* (e.g., the one by Marinkelle & Cadena, 1971: 235-237) provided new data on that species, which made it clear that the Tempati specimen belongs to *S. tildae*. In my 1973 checklist, therefore, the species was cited as indigenous to Suriname. The only Suriname specimen of *S. tildae* so far known is a female from Tempati, Tempati Creek, upper Commewijne basin, southern Commewijne District (ZMA no. 4469, skin and skull).

Description. — The main difference between the present species and *S. lilium* is in the length of the forearm; in *S. tildae* this length varies between 43.6 and 56.6 in *S. lilium* between 38 and 43.6 mm. The other differences between the two species have been extensively dealt with by Goodwin & Greenhall (1961: 251-253, figs. 53-56); see also the above key (p. 135).

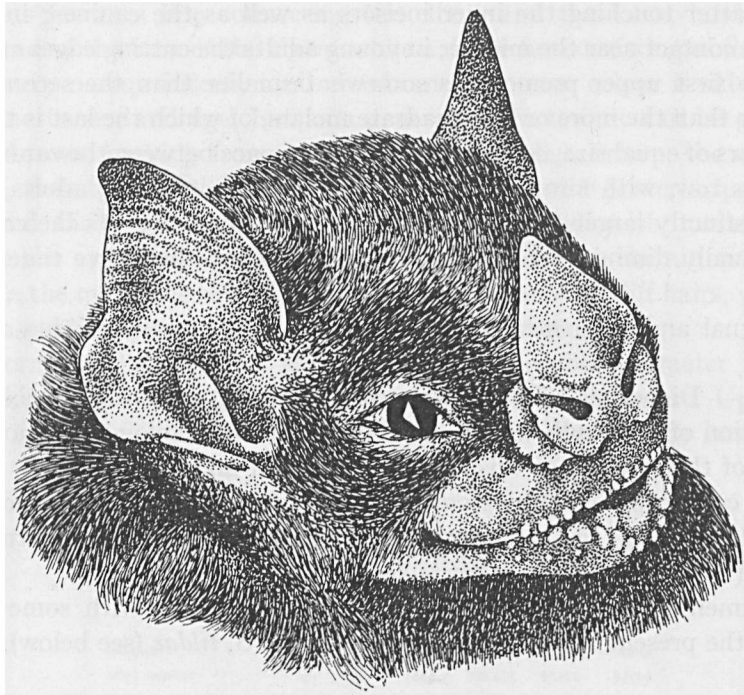


Fig. 29. *Sturnira tildae* De la Torre, ZMA no. 4469.

The external and skull measurements of the Suriname specimen are the following. Forearm, 45.7; length of third metacarpal, 46; first phalanx, 16; second phalanx, 21; third phalanx, 16; length of fourth metacarpal, 46; first phalanx, 14; second phalanx, 17; length of fifth metacarpal, 46.5; first phalanx, 10.5; second phalanx, 14; ear, length/breadth, 13.5/9.5; tibia, 17; hind foot, 14 mm. — Skull: greatest length, 23.1; condylobasal length, 21.1; condyle to front of canine, 20.6; basal length, 18.4; palatal length, 9.7; zygomatic breadth, 14.3; breadth of braincase, 10.7; height of braincase, 9.1; mastoid breadth, 12.7; postorbital constriction, 6.1; width across molars, 8.4; width across cingula canines, 6.3; upper tooth-row, c-m³, 6.4; lower tooth-row, c-m₃, 7.4; length of mandible, 15.0; height of mandible, 6.1 mm.

Subfamily STENODERMATINAE

The Suriname Stenodermatinae are characterized by the combination of the following characters: (1) muzzle short and broad, with distinct nose leaf; (2) no external tail (fig. 32c-h); (3) interfemoral membrane moderately developed, more or less deeply emarginate behind, when the membrane is stretched the central part of its posterior margin fails to reach as far as a line connecting the ankles; (4) wing membranes from the distal part of the metatarsus near the base of the outer toes; (5) tooth-rows distinctly arcuate (pls. 29-32).

Some species of this subfamily are marked with a distinct longitudinal whitish line on the back of the body from about the shoulders to the caudal part of the rump, and with whitish supraorbital and infraorbital streaks, while some other species show a distinct white patch at the bases of the shoulders. These markings vary greatly within the species and may even be entirely absent.

At present nine species of Stenodermatinae are known from Suriname. It is probable, however, that also a form of the *Artibeus jamaicensis*-group occurs there; this form differs from *A. lituratus fallax* by its smaller average size, though its maximum values overlap the minimum values of the latter.

The main characters for the distinction of the Suriname Stenodermatinae are mentioned in the following key.

Key to the Suriname Stenodermatinae

- 1a. Length of forearm less than 35 mm; crown of head considerably elevated above the short muzzle *Ametrida centurio*, p. 155
- b. Length of forearm more than 35 mm 2
- 2a. Length of forearm more than 60 mm *Artibeus lituratus fallax*, p. 149
- b. Length of forearm less than 52 mm 3
- 3a. Upper (outer and inner) incisors distinctly bilobed (fig. 30a), the inner about twice as high as the outer. Length of forearm varying from about 39 to 45 mm; whitish dorsal stripe as well as the whitish supraorbital and infraorbital streaks usually distinct *Uroderma bilobatum bilobatum*, p. 140
- b. Outer upper incisors without distinct lobes 4
- 4a. Inner upper incisors slender, much longer than broad, about three times as long as the outer incisors (fig. 30c); nasal bones absent. Length of forearm varying from 45 to 48.5 mm; ventral surface of the interfemoral membrane densely haired *Chiroderma villosum villosum*, p. 145
- b. Inner upper incisors short and broad 5
- 5a. Length of forearm about 50 mm; inner upper incisors bilobed *Artibeus concolor*, p. 148
- b. Length of forearm less than 45 mm; interfemoral membrane narrow, central part of its posterior margin reaching at most to the level of the middle of the tibiae 6
- 6a. A dense fur covers the legs from the tibia to the ankle as well as the whole surface of the interfemoral membrane; a fringe of hairs extends along the posterior margin of that membrane. Length of forearm about 38 mm; postorbital constriction about 7.5 mm *Pygoderma bilabiatum*, p. 153
- b. Tibia and interfemoral membrane thinly haired or for the greater part naked. Postorbital constriction less than 6 mm 7
- 7a. Inner upper incisor distinctly bilobed, about twice as long as the outer (see fig. 30d); two upper and two lower molars; length of upper tooth-row, c-m², less than 7 mm. Length of forearm varying from 38.7 to 43.5 mm; the posterior

- margin of the ventral surface of the interfemoral membrane fringed in its middle only *Artibeus cinereus cinereus*, p. 146
- b. Inner upper incisor faintly trifid, much larger than the outer (fig. 30b); three upper and three lower molars; length of upper tooth-row, c-m³, more than 7 mm. Length of forearm varying from 36.5 to 41.3 mm; the entire posterior margin of the interfemoral membrane is fringed *Vampyrops helleri*, p. 143

***Uroderma bilobatum bilobatum* Peters, 1866**

Text-figs. 15f (head), 30a (incisors and canines), 32c (interfemoral membrane), pl. 29 (skull)

Uroderma bilobatum Peters, 1866, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1866: 394-395.

Type localities. — "St. Paulo in Brasilien", "Cayenne", and an unknown locality. Restricted by Cabrera (1958: 79) to Ipanema, São Paulo, Brazil.

Synonymies. — Cabrera, 1958: 79; Husson 1962: 159.

Vernacular names. — (E) Yellow-eared Bat.

Distribution. — The range of the species extends from Brazil, Bolivia and Peru north to Mexico. The nominate subspecies is known from Brazil and Ecuador north to the Guianas, Venezuela, Colombia, Central America and Mexico.

Occurrence in Suriname. — The brothers Penard ("De Surinamer", 12 March 1905) were the first to report this species (which they indicated as *Artibeus bilobatus*) from Suriname and mentioned that it once in a while is found in Paramaribo. Husson (1962: 159) mentioned the following Suriname specimens:

1. Agricultural Experimental Station (Cultuurtuin), north-western Paramaribo, Suriname District, 3 females (nos. 13078-13080, skins and skulls).
2. Suriname, without more precise locality indication, 1 female (ZMA no. 1617, skin and skull).

Description. — Length of forearm varying from 39.2 to 44.7 mm; nose leaf well developed, laterally with two rounded lobes; lancet about 11 mm long and 5 mm broad; ears longer than the nose leaf, broad, rounded off above; tragus small, the outer margin toothed; interfemoral membrane well developed, extending to about the middle of the distal part of the tibia, angularly emarginate behind; calcar short but distinct; no external tail; wing membrane from the terminal part of the metatarsus near the base of the outer toe; dorsal surface dull dark brown, ventral surface more light greyish brown, the anterior part above and beneath being somewhat lighter than the posterior parts; a narrow whitish stripe extends over the middle of the back from between the shoulders to the interfemoral membrane; the anterior part being sometimes very indistinct or quite obliterated; a supraorbital streak of white hairs runs from the side of the nose leaf to between the ears; there is an infraorbital white streak from the corner of the mouth to the base of the ear; fur extending to about half the forearm, above and beneath; interfemoral membrane nearly naked; white phalanges contrasting strongly with the dark brown wing membranes; margin of the ears yellowish white.

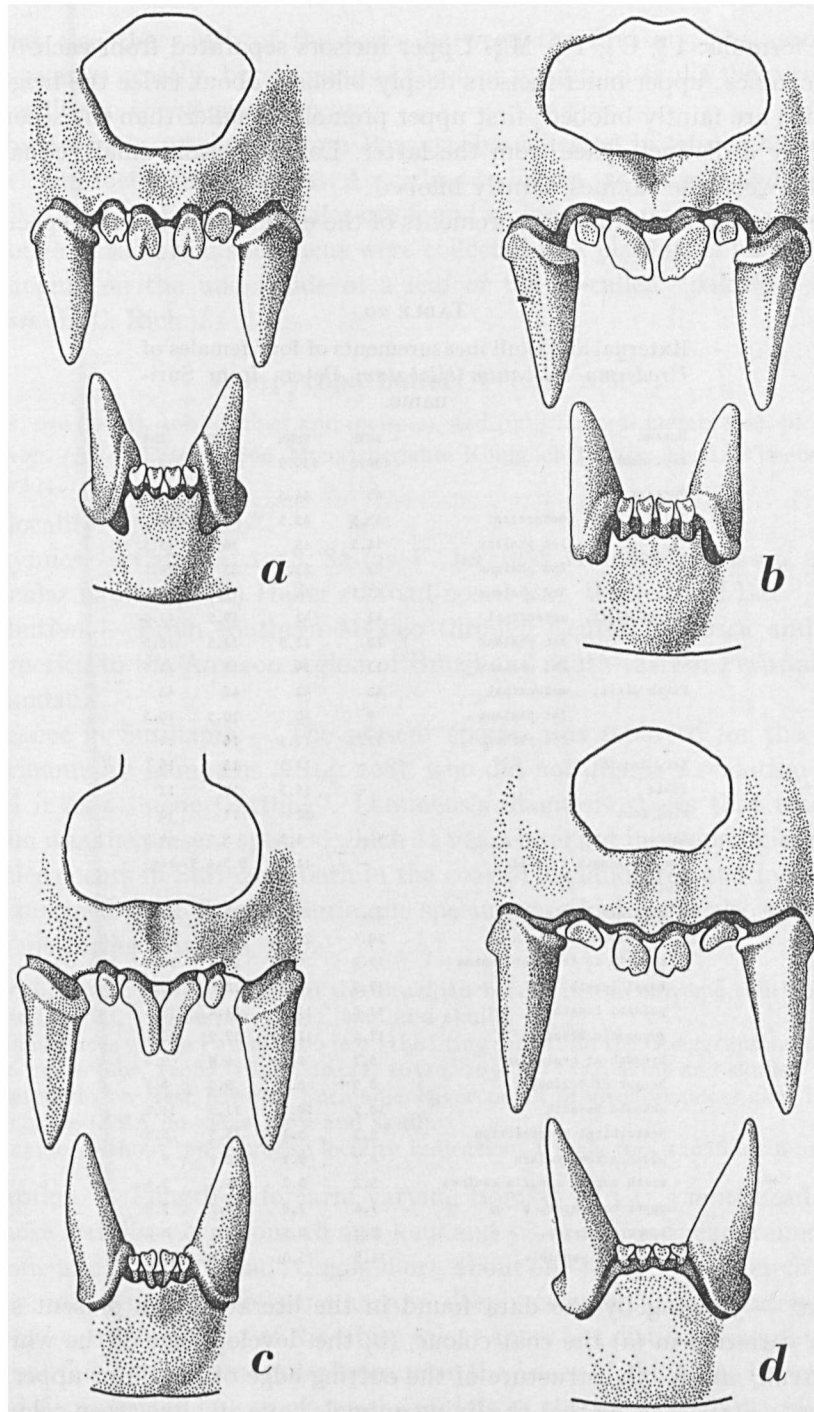


Fig. 30. Canines and incisors in front view. a, *Uroderma bilobatum bilobatum* Peters, no. 13080; b, *Vampyrops helleri* Peters, no. 16511; c, *Chiroderma villosum* Peters, SMN no. 1450; d, *Artibeus lituratus fallax* Peters, SMN no. 686-1. Width across cingula canines, in mm: a, 5.5; b, 5.6; c, 6.1; d, 8.6.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors separated from each other and from the canines; upper inner incisors deeply bilobed, about twice the height of the outer, which are faintly bilobed; first upper premolar smaller than the second, often separated by a distinct space from the latter. Lower incisors small, equal in size, crowded between the canines, faintly bilobed.

For the external and skull measurements of the examined Suriname specimens see Table 20.

TABLE 20
External and skull measurements of four females of
Uroderma bilobatum bilobatum Peters from Suri-
name.

Museum	RMNH	RMNH	RMNH	ZMA
Reg. number	13078	13079	13080	1617
Forearm	43	44.5	44.5	43.6
Third digit, metacarpal	43.5	43.5	42.5	42.5
1st phalanx	14.5	15	16	15.5
2nd phalanx	23	23.5	23	24.5
3rd phalanx	13.5	14	12.5	17.5
Fourth digit, metacarpal	42	42	40.5	42.5
1st phalanx	12	12.5	13.5	13.5
2nd phalanx	13	14	15	14.5
Fifth digit, metacarpal	42	42	42	43
1st phalanx	9	10	10.5	10.5
2nd phalanx	13.5	13.5	14	14
Ear, length	-	14.5	14	16
Tibia	-	16.5	17	17
Hind foot	-	11	11	10
Calcar	-	4.5	5.5	4.5
Lancet, length x breadth	-	11x5	9.5x4.5	11x5
Skull:				
greatest length	22.7	23.5	23.6	23.3
condylobasal length	20.4	21.1	21.3	21.1
condyle to front of canine	19.8	20.5	20.7	20.4
basal length	17.9	18.3	18.6	18.7
palatal length	11.0	11.4	11.4	11.6
zygomatic breadth	12.4	12.7	12.9	13.1
breadth of braincase	9.7	9.5	9.8	9.8
height of braincase	8.5	8.8	9.0	8.7
mastoid breadth	10.9	10.9	11.5	11.2
postorbital constriction	5.3	5.1	5.5	5.5
width across molars	8.7	9.1	8.9	9.1
width across cingula canines	5.2	5.2	5.5	5.4
upper tooth-row, $c - m^3$	7.6	7.8	8.2	7.8
lower tooth-row, $c - m_3$	8.2	8.5	8.7	8.2
length of mandible	14.6	15.0	15.2	15.2

Remarks. — Judging by the data found in the literature the present species is subject to variation in (a) the coat colour, (b) the development of the white dorsal median streak, and (c) the structure of the cutting edge of the outer upper incisors. Felten (1956: 344) observed that the living animals have an olive green colour, above and beneath, which, after death, changes on the dorsal surface into Saccardo's umber and on the ventral surface into dirty greyish brown. In the Suriname material I

found that also the width of the space between the first and the second upper premolars varies greatly, but in none of the four examined skulls these teeth touch each other like in the genus *Artibeus*.

The three female specimens from Paramaribo collected in September all have a well developed foetus in the uterus. According to Felten (1956: 345) and Goodwin & Greenhall (1961: 255) gravid females are found in January and May.

The above Paramaribo specimens were collected in a plantation where they were found hanging on the under side of a leaf of the so-called "paloeloe", *Ravenala guyanensis* (L. C. Rich.).

Vampyrops helleri Peters, 1866

Text-figs. 15c (head), 30b (canines and incisors), 32d (interfemoral membrane), pl. 29 (skull)

Vampyrops Helleri Peters, 1866, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1866: 392-394.

Type locality. — "Mexico".

Synonymies. — Cabrera, 1958: 82 (as *V. zarhinus* H. Allen); Husson, 1962: 162.

Vernacular names. — (E) Heller's Broad-nosed Bat, White-lined Bat.

Distribution. — From southern Mexico through Central America and northern South America to the Amazon region of Brazil and south-eastern Peru; also known from Trinidad.

Occurrence in Suriname. — The present species was reported for the first time from Suriname by Lammens (1844: 108), who did not give it a scientific name but indicated it as a "neue Gattung". Lammens's diagnosis shows that what he had before him was the present species, which 22 years later got its proper scientific name. The species occurs in Suriname both in the coastal lowland area and in the interior. I have examined the following Suriname specimens, which have also been reported upon by me earlier (Husson, 1962):

1. Near Sipaliwini airstrip, close to the Brazilian border in the extreme south-eastern part of Nickerie District, 1 male (no. 17372, skin and skull).
2. Various places within Paramaribo (e.g., the firing range and the Gonggrijpstraat), Suriname District, 6 males (nos. 12087, 16441, 16442, 16510, 16511, 17574, skins and skulls).
3. Brokopondo on west bank of Suriname River north of Brokopondo Lake, Brokopondo District, 1 male (ZMA no. 9842, skin and skull).
4. Suriname, without more precise locality indication, 1 male (no. 12086, skin and skull).

Description. — Length of forearm varying from 36.5 to 41.3 mm; head short and broad; nose leaf distinct, about 10 mm long and 5.5 mm broad; ears rounded, about 12 mm long and 8.5 mm broad; tragus short, about one-third or one-fourth the length of the ear; interfemoral membrane narrow, deeply concave behind, extending in the middle to the proximal part of the tibia; calcar short but distinct, about 4 mm long; no external tail; wing membranes from near the bases of the outer toes; fur rather short and dense, extending to about the middle of the forearm above and beneath, and on both surfaces of the wing membranes as far as a line drawn from the elbow to the knee; the dorsal surface of the tibia is covered with hairs; the interfemoral

membrane is thinly haired, while its posterior border is fringed with whitish hairs; the dorsal surface of the body is brownish, the hairs are light greyish brown, the extreme tips being more dark brown; the ventral surface is paler with more greyish, the chest is light greyish white; a narrow white median dorsal line extends from the crown of the head to the interfemoral membrane; the muzzle with two white streaks, one above and one below the eyes; the membranes are blackish or dark blackish brown, sharply contrasting with the whitish metacarpals and phalanges.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper inner incisors much larger than the outer, with broad oblique cusps, the cutting edges are faintly trifold or straight; the bases of the inner incisors are separated, the tips touch each other or are separated; the upper outer incisors scarcely reach to the cingulum of the canines, they are separated from that tooth as well as from the inner incisors (at least in the Suriname specimens at hand), the cutting edges are faintly bifid or straight; the first upper premolar is smaller than the second, being about half as high; it is in contact with the canine and with the second premolar; the last molar is small, its longitudinal diameter is about one-third of that of the second molar. The lower incisors completely

TABLE 21

External and skull measurements of eight males of *Vampyrops helleri* Peters from Suriname in the Leiden Museum.

Reg. number	12087	12086	16510	17372	17574	16442	16441	16511
Forearm	40.2	40	39.9	38.0	39	-	40.9	40.2
Third digit, metacarpal	39	-	38	38.5	39	39	41	40
1st phalanx	14	-	13	13.5	14	14	14.5	14.5
2nd phalanx	24	-	22	22	22	22	24	22.5
3rd phalanx	14	-	10	12.5	14	15	15	15
Fourth digit, metacarpal	38	-	36	36.5	37	37	40	39
1st phalanx	12	-	11	11.5	12	11	12.5	12.5
2nd phalanx	14.5	-	14	13.5	14	13.5	15.5	15
Fifth digit, metacarpal	39	-	38	38.5	39	38.5	41	40
1st phalanx	10.5	-	9	9.5	10	9.5	10	10.5
2nd phalanx	12.5	-	11	12	13	11.5	13	13.5
Tibia	15	-	-	14	-	-	-	16
Hind foot	9	-	-	10	-	-	-	11
Calcar	3	-	-	4	-	-	-	4
Ear, length x breadth	11x8	-	-	14x10	-	-	-	12x8.5
Skull:								
greatest length	21.5	21.4	21.4	22.1	-	-	22.3	22.1
condylobasal length	19.2	19.3	19.4	19.7	-	-	20.2	19.7
condyle to front of canine	18.8	19.0	19.0	19.5	-	-	19.6	19.3
basal length	16.6	16.7	16.3	17.4	-	-	17.4	17.3
palatal length	9.3	10.0	9.3	10.7	-	-	10.2	10.1
zygomatic breadth	12.6	12.1	13.1	12.9	-	-	-	13.2
breadth of braincase	9.9	9.2	9.7	9.5	-	-	9.6	9.8
height of braincase	8.9	-	8.7	9.2	-	-	9.6	9.4
mastoid breadth	11.1	10.5	11.1	11.0	-	-	10.8	11.1
postorbital constriction	5.8	5.5	5.5	5.5	-	-	5.7	5.6
width across molars	9.4	8.8	9.4	9.2	-	-	9.5	9.6
width across cingula canines	5.3	5.2	5.3	5.3	5.1	5.3	5.3	5.5
upper tooth-row, c = m ³	7.8	7.7	7.8	7.7	7.6	7.7	8.1	8.2
lower tooth-row, c = m ₃	8.3	8.3	8.3	8.4	8.0	8.2	-	8.7
length of mandible	14.2	14.3	14.2	14.5	-	-	-	15.0

fill the space between the canines, forming a nearly straight row, their cutting edges are faintly bifid; the first lower premolar is smaller than the second, being about half as high as that tooth; the second lower premolar is about as high as the canine; the third premolar is small, measuring about half the length of the second.

External and skull measurements of the eight examined Suriname specimens are given in Table 21.

Remarks. — As Husson (1962: 165) pointed out, the characters provided by the inner upper incisors are strongly variable and do not have the great diagnostic value attached to them by some authors.

The species seems often to be found hanging in pairs in the crumpled old leaves of the wild banana tree (*Heliconia bihai*) (see Husson, 1962).

Since *Vampyroops recifinus*, originally described by Thomas (1901c: 192) from Pernambuco, Brazil, is also found in Guyana, its occurrence in Suriname is probable. This species differs from *V. helleri* by its greater size; according to Sanborn (1955: 413) the length of the forearm in *V. recifinus* varies from 41.0 to 43.0 mm, the greatest length of the skull from 23.9 to 24.1 mm, and the length of the upper tooth-row from 8.3 to 8.9 mm.

Chiroderma villosum villosum Peters, 1860

Text-figs. 15e (head), 30c (canines and incisors), 32e (interfemoral membrane), pl. 32 (skull)

Chiroderma villosum Peters, 1860, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1860: 748-754.

Type locality. — "Habitatio: Brasilia".

Synonymies. — Cabrera, 1958: 85; Husson, 1962: 166.

Vernacular names. — (E) Peters' White-lined Bat.

Distribution. — The range of the species extends from Brazil and Colombia north to Central America and southern Mexico. The nominate subspecies is known from Brazil, Suriname, Trinidad, Tobago and Venezuela.

Occurrence in Suriname. — Kappler (1881: 163) was the first to report the present species from Suriname and until recently his specimen (listed below under 2) was the only one known from the country. In 1966, however, Dr. H. Nijssen of the Zoological Museum of Amsterdam collected a female (lot no. 1 below) by using a mist net. The material from Suriname seen by me is the following:

1. Brokopondo on the west bank of Suriname River, north of Brokopondo Lake, Brokopondo District, 1 female (ZMA no. 9343, skin and skull).

2. Suriname, without more precise locality indication, 1 female (SMN no. 1450, skin and skull).

Description. — Length of forearm varying from 44.1 to 48.2 mm; nose leaf well developed, lancet about 11 mm long and 6.5 mm broad; ears broad, rounded above; tragus small, about one-third the ear length; interfemoral membrane well developed, in the middle reaching to about the level of the distal end of the tibia, angularly emarginate; calcar distinct; no external tail; wing membranes from near the base of the outer toes; fur extending to about three-fourths the forearm and on the legs,

also the interfemoral membrane is ventrally densely hairy; the white supraorbital and infraorbital facial stripes and the white median dorsal streak indistinct, sometimes absent; dorsal surface of body light greyish brown, the bases and the tips of the hairs brown, the middle parts yellowish; ventral surface of body darker than the upper parts because of the longer brownish tips of the hairs.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{2}{2}$. The most striking character is the absence of nasal bones, their place being occupied by an emargination extending back to between the orbits. Upper incisors separated at their bases by a small space, a small space is likewise found between the upper incisors and the canines; inner upper incisors in contact with each other about the middle of their length, about three times as high as the small outer incisors, which scarcely reach the cingulum of the inner; first upper premolar much smaller than the second, about half the height of the latter, and separated from it by a distinct space; second upper molar larger than the first. Lower incisors of about the same size, the outer slightly smaller than the inner, evenly spaced between the canines, scarcely reaching the height of the inner margin of the canines; first lower premolar small, placed close to the canine but separated by a distinct space from the large second premolar; second lower molar about 1.5 times the length of the first.

External and skull measurements of the examined Suriname specimens (first no. 1, then no. 2; in parentheses the measurements of the type as given by Peters, 1860: 753-754). Forearm, 44.1, 47.3, (45); length of third metacarpal, 46, 47, (45); first phalanx, 16, 16.5, (17); second phalanx, 23.5, 26, (25); third phalanx \pm 20, 20, (21); length of fourth metacarpal, 43.5, 45.8, (44); first phalanx, 15, 15, (16); second phalanx, 16.5, 16.5, (18); length of fifth metacarpal, 43, 46.5, (45); first phalanx, 10.5, 11.5, (11); second phalanx, 13, 13, (15); ear, length, 15, 15, (16); ear, breadth, 9, 7.5, (11); tragus, 6.5, 6.5, (5.5); tibia, 17.5, 18, (16); hind foot, 11, 12.5, (13); calcar, 7.5, 6.5, (7.5) mm. — Skull: greatest length, 24.6, 25.0, (25.75); condylobasal length, 22.7, 22.7; condyle to front of canine, 21.9, 22.1; basal length, 20.3, 20.3; palatal length, 14.6, 13.8; zygomatic breadth, 16.2, 15.7, (16.5); breadth of braincase, 10.7, 11.0; height of braincase, 9.9, 9.7; mastoid breadth, 12.5, 12.3, (12.3); postorbital constriction, 5.8, 6.0; width across molars, 11.6, 11.4; width across cingula canines, 6.2, 6.1; upper tooth-row, c-m², 9.2, 9.0; upper tooth-row, p²-m², 6.2, 6.1; lower tooth-row, c-m₂, 9.7, 9.7; lower tooth-row, p₂-m₂, 6.8, 6.7; length of mandible, 16.5, 16.6 mm.

Artibeus cinereus cinereus (Gervais, 1856)

Text-fig. 15d (head), pl. 30 (skull)

Dermanura cinereum Gervais, 1856, in De Castelnau, Animaux nouveaux rares Amérique (Mammifères): 36, pl. 8 fig. 4, pl. 9 fig. 4, 4a, pl. 11 fig. 3.

Type locality. — "Brésil". Restricted by Cabrera (1958: 87) to Pará, northern Brazil.

Synonymies. — Cabrera, 1958: 87; Husson, 1962: 169.

Vernacular names. — (E) Pygmy Fruit Bat.

Distribution. — The species occurs in Central America from southern Mexico south, and in northern South America from Brazil, Bolivia and Peru north. The nominate subspecies inhabits Venezuela, Trinidad and Tobago, the Guianas and north-eastern Brazil as far south as Pernambuco.

Occurrence in Suriname. — The species was first reported from Suriname by Peters (1865: 358), who based a presumed new species *Artibeus (Dermanura) quadrivittatus* on Suriname material of the present species. Also later authors reported the species from Suriname (see Husson, 1962: 169), but their material is just labelled "Suriname", as is the material seen by myself: 4 males (no. 13113, SMN nos. 574.1, 3, and 861, 1, skins and skulls), 4 females (SMN nos. 527, 574, 2, 861, 2, ZMH no. 38985, skins and skulls), 1 holotype of *Artibeus quadrivittatus* (no. 13114, skin and skull).

Description. — Length of forearm varying from 38.7 to 44 mm; nose leaf well developed; ears rather short and broad, rounded above; interfemoral membrane narrow, deeply emarginate behind, in the centre reaching at most as far as a line connecting the middle of the two tibiae; calcar short but distinct, about 4.5 mm long; no external tail; wing membrane from near the base of the outer toe. Fur short, dense and soft, extending dorsally over the upper arm and to the basal third of the forearm; on the wing membranes a narrow hairy area borders the sides of the body; the basal fourth of the interfemoral membrane is pubescent, on the remainder of the membrane the hairs are so short and few that it gives the impression of being almost naked. On the ventral surface the upper arm and the basal third of the forearm are much less densely pubescent than on the dorsal surface; on the ventral surface of the interfemoral membrane the fur extends as a rather broad streak over the median part of the membrane from the rump to the posterior margin. The dorsal surface of the body is dark brown; the tips of the hairs are mummy brown, gradually passing into paler brown, the bases being lightest. The colour of the ventral surface is much lighter, the hairs are here uniformly light brown. On the head there are whitish supraorbital and infraorbital streaks, of which the supraorbital, at least in my specimens, is very distinct, while the infraorbital streak is faintly indicated or practically absent. The wing membranes are dark brown, the area between the third phalanges of the third and fourth digits is lighter.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{2}{2}$. Skull and teeth closely resemble those of *Artibeus lituratus fallax*, but the third upper and lower molars in *A. cinereus* are always absent. The sagittal crest is well defined but low, about 1.0 mm high.

The external and skull measurements of eight specimens from Suriname are given in Table 22.

Remarks. — The holotype of *Artibeus quadrivittatus* Peters is present in the Leiden Museum under reg. no. 13114. The dried skin is strongly bleached, but in other respects rather well preserved. Peters did not examine the skull of his holotype, which was still inside when I first examined the specimen. After extracting and cleaning, the skull proved to be damaged (pl. 30); the few measurements taken by me are given in Table 22.

TABLE 22

External and skull measurements of eight specimens of *Artibeus cinereus cinereus* (Gervais) from Suriname. RMNH reg. no. 13114 is the holotype of *Artibeus quadrivittatus* Peters.

Museum	RMNH	RMNH	SMN	SMN	ZMH	SMN	SMN	SMN
Reg. number	13114	13113	861,1	574,1	38985	861,2	574,2	527
Sex	?	♂	♂	♂	♀	♀	♀	♀
Forearm	40	38.7	39.6	40.5	40.6	40.6	43.2	42
Third digit, metacarpal	36	37	38	40	38.5	40	39	40
1st phalanx	15	13	14	13	14.5	14	14	14
2nd phalanx	19.5	19.5	21.5	22	21	21.5	21.5	22
3rd phalanx	9	13	15	16	13	13	12	-
Fourth digit, metacarpal	36	37.5	37	38.5	38.5	39	39.5	39
1st phalanx	12	11	11.5	12	12.5	12.5	13	13
2nd phalanx	14	12	14	14.5	14.5	15.5	14.5	-
Fifth digit, metacarpal	37	38	38.5	40	39	40.5	40.5	39
1st phalanx	10	8.5	9	9	10	10	10	9
2nd phalanx	9	10	12	13	13	14	13	-
Tibia	-	14	13.5	14.5	14.5	15	14	-
Hind foot	-	9	10	9	10	10	10	-
Calcar	-	3	5	4.5	4.5	4	4.5	-
Skull:								
greatest length	-	18.6	20.0	20.2	18.7	19.7	20.6	-
condylobasal length	-	16.5	18.3	17.9	16.7	17.9	18.2	-
condyle to front of canine	-	16.1	17.8	17.5	16.4	17.5	17.8	-
basal length	-	14.5	16.2	15.9	14.7	15.5	16.2	-
palatal length	-	8.3	9.1	9.6	8.7	9.4	10.1	-
zygomatic breadth	-	11.3	11.7	11.6	11.3	11.7	11.8	-
breadth of braincase	-	8.7	9.2	8.7	8.6	8.6	9.1	-
height of braincase, without crest	-	7.9	8.0	8.2	8.2	8.2	8.7	-
mastoid breadth	-	10.0	11.4	10.3	9.8	10.0	10.4	-
postorbital constriction	4.4	4.5	5.0	4.5	5.0	4.6	4.6	4.9
width across molars	8.0	8.3	8.4	8.8	7.7	8.3	8.5	8.6
width across cingula canines	5.1	5.5	5.4	5.7	5.1	5.5	5.6	5.5
upper tooth-row, c - m ³	6.6	5.8	6.5	6.8	6.1	6.8	6.6	6.7
lower tooth-row, c - m ₃	6.7	6.2	6.6	6.9	6.2	6.9	6.7	6.7
length of mandible	12.7	11.7	12.8	12.1	12.3	12.7	12.9	12.7

HersHKovitz (1949a: 449) pointed to the probable identity of *Artibeus quadrivittatus* with the typical *A. cinereus*. Though I have no Brazilian material of the genuine *A. cinereus* at my disposal, a comparison of my Suriname material with the data on the two forms found in the literature has convinced me that HersHKovitz's opinion is entirely correct.

Artibeus concolor Peters, 1865

Artibeus concolor Peters, 1865, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1865: 357-358.

Type locality. — "Paramaribo (Surinam)".

Synonymies. — Cabrera, 1958: 88; Husson, 1962: 177.

Vernacular names. — (E) Suriname Fruit Bat.

Distribution. — Suriname; Brazil (upper and lower Amazon region).

Occurrence in Suriname. — Apart from the single type specimen (in the Berlin Museum) no specimen of this species has ever been reported from Suriname. In the extensive Suriname collections seen by me the species is not represented.

Description. — The original description is rather short, and contains a few external measurements only; some skull measurements of the type have been published by Thomas (1892a: 409 footnote).

From the data found in literature it appears that *Artibeus concolor* agrees most closely with *A. lituratus fallax* Peters, but is much smaller, the length of the forearm in the former species being about 50 mm, in the latter about 66.5 mm, while the length of the tooth-row, c-m², varies in *A. concolor* from 7.2 to 7.5 mm, in *A.l. fallax* from 10.4 to 11.2 mm.

The following external and skull measurements of an adult female are given by Andersen (1908: 246, table); in parentheses the measurements of the type as given by Peters and Thomas. Forearm, 50 (47); length of the third metacarpal, 46.7; first phalanx, 16; second phalanx, 24; third phalanx, 13.2; length of fourth metacarpal, 45; first phalanx, 13.2; second phalanx 16.2; length of fifth metacarpal, 45.2; first phalanx, 11.5; second phalanx 13.2; ear, length, outer margin, 17.7 (16); ear, breadth, 14; tragus, 6; nose leaf, lancet, length × breadth, 9.8 × 6 (nose leaf, total length, 12.5); tibia, 18.6 (18); hind foot, 11.8; calcar, 6.8; (depth of interfemoral membrane, 16) mm. — Skull: greatest length to front of canine, 22.4; mastoid breadth, 11.8; breadth of braincase, 10.3; zygomatic breadth, 14; width across m¹, 9.4; (breadth of palate outside m¹, 9.9 or 10); width across cingula canines, 6.4; upper tooth-row, c-m², 7.2 (7.5); lower tooth-row, c-m₂, 8; length of mandible, 14.8 mm.

Remarks. — Also outside Suriname the species is evidently quite rare. In 1962 only four specimens were known: the type which at that time could not be located, a specimen from the Upper Amazon in the British Museum, which could not be located either, and two specimens from Pará, Brazil.

Artibeus lituratus fallax Peters, 1865

Text-figs. 15b (head), 30d (canines and incisors), 32g (interfemoral membrane), pl. 30 (skull)

Artibeus fallax Peters, 1865, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1865: 355-357.

Type locality. — "Guiana" and "Surinam". Restricted by lectotype selection by Husson (1962: 175) to Suriname.

Synonymies. — Cabrera, 1958: 89; Husson, 1962: 172.

Vernacular names. — (E) Greater Fruit Bat; (N) Stompbekvleermuis.

Distribution. — The range of the species extends from southern Mexico south through Central America to Paraguay and northern Argentina; it has also been reported from the Lesser Antilles. *A. lituratus fallax* is known from the Amazon basin in Brazil, the Guianas and Venezuela.

Occurrence in Suriname. — A rather common species in Suriname; it has been found both in the coastal lowland area and in the deep interior. It is possible that

the species was first reported from Suriname by Von Sack (1801: 254), but as pointed out by Husson (1962: 175) von Sack's description might equally well refer to *Phyllostomus hastatus*. Lammens (1844: 107) certainly meant the present species, which he dealt with under the name *Vespertilio spectrum*. Several later authors (Peters, 1865: 355; Kappler, 1881: 163; Jentink, 1887: 292; Jentink, 1888: 208) mentioned the present species from Suriname without adding new distribution data.

The brothers Penard ("De Surinamer", 12 March 1905) referred to the present species as 'one of the most common fruit- and insect-eating bats in the town and surroundings of Paramaribo'. Husson (1962: 172-173) listed most of the following Suriname material of the present species, to which are now added the specimens received by the Leiden Museum since 1962:

1. Sipaliwini savanna near the Sipaliwini airstrip, not far from the Brazilian border, extreme south-eastern part of Nickerie District, 1 female (no. 17384, skin and skull).
2. Wageningen, northern Nickerie District, 1 male (no. 24710, skin and skull).
3. Kwatta weg, west of Paramaribo, Suriname District, 1 male (no. 17383, skin and skull).
4. Weg naar Zee, north of Paramaribo, near mouth of Suriname River, 1 female (no. 24713, skin and skull).
5. Plantation "Ma Retraite", northern outskirts of Paramaribo, 2 males (nos. 13110, 13111, skins and skulls).
6. Agricultural Experimental Station (Cultuurtuin), north-western part of Paramaribo, 3 males (nos. 7484, 7485, 12004, skins and skulls).
7. Paramaribo, 5 males (nos. 13089, 13090, 17385, 17386, skins and skulls; 5004, skull), 5 females (nos. 13087, 13088, 13095, ZMA no. 1647, skins and skulls; no. 5003, skull).
8. Plantation "Welgedacht C", just south of Paramaribo, 1 female (no. 24714, skin and skull).
9. Mijnzorgweg, 10 km south of Paramaribo, 1 female (no. 13112, skin and skull).
10. Powakka, Amerindian village, west of Suriname River, about 5°26'N 55°4'W, Suriname District, 3 specimens (no. 25255, skins and skulls).
11. Zanderij airport, about 40 km south of Paramaribo, Para District, 1 female (no. 24711, skin and skull).
12. Moeroemoeroe Creek, upper Saramacca basin, north-western Brokopondo District, 1 female (no. 24715, skin and skull).
13. Brokopondo, west bank of Suriname River, north of Brokopondo Lake, Brokopondo District, 2 females (ZMA nos. 9207, 9209, skins and skulls).
14. Galibi, mouth of Marowijne River, Marowijne District, 2 males (nos. 13103, 13105, skins and skulls), 11 females (nos. 13097-13102, 13104, 13106-13109, skins and skulls).
15. Suriname, without more precise locality indication, 8 males (nos. 13081 (paralectotype), 13083 (lectotype), 13092-13094, 24689, 24712, SMN no. 686-2, skins and skulls), 11 females (nos. 13082 (paralectotype), 13086, 13091, 13096, 24690, 24691, 24708, 24709, SMN no. 686-1, 993-1, 2, skins and skulls), 1 specimen (no. 13085, skin and skull), 3 skulls (nos. 13084, 17645, 17646).

Description. — Length of forearm varying in the examined Suriname material from 60.1 to 74.9 mm (mean about 66 mm); nose leaf well developed, length of lancet about 10.5 mm, breadth of lancet about 8 mm; ears shorter than the head, broadly rounded; tragus short; interfemoral membrane moderately developed, emarginate behind, when stretched reaching to about the level of the middle of the tibiae; calcar relatively short, about 7 mm; no external tail; wing membranes from the metatarsus, nearer to the base of the outer toes than to the ankles. Fur soft,

dense and short; dorsally it extends to about the middle of the forearm and on the wing membranes as far as a line connecting the elbow and the knee; the base of the interfemoral membrane is loosely haired. The ventral surface is loosely haired as far as a line connecting about the middle of the forearm and the knee, and on the base of the interfemoral membrane. The general coat colour of the back of the body varies from dark greyish brown to darker brown, the ventral surface is somewhat paler. The bases of the hairs of the dorsal surface are light greyish or light buff, followed by a broad band of darker colour, while the tips are darkest; the hairs of the ventral surface are more uniformly greyish or brownish with the extreme tips somewhat paler. The two whitish facial stripes, one above and one beneath the eye, vary greatly: in some specimens these stripes are distinct (the supraorbital stripe is usually well defined), in others weakly developed or even absent; there is no trace of a longitudinal whitish stripe on the back of the body. The wings have a broad white coloured tip, which gives this bat a characteristic appearance. The rest of the wings is dark blackish brown or more dark brown.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$ (or $\frac{2}{2}$). Outer upper incisors small, not rising to the level of the cingulum of the canines, about half as high as the inner incisors; the cutting edge of the outer incisors is entire, it is as long as that of the distinctly bilobed inner incisors; all four upper incisors are either separated from each other and from the canines by small spaces (see fig. 30d) or touch each other (see Andersen, 1908: fig. 41d). First upper premolar, about half as high as the canine, distinctly smaller than the second premolar, touching both the canine and the second premolar; third upper molar reduced, smaller than the outer upper incisor, in some specimens even absent. Lower incisors forming a nearly straight row and completely filling the space between the canines; they are about equal in size, with faintly bilobed cutting edges. First lower premolar triangular with its base as broad as that of the second premolar; third molar small, usually present, rarely wanting. Skull robust; sagittal crest well developed, both in males and females, its height varying from 0.3 to 0.6 mm.

The external and skull measurements of ten specimens from Suriname are given in Table 23.

The four white facial stripes are variable in the Suriname specimens: in some specimens they are very distinct, in others hardly visible or wanting. Also the coat colour is subject to variation, of which Andersen (1908: 236, under *A. planirostris*) already remarked: "Thus there are three stages of colour: a dark and dull smoky brown, a dark brown, and a Prout's brown; the two former come very near to each other, the third, when fully developed, is different at a glance. The first is confined to the immature age; the second is characteristic of a majority of adults; the third seems to occur only in some fully adult and aged individuals". This statement is fully confirmed by the Suriname material at hand.

As to the presence of the small third upper molar, in my Suriname material I found that in 26 of 34 skulls this molar is present, in 7 skulls it is absent, while in

TABLE 23

External and skull measurements of ten specimens of *Artibeus lituratus fallax* Peters from Suriname. RMNH reg. no. 13083 is the lectotype of *Artibeus fallax*.

Museum		RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	SMN	
Reg. number		13083	13092	13103	13105	13089	13096	13107	13100	13109	686,1
Sex		♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm		65	62.7	62.8	63	66.2	65.5	65.8	65.8	66.2	68.4
Third digit,	metacarpal	60	58	59	58.5	62.5	63.5	62	60.5	63	67
	1st phalanx	18	18.5	19	19	21	21	20	19	20	24
	2nd phalanx	30	31.5	30	31	34.5	33	33	33	31	37.5
	3rd phalanx	-	21	23	23	25	25	24	24	24	24
Fourth digit,	metacarpal	57	57	58	57	60.5	64.5	61.5	59	61.5	66
	1st phalanx	15	16.5	16	17	17	18	17	16	18	19
	2nd phalanx	22	23	22	23	25.5	23	23	26	23	27
Fifth digit,	metacarpal	60	58.5	59	58.5	62.5	65.5	63.5	60.5	63	68
	1st phalanx	11	11	13	13	14	13	14	13	12	15
	2nd phalanx	17	18	18	18	20	18	19	15	18	20
Tibia		24	23	23	23	26	24	25	24	26	26
Hind foot		15	15	15	15	15	16	17	16	16	16
Calcar		6	6	8	7	8	5	6	7	6	7
Skull:											
	greatest length	30.5	29.1	29.9	30.0	30.2	30.2	30.1	30.6	31.4	31.3
	condylobasal length	27.3	25.9	26.6	26.8	27.2	26.8	27.1	27.7	27.7	28.5
	condyle to front of canine	26.4	25.0	25.6	26.1	26.7	26.2	26.1	26.9	26.9	27.7
	basal length	24.1	23.2	23.5	23.8	24.0	23.6	23.8	24.6	24.7	24.9
	palatal length	15.6	14.1	14.6	14.1	14.8	14.9	14.8	15.2	15.1	15.0
	zygomatic breadth	18.2	18.4	18.4	19.2	18.7	19.4	19.0	19.6	19.2	19.3
	breadth of braincase	12.9	12.9	13.1	13.4	13.4	13.5	13.1	13.8	13.6	13.4
	height of braincase										
	without crest	11.3	11.8	11.5	11.8	11.6	12.0	11.2	12.0	12.0	12.0
	mastoid breadth	16.4	16.0	16.4	16.8	16.5	17.0	16.3	16.7	16.7	17.0
	postorbital constriction	7.4	7.3	7.9	7.2	7.3	7.6	7.2	7.7	7.2	6.3
	width across molars	13.8	13.3	13.3	13.1	13.8	14.0	14.2	14.3	13.8	14.8
	width across cingula canines	8.7	8.5	8.2	8.5	8.6	8.6	8.9	9.1	9.0	8.6
	upper tooth-row, c - m ³	11.2	10.6	11.2	10.8	10.9	11.0	11.0	11.3	11.3	11.2
	lower tooth-row, c - m ₃	11.8	11.7	12.3	11.5	11.8	11.6	12.1	12.2	12.4	12.2
	length of mandible	21.4	19.6	20.3	20.3	20.6	20.3	20.7	21.1	21.5	21.9

one skull it is present on one side of the upper jaw only. The small third lower molar is present in all skulls examined.

Remarks. — *Artibeus lituratus fallax* is a fruit-eating bat and can inflict considerable damage to fruit trees. When the mangoes (*Mangifera indica* L.) are ripe, these bats will flutter all evening among the mango trees, eating from the ripe fruit that are still attached to the branches; by their activities the bats cause many fruits to fall to the ground, which noise, together with the fluttering sound, draws the attention to the bats.

The specimens from Galibi were found hanging in a cluster of 16 on the under side of a leaf of a coconut palm, and were killed with one shot. One female of this cluster (no. 13099) had a well developed foetus in its uterus; the date, 4 November, is interesting, since Goodwin & Greenhall (1961: 261) noted gravid females of *Artibeus lituratus palmarum* in Tobago material from "March, April, May, June, and July". In Paramaribo specimens were observed in houses.

Pygoderma bilabiatum (Wagner, 1843)

Text-figs. 31a (canines and incisors), 32h (interfemoral membrane), pl. 32 (skull)

Phyllostoma bilabiatum Wagner, 1843, *Archiv Naturgeschichte*, 9 (1): 366.

Type locality. — "Ypanema", São Paulo State, Brazil.

Synonymies. — Cabrera, 1958: 91; Husson, 1962: 184.

Vernacular names. — (E) Ipanema Bat.

Distribution. — The range of the present species extends from Paraguay and eastern Brazil to Suriname.

Occurrence in Suriname. — Peters (1863: 83-85) described material of the present species from "Surinam" as a new species, *Stenoderma* (*Pygoderma*) *microdon*. No Suriname material of *Pygoderma bilabiatum* has been reported upon since, and I have seen no Suriname specimens of it.

Description. — Length of forearm about 38 mm; nose leaf well developed, about 12.5 mm long and 8.5 mm broad, resembling that of *Artibeus cinereus*; ears rather broad, rounded above, about 17 mm long and 11.5 mm broad; tragus small; interfemoral membrane moderately developed, semicircularly emarginate, if stretched reaching to about the middle of the tibia; calcar small but distinct, about 5 mm long; no external tail; wing membrane from near the base of the outer toe; hairs rather long, dense and soft, dorsally the bases of the hairs are dark brown, the middle part pale buff, the tips dark brown; ventrally the hairs are uniformly greyish brown; heavy fur on the upper arm and on the proximal three-fourths of the forearm, ending there rather abruptly; on the wing membranes above and beneath the fur extends to a line connecting the distal fourth of the forearm to the knees; the legs and the interfemoral membrane are densely furred, the former to the ankles, the latter on its whole surface with a fringe along the posterior margin; a small patch of white hairs is present on each shoulder, at the origin of the antebrachial membrane.

Dentition: I $\frac{2}{2}$, C $\frac{1}{1}$, P $\frac{2}{2}$, M $\frac{2}{2}$. Upper incisors completely filling the space between the canines, the inner are conspicuously larger than the very small outer, which scarcely reach above the gums, the former in contact basally, their tips being wide apart; the outer side of the inner incisors with a secondary cusp near the middle; upper premolars nearly equal in size, the first a shade smaller than the second; first upper molar slightly longer than the second premolar; second upper molar about one-third of the length of the first. Lower incisors forming a continuous row between the canines, they are equal in size, deeply grooved above and on the front; lower premolars equal in size, slightly shorter than the canines; first lower molar somewhat larger than the premolars, the second molar about one-third the size of the first.

The following are the external and skull measurements of two Brazilian specimens (nos. 17391 and 17392, respectively); in parentheses some of the measurements of the type of *Stenoderma microdon* are given as these were published by Peters in 1863. Forearm, 38, 38, (38); length of third metacarpal, 39, 37; first phalanx, 18, 17;

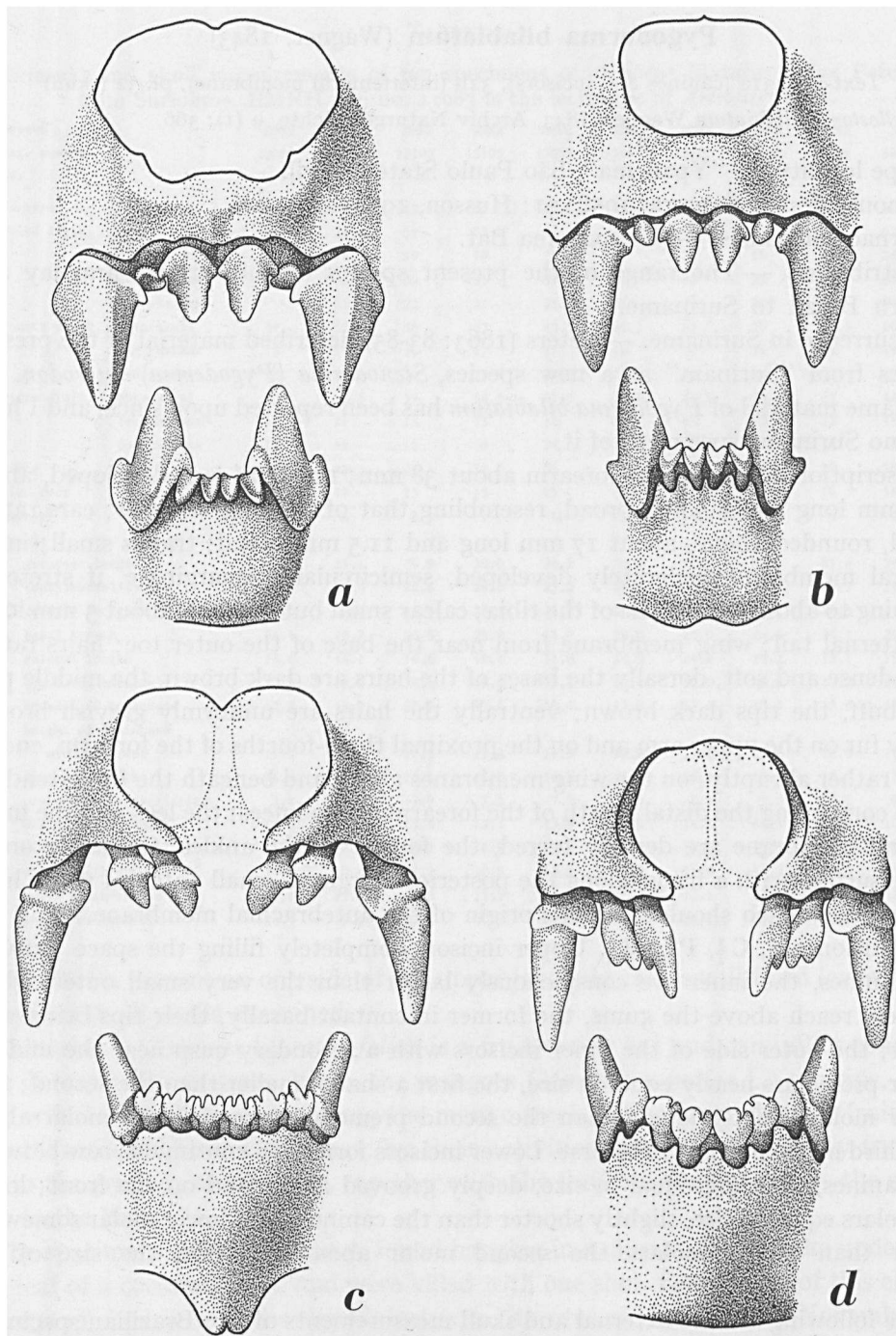


Fig. 31. Canines and incisors in front view. a, *Pygoderma bilabiatum* (Wagner), no. 17392; b, *Ametrida centurio* Gray, SMN no. 1633; c, *Furipterus horrens* (F. Cuvier), SMN no. 684; d, *Thyroptera tricolor tricolor* Spix, SMN no. 1302-2. Width across cingula canines, in mm: a, 6.4; b, 4.5; c, 2.8; d, 2.9.

second phalanx, 26, 27; third phalanx, 12, 10, (total length of third digit, 89); length of fourth metacarpal, 38.5, 38; first phalanx, 12, 12.5; second phalanx, 16, 16, (total length of fourth digit, 65); length of fifth metacarpal, 38, 40; first phalanx, 11, 11; second phalanx, 14, 12, (total length of fifth digit, 62); ear, length, (17); ear, breadth, (11.5); tragus, (7); tibia, (16.5); hind foot, 15, 15, (13.7); depth of interfemoral membrane, 15, 15, (12); calcar, 5, 5, (5); nose leaf, length \times breadth, (12.5 \times 8.5) mm. — Skull: greatest length 20.7, —, (19.6); condylobasal length, 18.4, 18.0; condyle to front of canine, 18.0, 17.6; basal length, 7.2, 7.0; palatal length 15.7, 15.3; zygomatic breadth, 14.3, 15.3, (13.4); breadth of braincase, 10.3, 10.3; height of braincase, 9.2, 9.8; mastoid breadth, 12.7, 12.7; postorbital constriction, 7.5, 7.6, (7.5); width across molars, 8.6, 8.3; width across cingula canines, 6.4, 6.4; upper tooth-row, c-m², 6.3, 6.0, (6); lower tooth-row, c-m₂, 6.5, 6.1, (5.5); length of mandible, 12.3, 12.3 mm.

Remarks. — The original description of *Stenoderma microdon* was based on two males from Suriname, preserved in alcohol (Peters, 1863: 84). Dr. G. H. H. Stein of the Berlin Museum informed me that these specimens cannot now be found in the collections of his Museum. In the material of Suriname bats at hand no specimens of Peters's species were found.

Ametrida centurio Gray, 1847

Text-figs. 21h (head), 31b (canines and incisors), 32f (interfemoral membrane),
pl. 31 (skull ♂ and ♀)

Ametrida centurio Gray, 1847, Proc. Zool. Soc. London, 15: 15.

Type locality. — "Pará, Brazil". Restricted (or redefined) by Peterson (1965: 5, 8) to the town of Belém, Pará State, Brazil.

Synonymies. — Cabrera, 1958: 92 (as *A. centurio* and *A. minor*); Husson, 1962: 179 (as *A. minor* on p. 182); Peterson, 1965: 5.

Vernacular names. — (E) Wrinkled-faced Bat.

Distribution. — The species has been recorded from northern Brazil (the states of Pará and Amazonas), the Guianas, Venezuela, Trinidad and Bonaire (Netherlands Antilles).

Occurrence in Suriname. — Peters (1866: 396) rather extensively described a specimen from Suriname (the specimen no. 13074 listed below), without, however, indicating its provenance. The second author to deal with Suriname material is Kappler (1881: 163), Jentink (1888: 209) being the third; neither Kappler nor Jentink gave a more precise locality indication than "Surinam". H. Allen (1894: 240) described a new species, *Ametrida minor*, from an unknown locality, which G. M. Allen (1902: 88-89) later showed to be Suriname. Although several authors followed H. Allen in considering *A. centurio* and *A. minor* distinct species (e.g., Cabrera, 1958 and Husson, 1962), Peterson (1965) proved conclusively that the specimens identified as *A. centurio* and *A. minor* are, respectively, the females and males of a single species. Husson (1959: 115; 1962: 179) mentioned *A. centurio* from "Suriname", and (1959: 115;

1962: 182) *A. minor* from Moengo and Kayserberg airstrip, Suriname. Peterson (1965) examined all this material and furthermore a male from Paramaribo. I have seen the following Suriname material, which is the same as that listed by me in 1962:

1. Kayserberg airstrip near Zuid River, Nickerie District, about 3°N 56°30'W, 1 male (CNHM no. 93204, skin and skull).
2. Moengo, about 85 km east of Paramaribo, northern Marowijne District, 1 male (no. 12512, skin and skull).
3. Suriname, without more precise locality indication, 1 female (no. 13074, skin and skull), 1 female (SMN no. 1633, skin and skull).

Specimen no. 13074 is the one described by Peters (1886), and incorrectly indicated as a male by Jentink (1888) and Husson (1959, 1962). Specimen SMN no. 1633 was collected by A. Kappler, and probably is the one on which his 1881 record is based.

Description. — Length of forearm varying in the males from 24.6 to 26.5 mm (in Suriname specimens from 24.8 to 25.9 mm), in the females from 29.8 to 33.2 mm (in Suriname specimens 31.0 and 32.0 mm); nose leaf well developed, short and broad; ears shorter than the head, rounded above, up to 12 mm long and 9.5 mm broad; tragus small, acutely pointed, the outer margin with four prominent tooth-like projections; crown of head greatly elevated above the face-line; interfemoral membrane moderately developed, angularly emarginate behind to about the level of the middle of the tibia; calcar short but distinct; no external tail; wing membrane from near the base of the outer toes; dorsal surface dark brown, darkest on rump, much paler on shoulders and head; the difference mainly being caused by the fact that in the anterior region the hairs are bicoloured, having the basal two-thirds whitish, while on the rump the hairs are practically uniformly brown. The ventral surface is greyish brown, slightly darker in the posterior than in the anterior region. A very conspicuous feature is the presence of a well-defined patch of pure white hairs on the shoulders near the base of the humerus; a smaller and inconspicuous spot of whitish hairs is found below the ear on the neck. As on the dorsal surface, the hairs of the anterior ventral region are bicoloured, having the basal two-thirds whitish, while those of the posterior part are of a practically uniform greyish brown tinge. The fur extends on the antibrachium, on the proximal half of the forearm, above and beneath, and on the wings from half the forearm to the proximal third of the tibia. The interfemoral membrane is thinly haired, above and beneath, the free margin being thinly fringed. The ears and the wings are naked, the former are light brown, the latter darker to blackish brown.

Dental formula: $I \frac{2}{2}, C \frac{1}{1}, P \frac{2}{2}, M \frac{3}{3}$. Upper incisors evenly spaced between the canines; the inner upper incisors conspicuously larger than the outer; first upper premolar smaller than the second, about half its height; third upper molar minute. Lower incisors small, of about equal size, crowded between the canines, with a deep notch in the middle; lower premolars of about equal size; last lower molar minute.

TABLE 24

External and skull measurements of four specimens of *Ametrida centurio* Gray from Suriname.

Museum	SMN	RMNH	RMNH	CNHM
Reg. number	1633	13074	12512	93204
Sex	♀	♀	♂	♂
Forearm	31.0	32	25.9	25
Third digit, metacarpal	30.5	30.7	26	-
1st phalanx	10	10	9	-
2nd phalanx	16	17.5	14	-
3rd phalanx	12.5	12.5	13	-
Fourth digit, metacarpal	26.5	26.7	23.5	-
1st phalanx	11.5	12	9.5	-
2nd phalanx	16.5	17.3	13	-
Fifth digit, metacarpal	27.5	27.6	24.5	-
1st phalanx	11	10.5	9.5	-
2nd phalanx	13	14.4	10.5	-
Ear, length x breadth	12x9.5	11.5x9.5	8.7x6.5	-
Tibia	14	14.5	15	-
Hind foot	8	9	9	-
Calcar	3.5	4	5	-
Nose leaf, length x breadth	7.5x3.5	6.5x-	-	-
Skull:				
greatest length	15.6	-	14.9	14.5
condylobasal length	13.2	-	11.9	12.0
condyle to front of canine	13.1	-	11.9	11.8
basal length	11.1	-	10.0	10.0
palatal length	5.3	-	4.6	4.3
zygomatic breadth	10.8	11.0	10.4	10.6
breadth of braincase	8.6	-	8.3	8.5
height of braincase	7.8	-	8.2	8.3
mastoid breadth	9.2	-	8.8	9.2
interorbital constriction	3.8	4.1	3.3	3.4
width across molars	7.6	7.7	7.4	7.2
width across cingula canines.	4.5	4.5	4.0	4.3
upper tooth-row, c - m ₃	4.5	4.7	4.3	4.2
lower tooth-row, c - m ₃	4.9	5.2	4.7	4.7
length of mandible	9.1	9.4	8.5	8.4

The external and skull measurements are given in Table 24. Because the Leiden specimen no. 13074 is in a very poor condition, Peters's (1866: 397-398) external measurements of that specimen are given here.

Remarks. — According to a collector's note, the Moengo specimen was captured indoors, as was the specimen from Bonaire. Peterson (1965: 8) reported three specimens taken aboard an oil barge in the Gulf of Paria (Trinidad), and several that were caught in mist nets. Peterson considered the species frugivorous and a forest or jungle dwelling species.

Because of the scarcity of material (in 1965 only 30 specimens were known in all), the strong sexual difference in the length of the forearm was for a long time considered to be a specific difference. The situation was further complicated because one of the earliest known specimens (the one mentioned by Peters in 1866) was incorrectly sexed. It is the great merit of Peterson (1965) to have solved the puzzle,

showing that all specimens assigned to *Ametrida centurio* were females, and all those brought to *A. minor* males, and that all the supposed differences between these two "species" were of a secondary sexual nature. In my check-list of Suriname mammals (Husson, 1973: 7) I did accept Peterson's conclusions.

FAMILY DESMODIDAE

To this family belong the genuine blood-sucking vampire bats, which are dangerous to man and domestic animals because they may transmit rabies. These sanguivorous bats are characterized by (1) the absence of a distinct lanceolate nose leaf: the nostrils being surrounded by dermal outgrowths that form a rudimentary nose leaf only (see fig. 33); (2) the absence of an external tail, while the interfemoral membrane is narrow or even reduced to a mere fringe; (3) the very large, canine-like, upper incisors, which almost fill the space between the canines, while the lower incisors are of normal size compared to the canines, and (4) the strongly reduced premolars and molars.

The family Desmodidae includes the three monotypical genera *Desmodus*, *Diaemus*, and *Diphylla*, of which so far only *Desmodus* has been found with certainty in Suriname. The occurrence of *Diaemus* in this part of the Guianas is practically certain, while that of *Diphylla* is probable. For this reason *Diaemus youngii* (Jentink) (pl. 33, text-figs. 32b, 33a, c) as well as *Diphylla ecaudata* Spix are included in the following key. The differences between *Desmodus* and *Diphylla* were extensively discussed by H. Allen (1896).

Key to the South American Desmodidae

- 1a. Interfemoral membrane rudimental, confined to a mere fringe on the inside of the thigh and lower leg, and not developed in the centre; provided with rather long hairs. Length of forearm about 55 mm. Dental formula $I \frac{2}{2}, C \frac{1}{1}, P \frac{1}{1}, M \frac{2}{2}$; outer upper incisors minute, structureless, placed close to the middle of the inner side of the canines; inner lower incisors with four lobes, outer incisors with seven lobes *Diphylla ecaudata ecaudata* Spix
- b. Interfemoral membrane moderately developed, when stretched its middle part reaches distinctly behind the knees. Length of forearm varying from 50 to 63 mm 2
- 2a. Wing membranes with distinct white markings between the third and fifth digits, extending from the second phalanges to the free margin; length of the thumb distinctly less than that of the hind foot. Length of forearm about 53 mm. Lower outer incisors bilobed, the inner entire (see fig. 33a). Dental formula: $I \frac{1}{2}, C \frac{1}{1}, P \frac{1}{2}, M \frac{1}{1}$ or $I \frac{1}{2}, C \frac{1}{1}, P \frac{1}{2}, M \frac{2}{1}$. . . *Diaemus youngii* (Jentink)
- b. Wing membranes without white markings, uniformly dark brown in colour; the thumb about as long as the hind foot. Length of forearm usually more than 55 mm. Both lower incisors bilobed (fig. 33b). Dental formula: $I \frac{1}{2}, C \frac{1}{1}, P \frac{1}{2}, M \frac{1}{1}$
Desmodus rotundus rotundus, p. 159

Desmodus rotundus rotundus (E. Geoffroy, 1810)

Text-figs. 8g (interfemoral membrane), 33b (head), 33d (canines and incisors), pl. 33 (skull)

Phyllostoma rotundum E. Geoffroy, 1810, Ann. Mus. Hist. Nat. Paris, 15: 181, 186.

Type locality. — "Le Paraguay". Restricted to Asuncion, Paraguay, by Cabrera (1958: 93).

Synonymies. — Cabrera, 1958: 93; Husson, 1962: 188.

Vernacular names. — (E) South American Vampire Bat; (N) Neotropische Vampier.

Distribution. — South America north of 33°S, Central America and Mexico; also in Trinidad. The nominate subspecies is restricted to South America and Trinidad.

Occurrence in Suriname. — Already very early authors reported upon Suriname bats that suck blood from humans. So Warren (1677: 21, 22) remarked: "The *Bats* are found to be not a little noxious both to Men and Beasts, in the night drawing away their Blood, and so easily, that the loss is not perceivable, 'till it be past prevention, which (if I was not misinform'd) has forc'd several people to foresake their Dwellings, to save that little blood they had, which would have been otherwise suck'd out". The same or similar stories are provided by many later authors, which are extensively dealt with by Husson (1962). As *Desmodus* does its work rather secretly, the blood sucking habit for a long time was not ascribed to it, but to the much larger and more ferocious looking species, *Vampyrum spectrum*, which thereby acquired its generic name *Vampyrum*. The present species is quite abundant in the coastal lowland area of Suriname, but it is not clear whether or not it also occurs in the deep interior. The brothers Penard ("De Surinamer", 19 and 26 March 1905) indicate that the species is quite abundant and that even cattle in the center of Paramaribo is not free from their attacks. Considering the fact that the species is common and well known, I have remarkably little material at my disposal:

1. Agricultural Experimental Station (Cultuurtuin), in the north-western part of Paramaribo, Suriname District, 1 male (no. 24697, skin and skull), 2 females (nos. 24695, 24696, skins and skulls).

2. Swamps behind the Agricultural Experimental Station, 1 male (no. 3951, skin and skull), 3 females (nos. 3949, 3950, 3952, skins and skulls).

3. Near Paramaribo, 1 male (no. 25252, skin and skull).

4. Plantation "Helena-Christina", about 10 km south of Paramaribo, 3 males (nos. 24699-24701, skins and skulls).

5. Sumatraweg, south-east of Lelydorp, about 14 km south of Paramaribo, Suriname District, 1 male (no. 24698, skin and skull), 1 pregnant female (no. 24702, skin and skull).

6. Suriname, without more precise locality indication, 2 females (SMN nos. 3538-1, 2, skin and skulls), 1 skull (no. 25068).

Description. — Length of forearm in males varying from 52.4 to 60.2 mm, in females from 56.7 to 63 mm; nostrils surrounded by dermal outgrowths forming a rudimentary nose leaf without a distinct lanceolate lancet; ears, rather short and broad, about 17 mm long and 12 mm broad, rounded above; tragus short and broad; thumb conspicuously long and strong, slightly longer than the hind foot, its metacarpal with a short, rounded cushion at the base, a more elongated pad extends to its middle; no external tail; interfemoral membrane narrow, its median part ex-

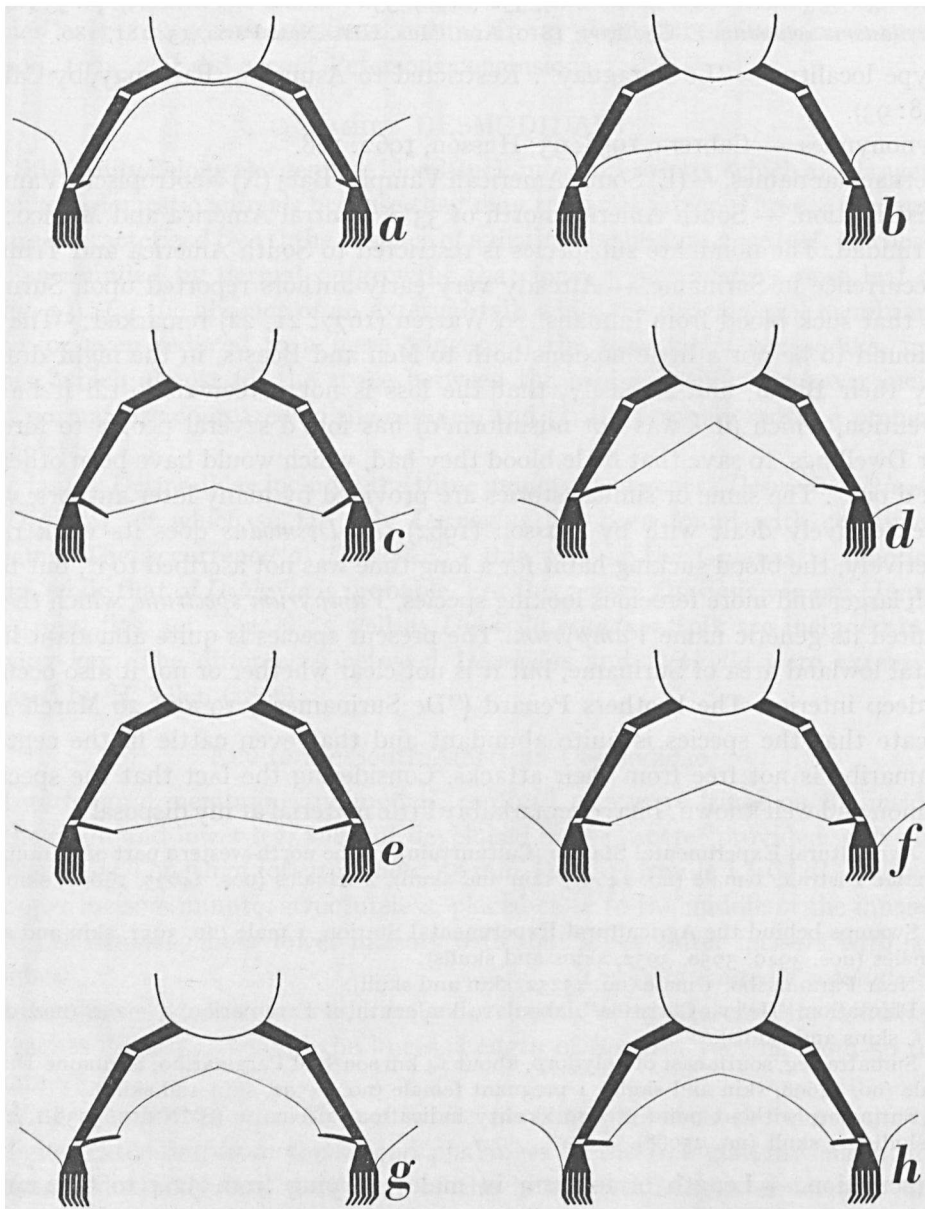


Fig. 32. Diagrams of interfemoral membranes, ventral view, showing the various forms to be observed in Suriname Glossophaginae (a), Desmodidae (b), and Stenodermatinae (c-h). a, *Anoura geoffroyi geoffroyi* Gray; b, *Diaemus youngii youngii* (Jentink); c, *Uroderma bilobatum bilobatum* Peters; d, *Vampyrops helleri* Peters; e, *Chiroderma villosum* Peters; f, *Ametrida centurio* Gray; g, *Artibeus lituratus fallax* Peters; h, *Pygoderma bilabiatum* (Wagner).

tending to about the level of the middle of the tibia, about 10 mm wide, continuing as a very narrow strip along the tibia: calcar rudimentary, presenting itself as a wart-like excrescence; wing membrane from the distal fourth of the tibia; fur rather short above and beneath, extending on the upper arm; a short covering of hairs is found on the dorsal surface of the antebrachial membrane, on the wing membrane between the body and a line connecting the elbow and the foot, and on the interfemoral membrane. As to the colour of the fur, two sharply defined phases may occur both in males and females. According to J. A. Allen (1900: 87) "In the rufous phase the color above is dark rufous brown, the hairs basally light yellow; below pale yellowish brown, the hairs uniform from base to tip, the tips slightly silvery. In the gray phase the color above is blackish brown, the basal half of the hairs grayish white; below lustrous silvery gray at the surface, the hairs darker (pale brown) basally".

Dental formula: $I \frac{1}{2}$, $C \frac{1}{1}$, $P \frac{1}{2}$, $M \frac{1}{1}$. Upper incisors very large, triangular with sharp cutting-edges, flat, strongly projected forward, completely filling the space between the somewhat smaller flat, scoop-like canines; upper premolar and molar reduced,

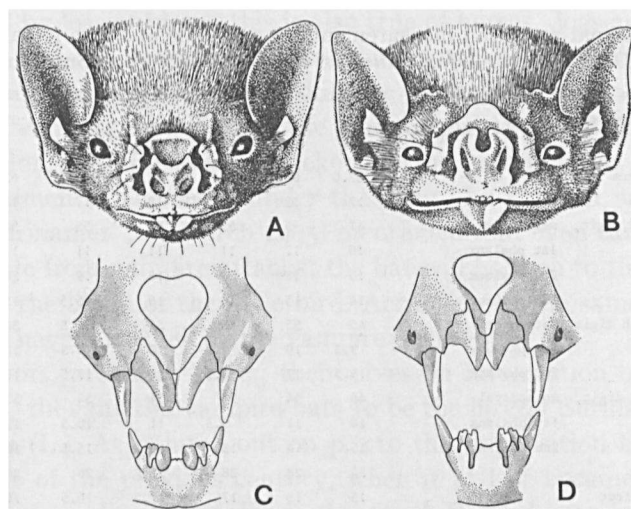


Fig. 33. a, c, *Diaemus youngii youngii* (Jentink), no. 12088; b, d, *Desmodus rotundus rotundus* (E. Geoffroy), no. 3949. a, b, heads; c, d, canines and incisors in front view. Width across cingula canines, in mm: c, 5.7; d, 5.8.

their combined alveolar length less than that of the canine. Lower incisors in pairs, distinctly bilobed; the teeth of each pair separated from one another and from the canines by spaces which are about 1.5 times the combined alveolar length of the inner and outer incisor; canines of normal size compared with the incisors; cheek-teeth reduced. A remarkable difference between the skull of *Desmodus rotundus* and *Diaemus youngii* is provided by the mandible. In *Diaemus* the coronoid process is much higher than the condylus, so that the margin connecting these two points runs obliquely down; in *Desmodus*, however, the coronoid process and the condylus

lie at about the same level, so that the margin between the two points runs nearly horizontally. Also the lower incisors show distinct differences in the two species. In *Desmodus* the inner lower incisors are separated by a space of about 1.5 times the combined alveolar length of each pair of incisors, they are of about equal size and both are distinctly bilobed. In *Diaemus* (text-fig. 33a, c) the space between the inner lower incisors is smaller than the alveolar length of one single incisor. The inner lower incisors in *Diaemus* are smaller than the outer; in the type the cutting edge is entire; the outer lower incisor is, however, distinctly bilobed, and separated from the canine by a space which is somewhat greater than the alveolar length of that incisor. The auditory bullae in *Diaemus* are larger and more swollen than in *Desmodus* (see pl. 33).

The external and skull measurements of the examined five females and one male from Suriname are given in Table 25.

Remarks. — In the Game Ordinance 1954, as revised in 1970, the Vampire Bat is placed on the list of predominantly harmful animals under the names "Bloed-

TABLE 25

External and skull measurements of one male and five females of *Desmodus rotundus rotundus* (E. Geoffroy) from Suriname.

Museum	RMNH	SMN	SMN	RMNH	RMNH	RMNH
Reg. number	3951	3538,1	3538,2	3950	3949	3952
Sex	♂	♀	♀	♀	♀	♀
Forearm	57.0	61.0	60.5	61.5	60.5	63
Thumb	17	19	18	18	17	18
Third digit, metacarpal	47	55	55	55	55	54
1st phalanx	10	11	11	11	11	11
2nd phalanx	16	18	18	18	19	20
3rd phalanx	14	15	15	16	16.5	15
Fourth digit, metacarpal	45	55	55	54	54.5	54
1st phalanx	9.5	10	9.5	10	10.5	10
2nd phalanx	14.5	17	16.5	16.5	17.5	17
Fifth digit, metacarpal	46	54	54	54	54	53
1st phalanx	10	11	9.5	11	10.5	11
2nd phalanx	15	14	15	15	15.5	16
Tibia	24	28	28	27	26	29
Hind foot	15	18	17	17.5	16.5	16
Calcar	1	1	1	1	1	1
Skull:						
greatest length	22.8	23.8	24.4	23.8	23.7	24.0
condylobasal length	20.6	21.8	21.4	21.4	21.0	22.0
condyle to front of canine	19.2	19.6	19.5	19.3	19.0	19.7
basal length	17.5	18.9	19.0	18.5	18.1	19.1
palatal length	8.4	9.7	9.6	9.1	8.6	9.3
zygomatic breadth	11.8	11.9	12.6	12.2	12.0	12.1
breadth of braincase	12.3	12.2	12.4	12.2	12.0	12.5
height of braincase	11.6	11.4	11.5	11.9	11.8	12.3
mastoid breadth	12.3	12.6	12.8	12.8	12.1	12.7
postorbital constriction	5.0	5.1	5.5	5.5	5.2	5.2
width across molars	5.8	5.9	6.3	6.0	6.2	6.2
width across canines	5.4	5.9	6.2	5.8	5.8	6.1
upper tooth-row, c - m ³	3.5	3.4	3.3	3.4	3.3	3.4
lower tooth-row, c - m ₃	4.4	4.5	4.4	4.6	4.4	4.2
mandible	14.2	14.5	14.6	14.5	14.2	14.7

zuigende vleermuizen (*Desmodus rotundus*)", being the only species of bat that under the Suriname law is considered harmful and that figures in the Ordinance; this means that all the other species are fully protected in the area covered by the Game Ordinance.

Its habits of sucking blood from animals and man have made *Desmodus* a well known bat in Suriname. Even in the oldest narratives mention was made of the vampire bat. The animal does its work usually unnoticed, sucking blood when its victim is fast asleep. These victims are found among practically all warm-blooded animals from man down to cage-birds. In man the bat usually bites the tips of the toes or fingers or even that of the nose; the teeth of the bat are so sharp that the bite is not noticed by the sleeper and the bat can perform its operation unnoticed. Because of the anticoagulants in the saliva of the bat, the wound, although very small, will continue to bleed long after the attack, and thereby cause a considerable loss of blood. The attack of a vampire bat on a human being can cause a great loss of blood, but it is rarely, if ever, fatal, while precautionary measures can prevent a repetition of the attack. Cattle may suffer badly from the vampires, and can become quite emaciated by loss of blood, this is also true of horses, dogs and pigs. Repeated attacks (and cattle with several vampire wounds can be regularly observed in the coastal area of Suriname) may finally kill the animals. Teenstra (1835: 417) mentioned that the vampire bats bite off the teats of pigs, but this may be based on a faulty observation. Also birds are attacked by the vampires, so Dr. F. Lukoschus collected a specimen of *Desmodus* under the wing of a chicken, while the brothers Penard ("De Surinamer", 26 March 1905) mentioned that even canary birds in their cages are not safe from vampire attacks: the bat will hold on to the bars of the cage and then drink the blood of the little bird. According to the same source, the only mammal that is never attacked by the vampire is the goat.

The old authors, probably basing themselves on information obtained from unreliable sources, thought the vampire bats to be the largest Suriname species, *Vampyrum spectrum* (L.). As pointed out on p. 110 this supposition has persisted to at least the middle of the previous century, when it at last became generally known that the true sanguivorous vampire is the small *Desmodus* and not the large but rather harmless *Vampyrum*.

In recent years another dangerous aspect of the vampire feeding habits showed itself. Around 1955 it became clear that in Suriname *Desmodus* is the principal carrier and transmitter of paralytical rabies. In October 1953, namely, an epidemic broke out among the cattle in the Paramaribo area (Santozwamp, near Welgedacht; Lelydorp; Kwatta) and in March 1955 about 40 to 50 cows in this region died from a lyssa virus, which was supposed to have been transmitted by bats. This supposition was strengthened by the fact that according to information obtained from the cattle owners the cows had badly suffered from attacks by vampire bats. Accounts of this epidemic were published by Langeler (1955) and by Collier & Tiggelman-Van Krugten (1955). The investigations on this subject are still being continued.

Though *Desmodus* seems to be the principal transmitting agency of rabies, insectivorous and fruit-eating bats have also been found to be infected with rabies and their saliva likewise may carry infection. Man and animals bitten by these infected bats may develop rabies. As even non-bloodsucking bats in a rabid condition attack and bite man and animals, they are almost as dangerous in this respect as the true vampires. From Trinidad eight species of bats are known of which it has been proved that they were infected with the rabies-virus; four of these species, viz., *Carollia perspicillata*, *Artibeus lituratus*, *Desmodus rotundus*, and *Molossus molossus*, are very abundant in Suriname (cf. Goodwin & Greenhall, 1961: 196-198, 267-270).

Goodwin & Greenhall (1961: 195) mentioned that in Trinidad there is "a character of folklore, the soucouyant, which is believed to sail through the air at night in search of human blood to suck" and which is clearly based on the habits of the vampire bat. Also in Suriname such a creature exists in the local folklore: the Asimma, or Asimman. The brothers Penard ("De Surinamer", 26 February 1905) describe her as follows: 'The creature is supposed to be an old woman, with or without teeth, with bloodshot eyes and a desiccated body. At night she wraps a skin, resembling that of a bat, around herself and then flies to the house of her choice, often carrying a light. After laying aside the bat skin, she enters the house by squeezing through a keyhole or other small opening. After having found her victim, she pricks a small wound and sucks out the blood, cooling the wound by blowing on it'. This strange witch-like creature is clearly based on the vampire bat, as shown by its habits, like flying, blood-sucking and crawling through small openings.

FAMILY FURIPTERIDAE

The family Furipteridae contains two monotypical genera, viz., *Amorphochilus* and *Furipterus*, of which only the latter occurs in Suriname. The genus *Furipterus* is externally characterized by (1) the short, peculiar tragus, which is triangular, (2) the greatly reduced thumb, which is included in the wing membrane, being placed at the base of the minute, apparently functionless claw, (3) the presence in the third digit of two phalanges of which the first is very small compared with the long, flexible second, and (4) the large interfemoral membrane, which is as long as head and body combined, while the tail terminates indistinctly at about three-fourths of that membrane.

Furipterus horrens (F. Cuvier, 1828)

Text-figs. 8d (interfemoral membrane), 10f (head), 10g (thumb), 10h (tragus), 31c (canines and incisors), pl. 34 (skull)

Furia horrens F. Cuvier, 1828, Mém. Mus. Hist. Nat. Paris, 16: 149-155, pl. 9.

Type locality. — "La Mana" (= Mana River, Guyane).

Synonymies. — Cabrera, 1958: 96; Husson, 1962: 200.

Vernacular names. — (E) Thumbless Bat.

Distribution. — The species has a wide distribution from southern Brazil north through the Guianas to Trinidad, W. I., and Colombia.

Occurrence in Suriname. — Although Peters (1865a: 648), Dobson (1878: 357), and Kappler (1881: 163) reported this species from Suriname, the first exact locality in Suriname has been given by Sanborn (1941: 381), who examined a male specimen from Camp One, Coppename River, above Kaaimanston, Saramacca District at about 5°5'N, collected there on 8 July 1938. Husson (1962) examined only a specimen without precise locality indication (lot 2 below). So far I have only seen two specimens from Suriname:

1. Ligolio (= Liguorio, = Ligorio), east bank of Gran Rio, Suriname River basin, at about 3°54'N 55°33'W, Brokopondo District, 1 adult specimen (no. 25185, skin and skull).
2. Suriname, without more precise locality indication, 1 male (SMN no. 684, skin and skull).

Description. — Length of forearm varying from 31.2 to 35.7 mm; ears as broad as high, roundish, funnel-shaped; tragus short and broad, triangular; thumb greatly reduced, included in the wing membrane, the minute, apparently functionless claw being free; interfemoral membrane large, as long as the head and body, when stretched reaching far beyond the feet; tail wholly enclosed in the interfemoral membrane, ending indistinctly in its posterior part, not perforating the membrane or appearing on its dorsal surface; calcar about as long as the tibia and as the entire free posterior margin of the interfemoral membrane; wing membranes from the tarsus, about in the middle between the outer toes and the ankles; fur soft; dorsal surface bluish grey, slightly tipped with dusky-brown; chin more reddish brownish; ventral surface somewhat paler than the dorsal surface, with more whitish-grey; ventral surface of the interfemoral membrane covered with fine thin hairs ranged along the transverse dark lines; colour of the membranes dark brown.

Dental formula: $I \frac{2}{3}$, $C \frac{1}{1}$, $P \frac{2}{3}$, $M \frac{3}{3}$. Rostrum rather short, about half the length of the braincase, sharply set off from the high braincase; upper incisors in pairs, the outer distinctly smaller than the inner; both the space between the two inner incisors and that between the outer incisor and the canine are distinct; upper canine small, its shaft about equal in height to the large second premolar; first upper premolar about half the size of both the canine and the second premolar; lower incisors with trifid cutting edges, they form a continuous row between the canines; lower canine as high as both the second and the third premolars, which are of about equal size; first lower premolar about half the height of the canine.

External and skull measurements of the examined specimens from Suriname and British Guiana, respectively. Forearm, 35.3, 35.5; length of third metacarpal, 31.5, 31.5; first phalanx, 5, 5.5; second phalanx, 18, 20; length of fourth metacarpal, 28.5, 29.5; first phalanx, 6.5, 6.5; second phalanx, 7.5, 9; length of fifth metacarpal, 28.0, 28.5; first phalanx, 10.5, 11; second phalanx, 5, 6; tibia, 14, 14; hind foot, 7, 7; calcar, 15, 17; depth of interfemoral membrane, approximately, —, 35 mm. — Skull: greatest length, 11.8, 11.9; condylobasal length, 10.9, 11.3; condyle to front of canine, 10.4, 10.7; basal length, from front of i^1 , 10.1, 10.2; palatal length, from

front of i^1 , 5.4, 5.4; zygomatic breadth, 7.7, 7.9; breadth of braincase, 5.9, 6.2; height of braincase, 5.4, 5.5; mastoid breadth, 6.4, 6.4; interorbital constriction, 3.1, 3.0; width across cingula canines, 2.8, 2.9; width across molars, 4.8, 5.1; upper tooth-row, c-m³, 4.7, 4.9; lower tooth-row, c-m₃, 5.0, 5.2; length of mandible, 8.3, 8.6 mm.

Remarks. — The specimen of lot 2 listed above was extensively described by Peters (1865a: 645-648). Jentink (1893: 280) as well as Peters (1865a: 647-648) included in their descriptions external measurements, which, however, in several cases differ slightly from those given by me. These differences are partly accounted for by that Jentink and Peters took their measurements in a different way, and partly by that the material in the course of time may have somewhat changed. So it is very difficult at present to take the length and the breadth of the ears; Peters noted for the Suriname specimen: "Höhe des Ohrs, 10; Höhe des vordern Ohrrandes, 7.5; Breite des Ohrs, 7.5".

FAMILY THYROPTERIDAE

The most striking character of this neotropical family of bats is the presence of a conspicuous circular sucking disk at the base of the thumbs and on the soles of the feet (fig. 10q, r). The funnel-shaped ears are separated; the third digit has three phalanges; the wing membranes are attached to the base of the outer claws; the interfemoral membrane is broad, enclosing the slender tail, the tip of which projects beyond the posterior border of the membrane, the length of this free end varies from 7 to 35 per cent of the total length of the tail.

The family Thyropteridae contains the single genus *Thyroptera* with two valid species: *Th. discifera* (Lichtenstein & Peters) and *Th. tricolor* Spix. The two species can externally be distinguished by the following characters: (1) in *Th. discifera* the dark brown ventral surface is only slightly paler than the dorsal surface, while in *Th. tricolor* the greater part of the ventral surface is whitish, contrasting strongly with the dark or reddish brown colour of the upper parts; (2) in *Th. discifera* the calcar bears only one cartilaginous projection which extends into the posterolateral border of the interfemoral membrane, while in *Th. tricolor* two such projections exist.

At present only *Thyroptera tricolor* is known to occur in Suriname. However, since Thomas (1928: 257) reported *Th. discifera* from Cayenne, French Guiana, that species may also be expected in Suriname. Cabrera (1958: 97-98) and Hall & Kelson (1959: 156-157, map 117) discussed the distribution of the two species and their subspecies.

Thyroptera tricolor tricolor Spix, 1823

Text-figs. 10p (head), 10q (thumb), 10r (hind foot), 31d (canines and incisors), pl. 34 (skull)

Thyroptera tricolor Spix, 1823, Simiarum Vespertilionum Brasiliensium species novae: 61, pl. 36 fig. 9.

Type locality. — "ad littora fluminis Amazonum", between Santo Antônio Dolçá at the mouth of the Rio Içá and Pará, Brazil (see Eigenmann, 1917, pl. 1)

Synonymies. — Cabrera, 1958: 98; Husson, 1962: 203.

Vernacular names. — (E) Brazilian Disk-winged Bat, Sucker-footed Bat.

Distribution. — The species has a wide distribution, its range extends from southern Brazil north through the Guianas, Trinidad, Venezuela, Ecuador and Colombia into Central America as far as Honduras. The nominate subspecies occurs in the northern part of Brazil, the Guianas, Trinidad and Venezuela, its exact geographic limits are uncertain.

Occurrence in Suriname. — The species was first mentioned from Suriname by Cantraine (1845: 492) who described it as new under the name *Thyroptera bicolor*. Also later authors reported the species from Suriname: Kappler (1881: 163), Jentink (1887: 284; 1888: 194), the brothers Penard ("De Surinamer", 2 April 1905), Husson (1962: 204). Of these authors only Husson (1962) gave more precise localities (viz., Paramaribo and Marowijne River), all the other records just mentioned "Surinam". I have examined the following material:

1. Paramaribo, Suriname District, 1 female (ZMH no. 23519, skin and skull).
2. Makambi Creek near Brownsweg, north-western corner of Brokopondo Lake, Brokopondo District, 1 female (no. 18247, skin and skull).
3. Tafelberg Mountain at about 3°52'N 56°6'W, southern Brokopondo District, 1 male (no. 25037, skin and skull).
4. Langamankondre near the mouth of the Marowijne River, Marowijne District, 1 male (no. 18226, skin and skull).
5. Marowijne River, Marowijne District, 1 male (no. 17553, skull).
6. Suriname, without more precise locality indication, 2 males (no. 17552, SMN no. 1301-4, skins and skulls), 4 females (no. 17551 (holotype of *T. bicolor* Cantraine), SMN no. 1301-1-3, skins and skulls).

Description. — Length of forearm varying from about 34 to 38 mm; ears separated, funnel-shaped; tragus small, curved inwards, with a prominent lobule near its base; at the base of the thumb of the hand and at that of the sole of the hindfoot a more or less circular suctorial disk is placed, the latter being always smaller than the former; interfemoral membrane large, when stretched reaching to the feet; calcar much longer than the foot, with two cartilaginous projections which are directed toward the posterolateral border of the interfemoral membrane; calcar of about the same length (8 mm) as the free border of the interfemoral membrane between tail and end of the calcar; hind foot short, about 5 mm, the third and fourth toes are ankylosed both with the phalanges and the claws; the slender tail, which is enclosed in the interfemoral membrane, extends beyond the posterior border of this membrane with not more than one-third of its total length; the wing membranes from the base of the claw of the outer toes of the hind feet; the fur is rather long and dense; the interfemoral membrane is very thinly haired, the free margin is distinctly but thinly fringed with short hairs; the dorsal surface of the body is dark brown to reddish brown; the entire ventral surface or its greater part is white, the white colour extending from the anus to the chin, the sides of the body and the lower lip are usually brownish, sometimes parts of the belly and the chest show a yellowish tinge; the ears are said to be blackish, the membranes dark brown.

Dental formula: $I \frac{2}{3}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{3}{3}$. Upper inner incisors widely separated from each other, with a distinct postero-external cusp; upper outer incisors unicuspidate or with a postero-external cusp, they are slightly smaller than the inner incisors and nearly in contact with them; they are separated from the slender canines by a distinct space; the first upper premolar is slightly smaller than the second, both are smaller than the large third premolar; the three premolars stand perfectly in the tooth-row and are in contact with each other or nearly so, the first premolar touches the canine, the third touches the first molar. The lower incisors are trilobed, the outer is slightly larger than the others; they form a continuous row between the canines; the lower canines are slender, small and low; the three lower premolars stand perfectly in the tooth-row, the first is slightly smaller than either the second or the third, which are of about the same size.

The external and skull measurements of six examined Suriname specimens are given in Table 26.

TABLE 26

External and skull measurements of six specimens of *Thyroptera tricolor tricolor* Spix from Suriname. RMNH reg. no. 17551 is the holotype of *Thyroptera bicolor* Cantraine.

Museum	RMNH	RMNH	SMN	SMN	SNN	SMN
Reg. number	17551	17552	1301,4	1301,1	1301,2	1301,3
Sex	♀	♂	♂	♀	♀	♀
Forearm	37.5	36.0	34.3	36.6	36.5	37.5
Third digit, metacarpal	36	33.5	34	34.5	35.5	35.5
1st phalanx	15	15	14	14	15.5	15
2nd phalanx	9	8.5	8	8	10	9
3rd phalanx	4	5	5.5	5	6.5	7
Fourth digit, metacarpal	35	32	33	34	35	35
1st phalanx	9	9	8	8	9.5	9
2nd phalanx	5.5	6.5	6	7	6.5	6.5
Fifth digit, metacarpal	33	30	30.5	30.5	32	32.5
1st phalanx	9	8.5	7.5	8	9.5	9
2nd phalanx	7	6	7	6.5	7	7.5
Tibia	17	17	16	17	16	19
Hind foot	5	5	5	5	5	5
Calcar	10	9.5	7.5	8	8	9
Tail	27	27	23	24.5	27	27
Free end of tail	7	6	5	5.5	4	2
Skull:						
greatest length	14.1	14.3	-	14.2	14.5	14.9
condylobasal length	12.7	13.1	-	13.4	13.5	13.7
condyle to front of canine	12.3	12.4	-	12.6	13.0	12.9
basal length	11.5	12.0	-	12.2	12.1	12.3
palatal length	6.3	6.7	-	6.9	6.9	7.0
zygomatic breadth	-	7.4	-	7.4	7.8	7.8
breadth of braincase	7.3	7.2	-	7.3	7.6	7.6
height of braincase	6.1	6.2	-	6.2	6.3	6.1
interorbital constriction	2.6	2.6	-	2.5	2.6	2.7
width across molars	5.1	5.1	-	5.2	5.2	5.3
width across cingula canines	-	2.8	-	2.8	2.9	2.8
upper tooth-row, $c - m^3$	5.5	5.6	-	5.6	5.8	5.8
lower tooth-row, $c - m_3$	6.0	5.8	-	5.8	6.0	6.1
length of mandible	-	10.2	-	10.4	10.5	10.6

Remarks. — The examined Suriname specimens are so strongly bleached that their original coat colour can no longer be ascertained; in the published descriptions of the species is stated that the ears are blackish and the membranes dark brown. In my old specimens one still can distinctly see that the greater part of the ventral surface of the body was white, strongly contrasting with the brownish colour of the dorsal surface. In some specimens the ventral surface seems to be entirely white, while in others a more or less distinct brownish band of varying width is present along the sides, the lower lip having that same colour; in some specimens there is an indication that parts of the chest and belly are tinged with pale yellowish.

The length of the free end of the tail differs greatly in different specimens (Table 26), it varies from 2 to 7 mm, which is about 7 to 25 per cent of the total length of the tail.

Of the six entire skulls examined by me, three have the outer upper incisors with a distinct posterolateral cusp, while in three others this tooth is unicuspidate; in all these specimens the upper inner incisors have a posterolateral cusp, which is distinctly visible in side view.

In all specimens the circular suckorial disk of the thumb is larger than that of the sole of the hind foot; in my material the diameter of the disk of the thumb varies from 2.5 to 3 mm (mean 2.6 mm), that of the sole of the hind foot from 1.5 to 2 mm (mean 1.8 mm). According to the brothers Penard ("De Surinamer", 2 April 1905) the sucking disk ("een roode kleverige plek") is of a red colour.

FAMILY VESPERTILIONIDAE

The Suriname Vespertilionidae can be distinguished from the other families of bats by the combination of the following characters: (1) the tail, about as long as the combined length of head and body, is entirely included within the wide interfemoral membrane; it ends at the posterior margin of that membrane or projects beyond it with only the extreme tip; the membrane, when stretched, reaches far beyond the outer toes (fig. 8b); (2) the third digit has three phalanges; (3) a nose leaf is absent, while the nostrils show no dermal outgrowths, and the lower lip no warts (fig. 10a, c, e, i, j); (4) the inner upper incisors are separated from each other by a wide emargination of the anterior border of the palate (fig. 34; pls. 35-37).

At present six vespertilionid bats are known from Suriname; they can be identified with the help of the following key. The expression "free margin of the interfemoral membrane", used in the key, indicates the part of the posterior margin of the membrane between the end of the calcar and that of the tail.

Key to the Suriname Vespertilionidae

- 1a. One upper incisor on either side of the premaxillaries; this tooth in contact with the canine (fig. 34c, d). Dorsal surface of the interfemoral membrane distinctly pubescent 2

- b. Two upper incisors on either side of the premaxillaries; they are in contact with each other, but the outer is separated by a small space from the canine (fig. 34a, b; in these figures the space between outer upper incisors and canine does not show, because of the angle from which the figure is drawn) 3
- 2a. Length of forearm usually more than 45 mm; width across cingula canines more than 5.5 mm. Interfemoral membrane loosely haired; general colour of the body brownish or yellowish brown *Dasypterus ega ega*, p. 184
- b. Length of forearm varying from about 36 to 42 mm; width across cingula canines less than 5 mm. Dorsal surface of interfemoral membrane densely furred; general colour of the body bright reddish or reddish brown
Lasiurus borealis frantzii, p. 181
- 3a. Wing membranes from the ankles; length of forearm about 46 mm
Myotis surinamensis, p. 176
- b. Wings from the bases of the outer toes; length of forearm less than 43 mm . . . 4
- 4a. Outer upper incisors much shorter and smaller than the inner, scarcely reaching to the cingulum of the canine (fig 34b). Length of forearm varying from about 39 to 42 mm. *Eptesicus melanopterus*, p. 179
- b. Outer upper incisor of about the same size as the inner (fig 34a). Length of forearm less than 39 mm 5
- 5a. Tragus attenuated in its upper fourth, with a distinct rounded lobe at the base of its inner margin followed by a distinct emargination (fig. 10b) above which lies the broadest part of the tragus. Colour above and beneath of about the same brownish tinge *Myotis nigricans nigricans*, p. 170
- b. Tragus of nearly the same width throughout, tapering slightly near the tip, the basal lobe indistinct (fig. 10d). Colour of the ventral surface much paler than that of the dorsal, especially so on the lower belly *Myotis albescens*, p. 173

***Myotis nigricans nigricans* (Schinz, 1821)**

Text-figs. 10a (head), 10b (tragus), 34a (canines and incisors), pl. 35 (skull)

Vespertilio nigricans Schinz, 1821, Cuvier, Das Tierreich, 1: 179-180.

Type locality. — "Ostküste von Brasilien" (Schinz, 1821: 180), actually is "auf der *Fazenda de Agá*, in der Gegend des Flusses *Iritiba* oder *Reritigba*", Espirito Santo State, Brazil (Wied-Neuwied, 1826: 268).

Synonymies. — Cabrera, 1958: 100; Husson, 1962: 209.

Vernacular names. — (E) Little Black Bat.

Distribution. — The range of the species extends from Argentina, southern Brazil and south-eastern Peru north through northern South America and Central America to north-eastern Mexico; it occurs also on the Lesser Antilles. The nominate subspecies inhabits South America, Central America as far north as Guatemala, and the Lesser Antilles.

Occurrence in Suriname. — As Husson (1962) pointed out, the first record of the species from Suriname perhaps is Lammens' (1844) description of "Neue Gattung

Nr. 2". It is interesting that between 1844 and 1962 evidently no other Suriname records of the species, which is not rare in Suriname, were published. Husson (1962) listed material from the localities enumerated below under nos. 2, 4, 5 and 6. I have now seen the following Suriname specimens:

1. Forest and savanna near Sipaliwini airstrip, extreme south-eastern part of Nickerie District, 2 females (nos. 19650, 25251, skins and skulls).
2. Garnizoenspad, Paramaribo, Suriname District, 1 female (no. 17279, skin and skull).
3. Agricultural Experimental Station (Cultuurtuin), Paramaribo, 1 male (no. 17633, skin and skull), 1 female (no. 17632, skin and skull).
4. Paramaribo, Suriname District, 2 males (no. 17103, ZMA no. 9566, skins and skulls).
5. Tempati Creek, upper Commewijne basin, southern Commewijne District, 1 male (ZMA no. 4468, skin and skull).
6. Suriname, without more precise locality indication, 1 male (no. 25248, skull), 1 female (ZMA no. 1518, skin and skull).

Description. — Length of forearm varying from 32 to 39 mm (mean about 36 mm); ears rather narrow, about 12 mm in length, in the middle abruptly narrowed into a broadly rounded tip; the outer margin emarginate in its distal half, inner margin evenly curved; tragus about half as high as the ear, broadest at about its middle, strongly attenuated in the upper fourth and acutely pointed, with distinct rounded lobule at the base of the outer margin; interfemoral membrane large, when stretched reaching far beyond the toes; tail wholly included the interfemoral membrane and ending in the posterior margin of the membrane; calcar about as long as the free margin of the interfemoral membrane, usually ending in a small projecting lobule; wing membrane from the base of the outer toe; length of hind foot usually less than half the length of the tibia. Fur soft and dense. Dorsally it extends on the wing membrane as far as a line connecting the middle of the upper arm and the knee; the fur on the interfemoral membrane covers a triangular area, the top of which lies on the tail, about at the level of the knees, the basis being formed by the proximal part of the membrane. Ventrally the fur extends on the wing and interfemoral membranes, but the pubescence here is much shorter than on the dorsal surface. Dorsally the hairs are blackish plumbeous for their greater part, the tips are dark brownish; on the ventral surface the tips of the hairs are more buffy or yellowish brown. The wing membranes are blackish brown.

Dental formula: $I \frac{2}{3}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{3}{3}$. Upper incisors about equal in size, the inner separated from each other by a wide anterior emargination of the palate; the outer incisors are separated by small spaces from the canines; first upper premolar small, of about the same size as the inner upper incisor, in contact with the canine; the much smaller second premolar usually stands in the tooth-row, but sometimes it is crowded inward so that the first and the third premolar are then close together; the third upper premolar large, its base as wide as that of the canine, about three-fourths as high as the canine and distinctly higher than the crown of the first upper molar. Lower incisors faintly trifid, forming a continuous row between the canines, the third wider than the first and the second; first lower premolar about half as high as the canine, somewhat larger than the small second premolar, both teeth

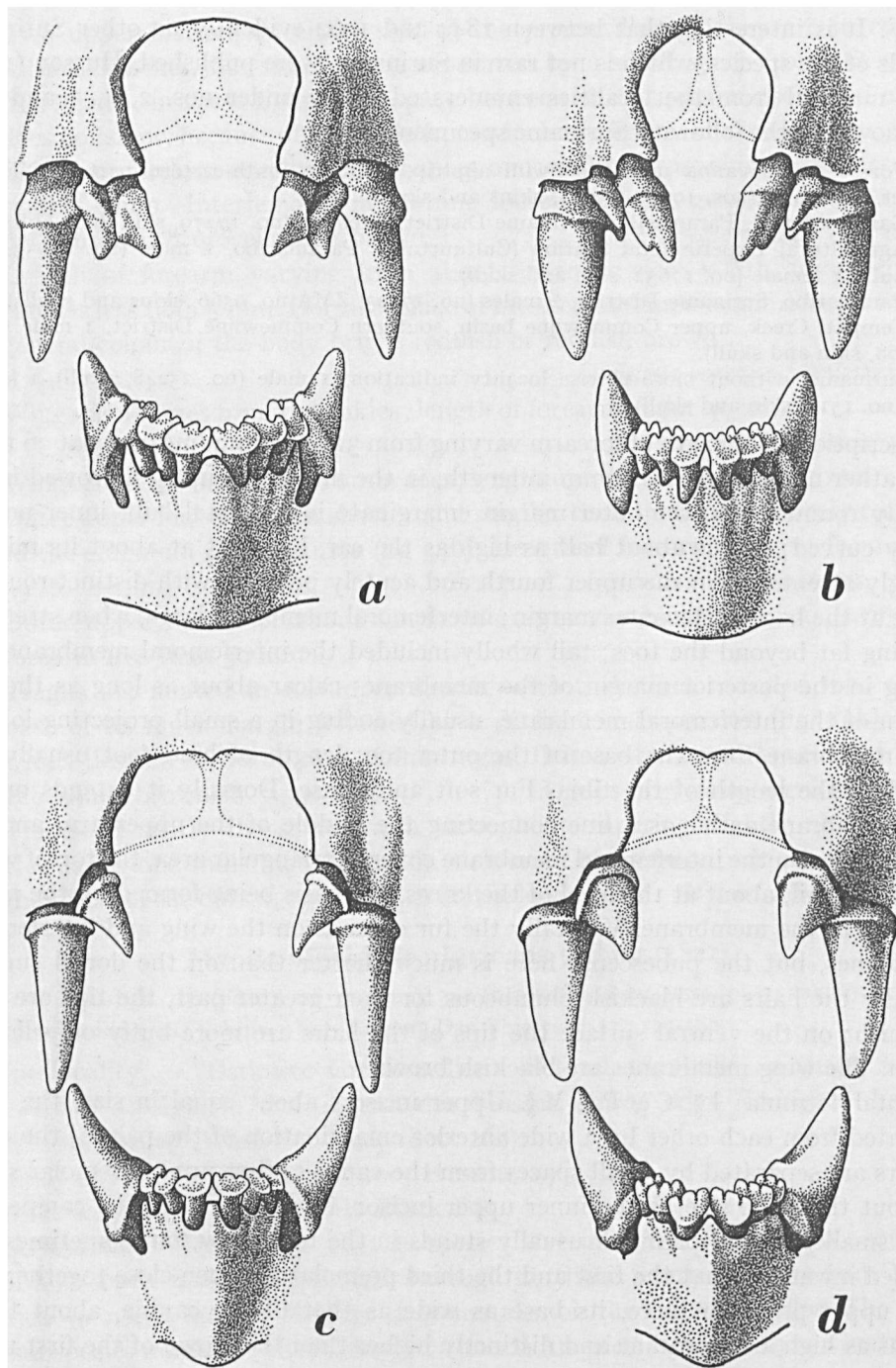


Fig. 34. Canines and incisors in front view. a, *Myotis nigricans nigricans* (Schinz), no. 17279; b, *Eptesicus melanopterus* (Jentink), SMN no. 264a; c, *Lasiurus borealis frantzii* (Peters), no. 17282; d, *Dasypterus ega ega* (Gervais), no. 17371. Width across cingula canines, in mm: a, 3.2; b, 4.6; c, 4.2; d, 6.1.

are distinctly smaller than the large third premolar; the base of the third lower premolar is about as wide as that of the canine, its height is about three-fourths that of the canine, but is slightly greater than that of the first lower molar. The three lower premolars form a continuous row, but sometimes the second premolar is slightly crowded inward. The sagittal crest is weakly developed, in some specimens it is sharply defined, but in others hardly visible.

The external and skull measurements of four specimens from Suriname are given in Table 27.

TABLE 27

External and skull measurements of four specimens of *Myotis nigricans nigricans* (Schinz) from Suriname.

Museum	RMNH	RMNH	RMNH	ZMA
Reg. number	17103	17279	17632	1518
Sex	♂	♀	♀	♀
Forearm	34.3	32.5	34.1	33.2
Third digit, metacarpal	32.5	31	32.5	30
1st phalanx	12	11.5	12	10
2nd phalanx	10.5	10	11	9.5
3rd phalanx	7	5.5	5	5.5
Fourth digit, metacarpal	32	30.5	32	29
1st phalanx	9	9.5	10	9
2nd phalanx	8	9.5	8	8
Fifth digit, metacarpal	30	28.5	31	28.5
1st phalanx	8.5	8	8.5	7
2nd phalanx	7	7	7	7.5
Tibia	14.5	14	15	14.5
Hind foot	7	7	7	7
Skull:				
greatest length from i^1	13.4	12.7	13.6	12.7
condylobasal length	12.7	11.6	12.7	12.1
condyle to front of canine	11.9	11.2	12.1	11.2
basal length from i^1	11.2	10.5	11.1	10.6
palatal length from i^1	6.4	-	-	-
zygomatic breadth	-	-	-	8.0
breadth of braincase	6.7	6.2	6.6	6.3
height of braincase	5.1	4.7	4.8	4.7
mastoid breadth	6.8	6.6	7.1	6.7
interorbital constriction	3.4	3.3	3.5	3.2
width across molars	5.3	5.1	5.4	5.3
width across cingula canines	3.2	3.2	-	3.2
upper tooth-row, $c - m^3$	4.8	4.6	4.9	4.5
lower tooth-row, $c - m_3$	5.2	4.9	5.2	4.8
length of mandible	9.2	8.8	9.7	8.7

Myotis albescens (E. Geoffroy, 1809)

Text-figs. 10c (head), 10d (tragus), 27e (interfemoral membrane), pl. 35 (skull)

Vespertilio albescens E. Geoffroy, 1809, Ann. Mus. Hist. Nat. Paris, 8: 204-205.

Type locality. — "Paraguay", shown to be "Estancia de San Solano, en el extremo sur del Paraguay, frente al Estero del Iberá" (Morales Agacino, 1938: 17-19).

Synonymies. — Cabrera, 1958: 102; Husson, 1962: 213.

Vernacular names. — (E) Paraguay Bat.

Distribution. — From Nicaragua through Central and South America to Patagonia.

Occurrence in Suriname. — Temminck (1840: 247-248) described a new species of bat from Suriname under the name *Vespertilio arsinoe*; *V. arsinoe* proves to be a junior synonym of *Myotis albescens* and Temminck's record is the first Suriname record for this species. The second mention of the species from Suriname is by Lammens. Lammens's (1844: 109) description of "Nr. 365. Die Zwergfledermaus" agrees rather well with *Myotis albescens*, but his identification of it with the European *Pipistrellus pipistrellus* (Schreber) is clearly incorrect. Kappler (1881: 163) and Jentink (1887: 283; 1888: 192) mentioned the species, as *Vespertilio arsinoe*, from "Surinam". More precise locality indications for Suriname material were provided by Husson (1962), who mentioned material from the localities listed below under 3, 4 and 6. I have now seen the following Suriname specimens:

1. Coeroeni Island near Coeroeni airstrip, upper Corantijn basin, Nickerie District, 5 specimens (no. 19653, skins and skulls).
2. Kaysergebergte, mountain range in southern Nickerie District, about 3°N 56°30'W, 1 male (no. 21630, skin and skull).
3. Garnizoenspad, Paramaribo, Suriname District, 1 female (no. 17278, skin and skull).
4. Paramaribo, Suriname District, 1 male (ZMH no. 38805, skin and skull), 1 specimen (no. 21753, skin and skull).
5. Paloemeu airstrip (= Vincent Fajk's airstrip), upper Tapanahony River near the mouth of the Paloemeu River, Marowijne District, 14 specimens (no. 19649a-n, skins and skulls).
6. Suriname, without more precise locality indication, 2 males (SMN nos. 264a-861 1/2-1 and 4, skin and skulls), 4 females (no. 17635 (holotype of *Vespertilio arsinoe* Temminck), SMN nos. 264a-861 1/2-2, 3 and 5, skins and skulls), 2 specimens (nos. 17636, 17637, skins and skulls), 1 skull (no. 17634).

Description. — Length of forearm varying from 33.8 to 37.4 mm; ear about 13 mm long, its outer margin not abruptly emarginate distally as in *Myotis nigricans* (see fig. 10a); tragus (fig. 10b) nearly of the same width throughout, tapering slightly at the tip, not reaching the middle of the ear conch, without a distinct basal lobe; interfemoral membrane well developed, when stretched reaching far beyond the toes; tail wholly enclosed in the interfemoral membrane, the extreme tip projecting free beyond the posterior margin of the membrane; wing membrane from the base of the outer toes; length of hind foot usually slightly more than half the length of the tibia. Fur soft and dense. Dorsally it extends on the wing membrane as far as a line connecting the basal third of the upper arm and the knee; also the basal part of the interfemoral membrane pubescent. On the ventral surface the wing membrane is furred to the elbow and the knee; the extreme basal part of the ventral surface of the interfemoral membrane is densely haired, while short hairs are present in the rest of the basal half of this membrane. The basal three-fourths of the hairs of the dorsal surface are dark greyish brown, the tips are more buffy; the hairs of the ventral surface have the basal three-fourths dark brown, while the tips are yellowish or ashy, which colour passes into white on the lower belly. The wing membranes are blackish brown.

Dental formula: $I \frac{2}{3}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{3}{3}$. Teeth essentially like those of *Myotis nigricans nigricans*. The interorbital region as well as the braincase are both relatively and absolutely wider than in that species.

The external and skull measurements of four specimens from Suriname are given in Table 28.

TABLE 28

External and skull measurements of four specimens of *Myotis albescens* (E. Geoffroy) from Suriname. RMNH reg. no. 17635 is the holotype of *Vespertilio arsinoe* Temminck.

Museum	RMNH	SMN	SMN	ZMH
Reg. number	17635	264a,2	264a,3	38805
Sex	♀	♀	♀	♂
Forearm	34.5	35.6	36.5	34.1
Third digit, metacarpal	-	31.5	33.5	32.5
1st phalanx	-	12	11.5	12
2nd phalanx	-	10	9	10.5
3rd phalanx	-	5.5	5	5.5
Fourth digit, metacarpal	-	31.5	33	31
1st phalanx	-	9	9	9.5
2nd phalanx	-	9	10	10.5
Fifth digit, metacarpal	-	30.5	31.5	31
1st phalanx	-	8.5	8.5	8
2nd phalanx	-	7.5	7	7.5
Tibia	-	14.5	15	15.5
Hind foot	-	7.5	8	8
Skull:				
greatest length from i^1	13.6	13.4	-	-
condylobasal length	12.7	12.5	-	-
condyle to front of canine	12.0	12.0	-	-
basal length from i^1	-	11.2	-	-
palatal length from i^1	-	6.6	-	-
zygomatic breadth	-	-	-	-
breadth of braincase	7.0	6.8	-	-
height of braincase	-	5.4	-	-
mastoid breadth	7.0	7.2	-	-
interorbital constriction	3.7	3.7	-	-
width across molars	5.4	5.3	-	-
width across cingula canines	3.5	3.2	3.4	3.7
upper tooth-row, $c - m^3$	4.7	4.8	4.9	5.1
lower tooth-row, $c - m_3$	5.1	5.2	5.2	5.3
length of mandible	9.5	9.7	9.8	9.8

Remarks. — Lammens's (1844: 109) description of "Nr. 365. Die Zwergfledermaus" agrees rather well with *Myotis albescens*. Lammens's identification of his material with "*Vespertilio pipistrellus*", i.e., the European *Pipistrellus pipistrellus* (Schreber), is of course incorrect as this species does not occur in the Americas; moreover Zimmermann (1780(2): 413-414) explicitly stated that the species occurs "nicht nur in Frankreich und Deutschland, sondern auch im Casanischen". Lammens's description is as follows: "Die Länge dieses Thieres ist ungefähr 2''', Flugweite 7, Schwanz $1\frac{1}{2}$. Der Kopf gestreckt; die Ohren behaart, schmal und in die

Höhe gerichtet, so lang als der Kopf; der Schwanz steckt ganz in der Flughaut und kann $\frac{1}{4}$ ''' darüber herausragen. Er ist schwärzlich, schwach mit Weiss oder Gelblichweiss gewellt. Bauch grau. Sie hängt sich gern an Bäume über dem Wasser".

The holotype of Temminck's *Vespertilio arsinoe* (no. 17635), an adult female, is in poor condition; the external measurements and also those of the skull are provided as far as it is still possible to take these (Table 28). Dobson (1878: 328) gave an excellent redescription of the holotype to which I have nothing to add, while he noted also some external measurements of the specimen.

The Suriname material at hand both of *Myotis nigricans nigricans* and *M. albescens* is too small to give a correct idea of the variation in the coat colour and the size of the animals, and of the variation in the position of the upper and lower premolars, characters which in the literature are reported to vary rather strongly in several populations of this species; the list of synonyms of the two species (cf. Miller & Allen, 1928) shows that many of these variants have been considered good species by older authors. The two species were separated by me on the following characters, which, as far as I can see, are especially useful for a quick identification: (1) the shape and size of the tragus, which is of the same width throughout in *M. albescens*, but is widened in *M. nigricans* (see fig. 10b and d), and (2) the absolutely and relatively wider interorbital constriction and braincase in *M. albescens* compared with those of *M. nigricans*: in the former species the interorbital constriction is usually more than 3.6 mm and the breadth of the braincase more than 6.8 mm, while in *M. nigricans* these values are as a rule much lower.

Myotis surinamensis Husson, 1962

Text-figs. 27f (interfemoral membrane), 35 (animal), pl. 36 (skull)

Myotis surinamensis Husson, 1962, Zoologische Verhandelingen, Leiden, 58: 218-221, text-figs. 21f, 35, pl. 24.

Type locality. — "La Guyane hollandaise", being the type locality of *Vespertilio ferrugineus* Temminck (1840) (not C. L. Brehm, 1827), for which the name *Myotis surinamensis* was proposed as a substitute name.

Synonymies. — Husson, 1962: 218.

Distribution. — So far only reported from Suriname and "South America".

Occurrence in Suriname. — The only Suriname specimen known is a female collected by H. H. Dieperink in Suriname between 1824 and 1836. Most of Dieperink's collections were made in and near Paramaribo, but there is no full certainty that the specimen actually originates from there, it is just labelled "Suriname".

Description. — Length of forearm 46.6 mm; ears shorter than head; tragus reaching to nearly the middle of the ear; interfemoral membrane well developed, extending, when stretched, behind the feet, forming a very acute angle in the centre of its free posterior margin; tail projecting with the last vertebra; calcar long, its actual length in the dried skin can not be determined; wing membrane from the ankle; foot large, about three-fifths the tibia; fur, present only on the body and

on the interfemoral membrane at the base of the tail, moderately long on the dorsal surface, shorter on the ventral parts, woolly; hairs distinctly bicoloured, on the upper parts: the terminal third is light yellowish, the basal parts are dark, giving the whole surface a reddish brown tinge; the extremities of the hairs of the ventral surface are light greyish, the rest is dark brown, so that the whole under surface seems to be variegated with dark brown and ashy.

Dental formula: $I \frac{2}{3}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{3}{3}$. Upper incisors subequal in length, closely crowded; inner incisors separated by a large space, the base of their cingulum with a distinct posterior cusp, the cutting edge broad and oblique, being highest externally; outer incisors conical, separated from the canines by a distinct space equal to that between the canine and third (large) premolar; first and second upper premolar small, drawn inwards from the tooth-row; second premolar the smallest, almost entirely hidden by the cingulum of the third premolar when viewed from the outer side. Lower incisors subequal, trifold, completely filling the space between the canines; first and second premolars are small and stand perfectly in the tooth-row, the second is the smaller of the two.

The following are the external and skull measurements of the type of *Vespertilio ferrugineus*; in parentheses are given the skull measurements of a second examined specimen. Forearm, 46.6; length of third metacarpal, 44.5; first phalanx, 15.5; second phalanx, 18; length of fourth metacarpal, 43.5; first phalanx, 13; second phalanx, 9.5; length of fifth metacarpal, 41; first phalanx, 11; second phalanx, 8; ear, length, 12; ear, breadth, 9; tibia, 18; hind foot, 11.5; calcar, teste Dobson, 11.5; tail from anus, 45 mm. — Skull: greatest length, —, (16.8); condylobasal length, —, (16.4); condyle to front of canine, —, (15.4); basal length, from front of incisors, —, (14.3); palatal length, from front of incisors, 9.2, (—); zygomatic breadth, —, (—); breadth of braincase, —, (8.7); height of braincase, —, (6.2); mastoid breadth, —, (9.2); interorbital constriction, 5.2, (5.0); width across molars, 7.2, (7.1); width across cingula canines, 5.2, (4.8); upper tooth-row, c-m³, 6.7, (6.2); lower tooth-row, c-m₃, 7.1, (6.6); length of mandible, 13.3, (12.4) mm.

Remarks. — In his "Catalogue systématique" Jentink (1888: 187) considered Temminck's plate 59 fig. 2 (animal, dorsal view; see fig. 35 in the present paper) to be made after the type in question. Temminck (1840: 240), however, noted that the description of *Vespertilio ferrugineus* was based on several spirit specimens ("basée sur la vue de plusieurs individus conservées à l'esprit de vin"). For this reason it may be possible that the figure in question was not made after the type specimen dealt with here. It is unknown whether Temminck's "syntypes" have been exchanged with other European museums, or must be considered lost. The present Leiden specimen is the only "syntype" known to me, and therefore I now select it to be the lectotype of Temminck's *Vespertilio ferrugineus*.

Jentink did not mention the skull of the type specimen; this probably means that at that time the skull was not removed from the mounted specimen. In a previous paper I commented upon the interchange of the skull of the type of Tem-

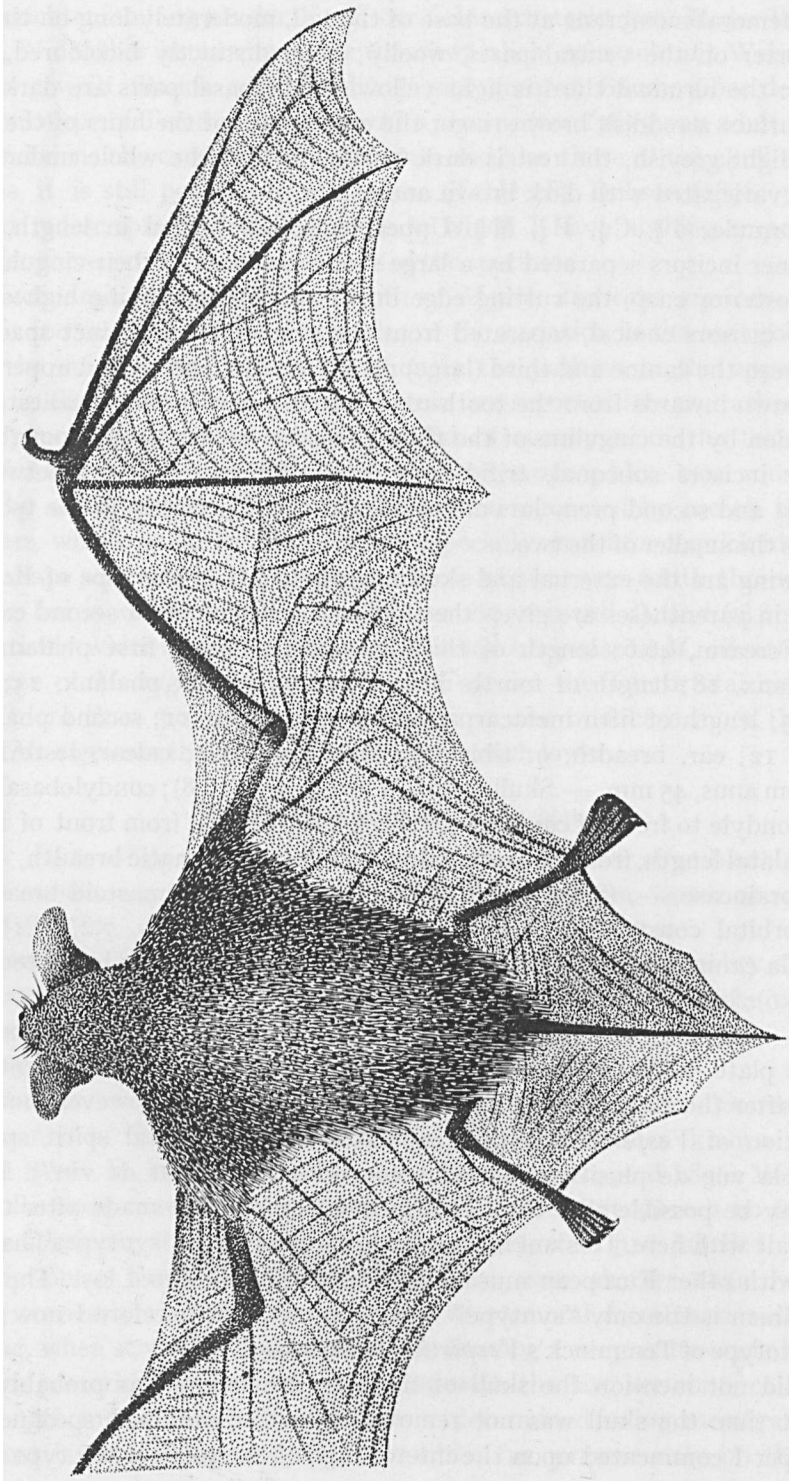


Fig. 35. *Myotis surinamensis* Husson, after Temminck, 1840.

minck's *Vespertilio harpia* and *V. ferrugineus* (see Husson, 1955: 121-122) and I suggested that Dobson (1878: 297) probably studied the skull of the skeleton mentioned by Jentink. I am not fully convinced that this "South America" specimen is identical with the present species. Though the structure and the position of the teeth are identical in the two specimens, the teeth differ quite strongly in size. With the available material at hand it is difficult to decide whether or not the dimensions of the two specimens fall within the variation of the species.

There are differences of opinion among authors concerning the generic position of *Vespertilio ferrugineus*, caused by the fact that Temminck incorrectly described the dental formula as follows: "Dents incisives 4 par paire en haut; l'interne longue, large et en biseau; l'externe courte, bifurquée; 6 en bas; molaires supérieures 4, inférieures 5, dont une fausse". Dobson (1878) placed the present species in the subgenus *Leuconoe* of the genus *Vespertilio* on the basis of the dental formula and of certain external characters. In their revision of the American forms of the genus *Myotis*, Miller & Allen (1928: 20), however, based themselves on the dental formula as given by Temminck "which indicates probably an *Eptesicus*"; for this reason *Vespertilio ferrugineus* was not further dealt with by them. Without giving his reasons, Cabrera (1958: 105) placed the present species in the genus *Eptesicus* as a junior synonym of the typical form of *E. brasiliensis* (Desmarest). It is, however, evident that Temminck's species is a true *Myotis* belonging to the largest forms of American members of that genus. According to Miller & Allen (1928: 205-208) *Myotis ferrugineus*, though much larger than *M. simus*, closely resembles that species which was described by Thomas (1901e: 541-542) from Sarayacu, eastern Peru. According to Handley (1960: 467-468), however, the most important characters given for *M. simus*, especially the insertion of the wing at the ankle, are either incorrectly described or are highly variable.

***Eptesicus melanopterus* (Jentink, 1904)**

Text-figs. 10i (head), 27g (interfemoral membrane), 34b (canines and incisors), pl. 36 (skull)
Vesperus melanopterus Jentink, 1904, Notes Leyden Mus., 24: 176.

Type locality. — "Paramaribo, Suriname".

Synonymies. — Cabrera, 1958: 107; Husson, 1962: 221.

Vernacular names. — (E) Suriname Brown Bat.

Distribution. — The present species has been reported from Suriname, Trinidad and Tobago, and, if *Eptesicus chapmani* J. A. Allen, 1915, is a synonym, also from north-eastern Brazil.

Occurrence in Suriname. — Jentink's type was collected at Paramaribo. Sanborn (1941: 384) reported upon a female from Zanderij (about 40 km south of Paramaribo). Husson (1962) listed material from the localities 3 and 7 below. I have now examined the following specimens:

1. Burnside, Coronie District, coastal area about 150 km west of Paramaribo, 1 female (no. 24844, skin and skull).
2. Kwattaweg, just west of Paramaribo, Suriname District, 1 male (no. 24843, skin and skull).
3. Paramaribo, 3 females (nos. 12092 (holotype), 24845, ZMH no. 1860a, skins and skulls).
4. Between Paramam (Para District) and Afobaka (Brokopondo District), 1 juvenile male (ZMA no. 9216, skin and skull).
5. Brokopondo, west bank of Suriname River north of Brokopondo Lake, 2 males (ZMA nos. 9341, 9564, skins and skulls), 1 female (ZMA no. 9551, skin and skull).
6. Brownsberg, west of Brokopondo Lake, Brokopondo District, 1 female (no. 24842, skin and skull).
7. Suriname, without more precise locality indication, 1 male and 1 female (SMN no. 264a, skins and skulls).

Description. — Length of forearm varying from 39.2 to 41.6 mm; ears and tragus well developed, the latter reaching to about one-third the length of the ear; inter-femoral membrane well developed, when stretched it reaches behind the claws of the hind foot; tail extending to the posterior border of the naked interfemoral membrane,

TABLE 29

External and skull measurements of four specimens of *Eptesicus melanopterus* (Jentink) from Suriname; RMNH reg. no. 12092 is the holotype of *Vesperus melanopterus* Jentink.

Museum	RMNH	SMN	SMN	ZMH
Reg. number	12092	264a	264a	1860a
Sex	♀	♂	♀	♀
Forearm	40.6	39.2	40.6	40.5
Third digit, metacarpal	39	37.5	38	38.5
1st phalanx	15	13.5	14.5	14.5
2nd phalanx	13	11.5	11	12
3rd phalanx	7	4.5	5	5
Fourth digit, metacarpal	38	36.5	37.5	37.5
1st phalanx	13	12	12	12
2nd phalanx	9.5	9	7	9
Fifth digit, metacarpal	36.5	36	36.5	36.5
1st phalanx	9.5	8	9.5	8
2nd phalanx	8	5	5.5	5.5
Ear, length x breadth	12x8.5	11x9	11.5x8	11x7.5
Tibia	16	15.5	16	16
Hind foot	8	8	9	8
Calcar	16	15	15.5	15
Skull:				
greatest length	-	15.5	15.4	16.0
condylobasal length	-	14.6	14.6	14.9
condyle to front of canine	-	14.1	14.1	14.5
basal length from front of i^1	-	13.1	13.0	13.2
palatal length from front of i^1	-	7.2	7.8	7.1
zygomatic breadth	-	10.9	-	-
breadth of braincase	-	7.3	7.3	7.7
height of braincase	-	5.8	5.8	5.9
mastoid breadth	-	8.1	7.9	8.8
interorbital constriction	-	4.0	3.6	4.0
width across molars	7.1	6.6	6.8	6.7
width across cingula canines	5.0	4.6	4.7	4.6
upper tooth-row, $c - m^3$	6.0	5.6	6.1	5.8
lower tooth-row, $c - m_3$	6.5	6.1	6.6	6.3
length of mandible	-	11.3	11.1	11.6

its free distal part about 2.5 mm long; wing membrane from the base of the outer toe; calcar well developed, with a narrow cutaneous margin, of about the same length as the tibia and about equal to the free margin of the interfemoral membrane between the calcar lobe and the tail end; upper parts uniformly cinnamon brown to dark brown, the extreme tips of the hairs yellowish; the basal half of the hairs of the under parts dark brown, the distal half whitish or light yellowish; wings dark brown; fur strictly confined to the body.

Dental formula: $I \frac{2}{3}$, $C \frac{1}{1}$, $P \frac{1}{2}$, $M \frac{3}{3}$. Inner upper incisors distinctly bifid, the inner cusp the highest; these two inner incisors are separated from each other by a distinct space, and are much larger than the outer upper incisors which they surpass for more than half their length; upper outer incisors separated from the canines by a space equal to the greatest diameter of one outer incisor; upper premolar large, more than half the size of the canine, in contact with both the canine and the first molar. Lower incisors trifold, completely filling the space between the canines; first lower premolar crowded in the tooth-row, about half the height of the second premolar, which hardly exceeds the first molar in vertical extent; sagittal crest distinct but weakly developed.

The external and skull measurements of the four examined Suriname specimens are given in Table 29.

***Lasiurus borealis frantzii* (Peters, 1871)**

Text-figs. 8b (interfemoral membrane), 10e (head), 34c (canines and incisors), pl. 37 (skull)

Atalapha Frantzii Peters, 1871, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1870: 908-909.

Type locality. — "Costa Rica" and "Brasilien". Restricted to Costa Rica by Miller & Kellogg (1955: 106).

Synonymies. — Cabrera, 1958: 113; Husson, 1962: 224.

Vernacular names. — (E) Red Bat.

Distribution. — The species *Lasiurus borealis* ranges from Canada south to South America as far as Uruguay, Argentina and Peru, including Central America and the West Indies. The present subspecies is known from Costa Rica and Panama to Peru and southern Brazil, including Colombia, Venezuela, the Guianas and Trinidad.

Occurrence in Suriname. — Lammens (1844: 109) described a species of Suriname bat as "Neue Gattung Nr. 1", his description shows that the present form is meant. The second record of the species from Suriname is the one by the brothers Penard ("De Surinamer", 2 April 1905), who indicated the species with the name *Atalapha noveboracensis* and remarked that it belongs to the common bats of Suriname. There are no other Suriname records of this species until in 1962 Husson dealt with the material listed below under nos. 1, 4 and 6. The Leiden Museum holds the following Suriname specimens of the species:

1. Coronie District near Totness, coastal area, 2 males (nos. 17205, 17570, skins and skulls), 1 female (no. 17569, skin and skull).
2. Kwattaweg, just west of Paramaribo, Suriname District, 1 female (no. 24841, skin and skull).
3. Combé, northern part of Paramaribo, 1 male (no. 17572, skin and skull), 2 females (nos. 17571, 25259, skins and skulls).
4. Paramaribo, 1 male (no. 17282, skin and skull), 2 females (nos. 7490, 17283, skins and skulls).
5. Powakka, Amerindian village west of Suriname River, about 5°26'N 55°4'W, Suriname District, 1 male (no. 25260, skin and skull).
6. Nason on Marowijne River about 4°48'N, Marowijne District, 1 male (no. 17568, skin and skull).

Description. — Length of forearm varying from 36.0 to 41.3 mm; muzzle short and broad; ears, about 7.5 mm long and 4.5 mm broad, more or less rectangular, their tips broadly rounded; tragus about half the length of the ear, broad in the middle, the obtuse tip curved inwards; interfemoral membrane large, when stretched reaching far beyond the toes; tail wholly enclosed in the membrane, the extreme tip free; calcar about 16 mm, equal in length to the free margin of the interfemoral membrane; wing membrane from near the base of the outer toe. Fur soft and dense; dorsally it extends on the wing membranes as far as a line drawn from the basal third of the upper arm to the bases of the toes; on the membrane it is almost as thick and dense as on the body. In the basal third the interfemoral membrane is thickly covered with long hairs, this fur becomes gradually more loose; usually a distinct strip along the calcar and the free margin of the membrane are naked. On the ventral surface of the wing membrane the fur is thick and extends as far as a line drawn from the elbow to the knee; a narrow area behind the forearm is loosely haired, the fur being more dense in the angle between the forearm and the fifth digit and in that between the fifth and the fourth digits, extending to about the middle of the fifth metacarpal bone; the forearm is quite naked; the basal fifth of the interfemoral membrane is haired. The hairs of the back of the body are distinctly tricoloured; the basal fourth is blackish, followed by a broad streak of light yellowish, while the distal third is bright reddish; the hairs of the dorsal surface of the membranes are practically of a uniformly reddish colour. The colour of the ventral surface is much lighter than that of the back; the greater portion of the hairs, especially in the lower part of the body, are bicoloured: the terminal fourth is yellowish or buffy, the basal three-fourths are blackish or dark brown. The chin is reddish or yellowish red. The larger parts of the wings are dark brown; in sharp contrast to this colour there are buffy or yellowish streaks along the forearm and the digits, while also a very fine reticular pattern of this light colour may be seen on the rest of the membrane.

Dental formula: $I \frac{1}{3}, C \frac{1}{1}, P \frac{2}{2}, M \frac{3}{3}$. Upper incisors short and robust, in contact with the canine (fig. 34c); first upper premolar minute, situated in the inner angle between the canine and the large second premolar; second premolar half as long as the first molar, its height more than half that of the canine. Lower incisors trifid,

forming a continuous row between the canines; first lower premolar smaller than the second, in contact with the canine as well as with the second premolar. Skull short and broad; sagittal crest very weakly developed, sharply defined in its middle part only.

The external and skull measurements of seven specimens from Suriname are given in Table 30.

TABLE 30

External and skull measurements of seven specimens of *Lasiurus borealis frantzii* (Peters) from Suriname in the Leiden Museum.

Reg. number	17282	17570	17205	17568	17569	17283	17571
Sex	♂	♂	♂	♂	♀	♀	♀
Forearm	38.6	36.3	36.0	38.5	38.3	41.3	36.7
Third digit, metacarpal	41	40	40	43	42	45	31.5
1st phalanx	16	16	16	17	17	17	10
2nd phalanx	18	16.5	17	18	17.5	18	10.5
3rd phalanx	3	3	3.5	3.5	3.5	3.5	3.5
Fourth digit, metacarpal	38.5	36.5	37	39.5	40	42.5	29.5
1st phalanx	11	10.5	11	11.5	11.5	11.5	7.5
2nd phalanx	11	11	11	11.5	13	11.5	9
Fifth digit, metacarpal	35	33	32.5	36	36.5	38.5	28.5
1st phalanx	8	7	7	8	7	7	6
2nd phalanx	7.5	7.5	8	8.5	8	8	7
Tibia	-	20	-	-	21	-	16
Hind foot	-	9	-	-	10	-	8
Calcar	14	16	17	16	14	16	12
Tail, approximately	40	42	40	46	-	50	30
Skull:							
greatest length	11.5	11.7	11.7	11.7	11.8	11.9	11.7
condylobasal length, from i	11.1	11.2	10.8	11.4	11.6	11.8	11.3
condyle to front of canine	11.0	11.2	10.8	11.4	11.5	11.8	11.0
basal length, from i	9.7	9.4	9.3	9.9	9.7	10.0	9.9
palatal length, from i	4.7	4.7	4.6	5.1	5.0	5.2	5.2
zygomatic breadth	8.1	8.4	8.5	8.9	9.0	8.9	9.1
breadth of braincase	7.3	7.3	7.3	7.1	7.3	7.5	7.4
height of braincase	5.6	5.5	5.6	5.5	5.6	5.8	5.6
mastoid breadth	7.4	7.3	7.3	7.4	7.6	7.6	7.2
interorbital constriction	4.5	4.1	4.2	4.3	4.2	4.2	4.3
width across molars	5.1	5.2	5.2	5.3	5.4	5.5	-
width across cingula canines	4.1	4.1	4.2	4.3	4.4	4.4	-
upper tooth-row, c - m ³	3.8	3.7	3.8	3.9	3.9	4.1	4.0
lower tooth-row, c - m ₃	4.4	4.2	4.4	4.4	4.5	4.4	4.6
length of mandible	8.1	8.4	8.3	8.4	8.7	8.8	-

Remarks. — In the adult Suriname specimens of the present species the third metacarpal bone is distinctly longer than the forearm (see Table 30); in specimen no. 17571, however, the third metacarpal is much shorter than the forearm; though the measurements of the skull of this specimen suggest the adult condition of the animal, the phalangeal epiphyses are not ossified. The same three peculiarities are also observed in one Suriname specimen of *Dasypterus ega ega* (see Table 31, ZMA no. 1524c). It seems probable that the relative shortness of the metacarpal is a juvenile character, and that the specimen, though the skull looks like that of an adult, actually is not full-grown. My material is, however, too scanty to give positive

information on this point, while this phenomenon is not adequately treated in the literature.

Handley (1960: 473) remarked that the first upper premolar in one or both maxillae was absent in about 10 per cent of his material of *Lasiurus*. In all seven examined skulls of my Suriname material of *L. borealis frantzii*, however, this premolar is present.

According to Goodwin & Greenhall (1961: 278) the present species "roosts individually, hanging among the leaves of trees". My specimens from Combé, Paramaribo (nos. 17571 and 17572), were collected in a house along the Suriname River, while the three individuals from Coronie (nos. 17205, 17569 and 17570) were found together in a shrub of the genus *Thespesia*.

***Dasypterus ega ega* (Gervais, 1856)**

Text-figs. 10j (head), 27h (interfemoral membrane), 34d (canines and incisors), pl. 37 (skull)

Nycticejus Ega Gervais, 1856, in De Castelnau, Animaux nouveaux rares Amérique, (Mammifères): 73, pl. 14 fig. 1.

Type locality. — "Ega", upper Amazon River, Brazil.

Synonymies. — Cabrera, 1958: 115; Husson, 1962: 227.

Vernacular names. — (E) Big Yellow Bat.

Distribution. — The species has a wide range of distribution, extending from southern California through Central America and the mainland of South America south to Uruguay, northern Argentina and Peru. The nominate subspecies is known from Brazil (Amazon River and the Mato Grosso), Peru, Bolivia and Suriname.

Occurrence in Suriname. — The species was first reported for Suriname by the brothers Penard ("De Surinamer", 2 April 1905), who cited it as *Atalapha ega* and thought it much rarer than the previous species (*Lasiurus borealis frantzii*). Husson (1962) mentioned three Suriname female specimens of the species, without a more precise locality indication (nos. 17370, 17371, ZMA no. 1524c, skins and skulls). No other Suriname specimens are known to me.

Description. — Length of forearm varying from 43.8 to 51.2 mm; muzzle short and broad; ears rhomboidal, about 14 mm long and 11 mm broad, with rounded tips; tragus broad, slightly longer than half the length of the ear; interfemoral membrane large, when stretched reaching far beyond the toes; tail about as long as body and head together, wholly included within the interfemoral membrane, ending at the posterior margin of that membrane; calcar about as long as the free margin of the interfemoral membrane; wing membranes from the bases of the outer toes. Fur soft and silky, extending on the dorsal surface of the wing membranes as far as a line drawn from the middle of the upper arm to the knee; on the dorsal surface of the interfemoral membrane the fur covers the basal fourth and extends along the tail to about the middle; the legs are thinly haired. On the ventral surface of the wing membranes the fur extends as far as a line drawn from the elbow to the knee; a patch of short hairs is present in the angle formed by the forearm and the fourth

metacarpal bone. In the basal third of the area of the tail the interfemoral membrane is ventrally covered with hairs. The hairs of the dorsal surface of the body may have a dark brown base, followed by a broad band of yellowish buff, and ending in a somewhat darker tip. The colour of the ventral surface is somewhat lighter, the hairs are brownish at the base, while the remainder is yellowish buff. The wing membranes are brownish with streaks of a lighter, whitish colour along the digits and also along the posterior margin; the hairs of the interfemoral membrane, both dorsally and ventrally, are similar to those of the body.

Dental formula: $I \frac{1}{3}$, $C \frac{1}{1}$, $P \frac{1}{2}$, $M \frac{3}{3}$. Teeth essentially similar to those of *Lasiurus borealis frantzii*, but the minute first upper premolar is always absent. The skull is more robust than in the previous species, while the sagittal crest, though weakly developed, is more distinct. For a comparison of the shape of the skulls of the two species plate 37 should be consulted.

The external and skull measurements of three females from Suriname are given in Table 31.

TABLE 31

External and skull measurements of three females of *Dasypterus ega ega* (Gervais) from Suriname.

Museum	RMNH	RMNH	ZMA
Reg. number	17371	17370	1524c
Forearm	47.5	47.0	48.1
Third digit, metacarpal	52.5	54	43.5
1st phalanx	17.5	18.5	13.5
2nd phalanx	17	18	12.5
3rd phalanx	4	5	5
Fourth digit, metacarpal	49.5	50	40
1st phalanx	12.5	13	10
2nd phalanx	9	11	8.5
Fifth digit, metacarpal	42	42.5	37.5
1st phalanx	9	8	7.5
2nd phalanx	8	9	7.5
Tibia	20	20	19
Hind foot	-	9.5	10
Calcar	-	15	17
Tail, approximately	50	-	-
Skull:			
greatest length	15.3	-	15.7
condylobasal length from i	15.0	-	15.3
condyle to front of canine	14.8	-	15.1
basal length from i	13.3	-	13.5
palatal length from i	6.9	-	7.0
zygomatic breadth	11.1	-	-
breadth of braincase	8.5	-	8.1
height of braincase	6.8	-	6.6
mastoid breadth	9.1	-	8.9
interorbital constriction	4.6	-	4.8
width across molars	7.3	-	-
width across cingula canines	6.0	-	5.9
upper tooth-row, c - m ³	5.5	5.6	5.6
lower tooth-row, c - m ₃	6.3	6.4	6.4
length of mandible	11.5	11.7	11.9

FAMILY MOLOSSIDAE

The species of the family Molossidae can immediately be distinguished from all other Suriname bats by the thick tail, which for about half its length extends beyond the posterior margin of the well-developed interfemoral membrane. Other striking characters are: (1) the narrowness of the wings, caused by the fact that the length of the fifth digit equals that of the third metacarpal, (2) the short and broad hind foot, (3) the toes, which bear long curved prehensile hairs, (4) the thick ears, which (except in *Molossops planirostris*) have their inner margins arising from one point on the forehead, sometimes being even joined together by a low band, (5) the shape of the muzzle, which is broad, obtuse, and obliquely truncated, resembling that of a mastiff or toad (old Dutch and German vernacular names for this group are "Hondsbek" and "Hundsmaul"). The calcar ends indistinctly, so that its length (a character of great importance in other groups of bats) cannot be used to separate the species of this family. The wings are attached to the distal third of the tibia or to the ankles. The shape and the size of the tragus and of the antitragus in some cases prove to be characters of diagnostic value.

Key to the Suriname Molossidae

- 1a. Inner margins of both ears distinctly separated, thus not arising from one point on the forehead. Length of forearm varying from 31 to 33.5 mm
Molossops planirostris planirostris, p. 187
- b. Inner margins of both ears arising from one point on the forehead or joined together by a low band. Length of forearm varying from 35 to 73 mm 2
- 2a. Upper lip with deep vertical grooves or wrinkles (see fig. 36c, f); anterior border of palate emarginate, separating the two inner incisors 3
- b. Upper lip smooth, without distinct vertical grooves or wrinkles (fig. 36a, b, d, e, g, h); anterior border of palate without emargination, so that the inner incisors are not separated by a distinct space 4
- 3a. Length of forearm varying from 40 to 45.5 mm *Tadarida europs*, p. 189
- b. Length of forearm varying from 56.5 to 64 mm *Tadarida macrotis*, p. 197
- 4a. Antitragus circular, about as high as long. Only one large premolar in upper tooth-row; lower jaw with two incisors. In full-grown specimens the knife-like sagittal crest is greatly developed 5
- b. Antitragus half-oval or half-cordate, longer than high. Two premolars in upper jaw, the anterior being very small; lower jaw with four incisors 7
- 5a. Hairs of the fur unicoloured, the colour of the basal part not different from that of the distal part. Length of forearm varying from 46 to 53 mm
Molossus ater ater, p. 202
- b. Hairs of the fur bicoloured, the basal part whitish, the distal part dark brown . 6
- 6a. Length of forearm varying from 37 to 41 mm. Fur not extending onto interfemoral membrane. *Molossus molossus*, p. 199

- b. Length of forearm varying from 46.9 to 50 mm. Fur extending distinctly onto interfemoral membrane *Molossus trinitatus*, p. 204
- 7a. Ventral surface of mesopatagium with a longitudinal area, about 5 mm wide, covered with white hairs, extending between proximal half of upper arm and that of thigh; this streak of white colour is sharply set off from the dark brown of the body. Length of forearm varying from 51 to 53 mm
Eumops geijskesi, p. 195
- b. No streak of white hairs on ventral surface of mesopatagium 8
- 8a. Length of forearm more than 65 mm *Eumops trumbulli*, p. 197
- b. Length of forearm less than 65 mm 9
- 9a. Tragus linear, small, with rounded tip. Small first upper premolar crowded out of the tooth-row, so that canine and large second premolar are in contact with each other. Upper parts dark blackish brown, under parts more dark brown. Length of forearm varying from about 56 to 63 mm.
Eumops auripendulus auripendulus, p. 193
- b. Tragus quadrate, small, superior margin straight. Minute first upper premolar in centre of space between canine and second premolar. Upper parts chestnut-brown with greyish tinge, under parts much paler. Length of forearm varying from 58 to 61 mm. *Eumops glaucinus*, p. 193

***Molossops planirostris planirostris* (Peters, 1865)**

Text-figs. 36e (head), 37a (canines and incisors), pl. 38 (skull)

Molossus (Molossops) planirostris Peters, 1865b, Monatsberichte Königlich Preuss. Akad. Wissensch. Berlin, 1865: 575.

Type locality. — "British Guiana", "Barra do Rio negro in Brasilien" and "Buenos Aires", Argentina. Restricted to Guyana by Miller (1912a: 399).

Synonymies. — Cabrera, 1958: 119; Husson, 1962: 231 (as *Cynomops p. planirostris*).

Vernacular names. — (E) Dog-faced Bat.

Distribution. — The species inhabits northern South America (from northern Brazil to Colombia) and Panama. The nominate subspecies is known from the Guianas to Colombia and Panama.

Occurrence in Suriname. — Temminck (1841: 356) reported upon a Suriname specimen of this species and considered it a juvenile of "*Dysopes abrasus*" [= *Eumops abrasus* (Temminck)]. This same specimen was later listed by Jentink (1888: 201, as *Molossus abrasus*) and discussed by Husson (1962: 234). I have now seen the following material:

1. Plantation "Blauwgrond", west bank of Suriname River just north-east of Paramaribo, Suriname District, 7 females (nos. 25429, 25430, 25432-25434, 25436, 25437, skins and skulls).
2. Paramaribo, 3 females (nos. 25435, 25438, 25440, skins and skulls).
3. Plantation "Welgedacht C", about 6 km south-west of Paramaribo, 1 male (no. 25431, skin and skull).
4. Plantation "Helena Christina", about 10 km south-west of Paramaribo, 1 female (no. 25441, skin and skull).

5. Plantation "Meerzorg", east bank of Suriname River opposite Paramaribo, Suriname District, 2 females (nos. 25439, 25442, skins and skulls).

6. Suriname, without more precise locality indication, 1 female (no. 13064, skin and skull).

Description. — *Molossops p. planirostris* can at once be distinguished from all other Suriname Molossidae by (1) its smaller size, the length of the forearm varying from 31 to 33.5 mm, and (2) the whitish chin, neck, chest, and abdomen, which are sharply set off from the rust brown sides of the ventral surface.

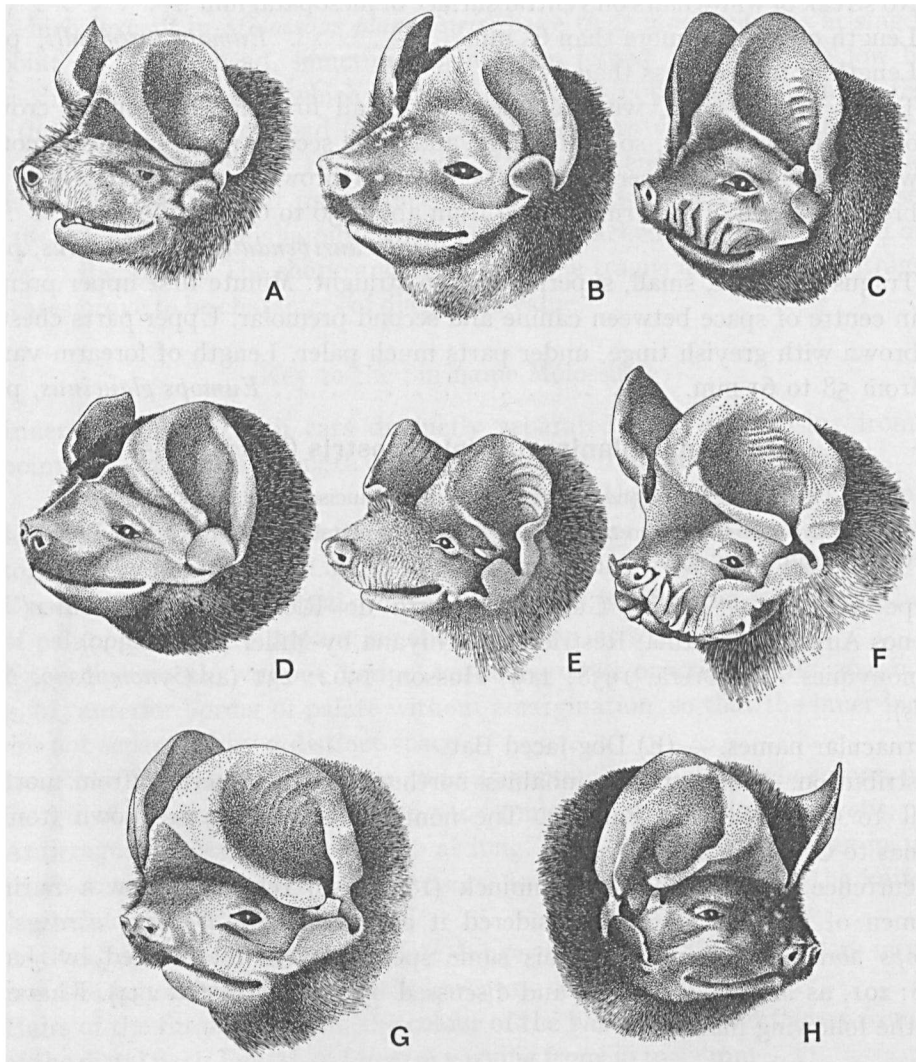


Fig. 36. a, *Eumops auripendulus auripendulus* (Shaw), BMNH no. 52.1082; b, *Molossus ater* E. Geoffroy; no. 13000; c, *Tadarida europs* (H. Allen), no. 15920; d, *Molossus molossus* (Pallas), no. 17373; e, *Molossops planirostris planirostris* (Peters), BMNH no. 80.11.29.4; f, *Tadarida macrotis* (Gray), BMNH no. 9.1.4.52; g, *Eumops trumbulli* (Thomas), no. 13063; h, *Eumops geijskesi* Husson, no. 12943.

Length of forearm varying from 31 to 33.5 mm; ears shorter than the head, the points of origin of the inner margins distinctly separated; tragus short, more or less triangular with a broad base; antitragus large, more or less square with rounded angles; calcar indistinct, at least in the examined specimens; about two-fifths of the tail project free beyond the posterior margin of the interfemoral membrane; wing membranes from the distal third of the tibiae; fur soft and short; hairs of the dorsal surface rust brown, the bases being much lighter, varying from light yellowish to whitish; chin, neck and a broad longitudinal band on chest and abdomen whitish or light yellowish white, contrasting sharply with the rust brown sides of the ventral surface, which are of the same tinge as the dorsal surface; wings darker brown without the rubiginous tinge.

Dental formula: $I \frac{1}{2}$, $C \frac{1}{1}$, $P \frac{1}{2}$, $M \frac{3}{3}$. Upper incisors, about half the height of the canines, in contact at their bases, their tips diverging, separated by a distinct space from the canines; the large upper premolar in contact with the first molar, sometimes separated by a small space from the canine; lacrymal ridges conspicuous, projecting laterally. Lower incisors small, bifid, crowded, the inner placed before the outer, their height being much less than that of the cingulum of the canines; lower premolars, the first of which is not so high as the second, in contact with each other, the first also with the canine and the second with the first molar.

External and skull measurements of two examined specimens from British Guiana, adult female and male, respectively. Forearm, 32, 32.5; length of third metacarpal, 33, 35; first phalanx, 15, 15; second phalanx, 13, 14; third phalanx, 3, 3; length of fourth metacarpal, 32.5, 34; first phalanx, 11, 10; second phalanx, 4.5, 4; length of fifth metacarpal, 20, 21; first phalanx, 9, 10; second phalanx, 3, 3; tail from anus, 30, 29 mm. — Skull: greatest length, 15.6, 17.0; condylobasal length, 15.3, 16.2; condyle to front of canine, 14.8, 16.0; basal length, 13.2, 14.3; palatal length, 6.5, 7.5; zygomatic breadth, 10.7, 11.6; breadth of braincase, 8.3, 8.7; height of braincase, 5.8, —; mastoid breadth, 10.3, 11.7; interorbital constriction, 4.4, 4.3; width across molars, 7.3, 7.7; width across cingula canines, 4.2, 5.0; upper tooth-row, $c-m^3$, 6.1, 6.6; lower tooth-row, $c-m_3$, 6.5, 7.1; length of mandible, 11.1, 11.8 mm.

Tadarida europs (H. Allen, 1889)

Text-figs. 36c (head), 37b (canines and incisors), pl. 39 (skull)

Nyctinomus europs H. Allen, 1889, Proc. American Philos. Soc. Philadelphia, 26: 558-561.

Type locality. — "Brazil". Restricted by Cabrera (1958: 121) to "Corumbá, estado de Mato-Grosso".

Synonymies. — Cabrera, 1958: 121; Husson, 1962: 234.

Vernacular names. — (E) Allen's Little Wrinkled-lipped Free-tailed Bat.

Distribution. — The species has been reported from Brazil, Suriname, Trinidad and Venezuela.

Occurrence in Suriname. — The species was reported for the first time from Suriname by Husson (1962), who dealt with the five males from the second lot referred to below. Since that time two more specimens of the species have been collected in Suriname. The total material is as follows:

1. Doublesteps Falls, Kabalebo River, about 4°N 57°25'W, Nickerie District, 2 specimens (no. 25314, skins and skulls).
2. Gonini River near confluence with Marowijne River, Marowijne District, 5 males (nos. 15918-15922, skins and skulls).

Description. — The most striking external characters are (1) the presence of a fold in the skin from the pubis to the lower third of the tibia, by which the femur and the upper part of the tibia are concealed ventrally, and (2) the narrowing of the fur on the dorsal surface.

Length of forearm varying from 40 to 45.2 mm; upper lip with deep vertical grooves or wrinkles; ears large, rounded, inner margins arising from one point on the forehead (not united); tragus small, quadrate, upper margin straight, about 1 mm in length; antitragus about as long as high, up to 4 mm long; femur and basal part of tibia on the ventral surface concealed by a fold of the skin extending from the pubis to the lower third of the tibia, the hind foot and lower part of the tibia being visible only; fur rather soft; dorsally behind the basis of the humerus the fur abruptly narrows inward, extending down to the basis of the tail; hairs of the dorsal surface uniformly auburn coloured, those of the ventral surface being lighter with light buff tips, in some specimens verging to white on the sides.

Dental formula: $I \frac{1}{2}, C \frac{1}{1}, P \frac{2}{2}, M \frac{3}{3}$. Teeth essentially like those of *Tadarida macrotis* (see under that species); the small first upper premolar, however, stands in the tooth-row and touches the canine as well as the large second premolar. Postorbital constriction of about the same width as the alveolar width across the canines; sagittal crest sharply defined, but scarcely developed.

External and skull measurements of two male specimens from Suriname (nos. 15918 and 15919, respectively) are given here. Forearm, 42.1, 42.9; length of third metacarpal, 43, 42.5; first phalanx, 19, 20; second phalanx, 15, 15.5; third phalanx, 7, 7; length of fourth metacarpal, 41.5, 41.5; first phalanx, 16, 17.5; second phalanx, 6, 4; length of fifth metacarpal, 24, 24.5; first phalanx, 13, 13.5; second phalanx 5.5, 6; tibia, 12.5, 12; tail, from anus, 43, 42 mm. — Skull: greatest length, 17.3, 16.9; condylobasal length, 16.6, 15.8; condyle to front of canine, 15.6, 15.4; basal length, from front of incisor, 14.9, 14.0; palatal length, from front of incisor, 7.3, 6.9; zygomatic breadth, 10.2, 9.6; breadth of braincase, —, 8.0; mastoid breadth, 9.9, 9.5; post-orbital constriction, 3.5, 3.3; width across molars, 7.0, 6.9; width across cingula canines, 3.8, 3.7; upper tooth-row, c-m³, 6.8, 6.4; lower tooth-row, c-m₃, 7.2, 6.8; length of mandible, 12.3, 11.8 mm.

Remarks. — In the five male specimens of *Tadarida europis* examined from Suriname the length of the forearm varies from 41.3 to 44.9 mm.

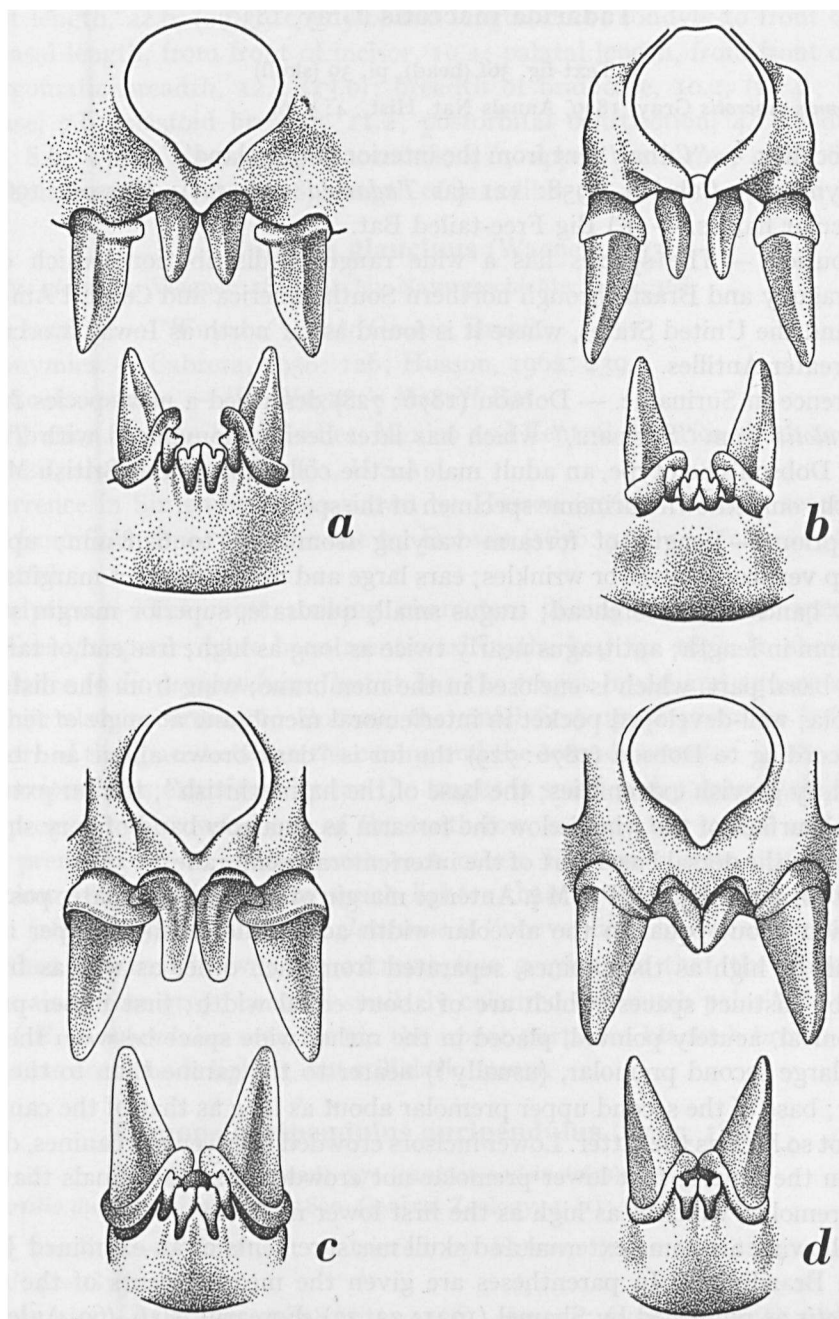


Fig. 37. Canines and incisors in front view. a, *Molossops planirostris planirostris* (Peters), no. 12900; b, *Tadarida europs* (H. Allen), no. 15919; c, *Eumops auripendulus auripendulus* (Shaw), no. 12907; d, *Molossus ater ater* E. Geoffroy, no. 12998. Width across cingula canines, in mm: a, 4.2; b, 3.7; c, 6.2; d, 5.4.

Tadarida macrotis (Gray, 1839)

Text-fig. 36f (head), pl. 39 (skull)

Nyctinomus macrotis Gray, 1839, Annals Nat. Hist., 4: 5, 6.

Type locality. — "Cuba. 'Sent from the interior of the island' "

Synonymies. — Cabrera, 1958: 121 (as *Tadarida molossus*); Husson, 1962: 236.

Vernacular names. — (E) Big Free-tailed Bat.

Distribution. — The species has a wide range of distribution, which extends from Paraguay and Brazil through northern South America and Central America to Mexico and the United States, where it is found as far north as Iowa; it occurs also on the Greater Antilles.

Occurrence in Suriname. — Dobson (1876: 728) described a new species *Nyctinomus megalotis* from "Surinam," which has later been synonymized with *Tadarida macrotis*. Dobson's holotype, an adult male in the collection of the British Museum, so far is the only known Suriname specimen of the species.

Description. — Length of forearm varying from 56.6 to 63.8 mm; upper lip with deep vertical grooves or wrinkles; ears large and rounded, inner margins united by a low band on the forehead; tragus small, quadrate, superior margin straight, about 2 mm in length; antitragus nearly twice as long as high; free end of tail longer than the basal part, which is enclosed in the membrane; wing from the distal third of the tibia; well-developed pocket in interfemoral membrane at angle of femur and tibia; according to Dobson (1876: 729) the fur is "dark brown above and beneath, with slightly greyish extremities; the base of the hairs whitish"; the fur extends on the dorsal surface of the wing below the forearm as a narrow band of very short fine hairs, and on the dorsal basal part of the interfemoral membrane.

Dental formula: $I \frac{1}{2}, C \frac{1}{1}, P \frac{2}{2}, M \frac{3}{3}$. Anterior margin of palate emarginate; postorbital constriction about equal to the alveolar width across the canines; upper incisors, about half as high as the canines, separated from each other as well as from the canines by distinct spaces, which are of about equal width; first upper premolar small, conical, acutely pointed, placed in the rather wide space between the canine and the large second premolar, (usually?) nearer to the canine than to the second premolar; base of the second upper premolar about as long as that of the canine, the former not so high as the latter. Lower incisors crowded between the canines, distinctly bifid in the centre; first lower premolar not crowded, its base equals that of the second premolar, which is as high as the first lower molar.

The following are some external and skull measurements of an examined Jamaica skin and Brazil skull. In parentheses are given the measurements of the type of *N. megalotis* as published by Shamel (1931: 23, 27). Forearm, 56.6, (60.4); length of third metacarpal, 55; first phalanx, 22.5; second phalanx, 19.5; third phalanx, 6; length of fourth metacarpal, 52.5; first phalanx, 18; second phalanx, 4.5; length of fifth metacarpal, 26.5; first phalanx, 17.5; second phalanx, 8; ear, from notch, 22; tibia, 17, (17.0); hind foot, 10, (9.0); tail, from anus, 52, (57) mm. — Skull:

greatest length, 22.6, (24.0); condylobasal length, 21.1; condyle to front of canine, 20.3; basal length, from front of incisor, 19.4; palatal length, from front of incisor, 9.3; zygomatic breadth, 12.2 (13.0); breadth of braincase, 10.2, (10.4); height of braincase, 7.6; mastoid breadth, 11.2; postorbital constriction, 4.1; width across molars, 8.6; width across cingula canines, 4.6; upper tooth-row, c-m³, 8.4, (9.0); lower tooth-row, c-m₃, 9.2, (9.8); length of mandible, 15.4, (17.0) mm.

***Eumops glaucinus* (Wagner, 1843)**

Dysopes glaucinus Wagner, 1843, Archiv Naturgeschichte, 9 (1): 368.

Type locality. — "Cuyaba", Mato Grosso, Brazil.

Synonymies. — Cabrera, 1958: 126; Husson, 1962: 239.

Vernacular names. — (E) Wagner's Mastiff Bat.

Distribution. — The West Indies, Mexico and Central America south to Ecuador and Brazil; also southern Florida, U.S.A.

Occurrence in Suriname. — As shown by Husson (1962), the only record of this species from Suriname, viz., the one by Dobson (1876: 714, as *Molossus glaucinus*), is doubtful.

Description. — The most striking characters distinguishing this species from other *Eumops* species have been mentioned in the key (p. 187). It shows a close resemblance to *E. auripendulus*, but it has the tragus broad and square across the top, while also, according to Dobson, the small first upper premolar is located in the centre of the space between the canine and the second premolar. In the specimens of *E. auripendulus* examined by me the tragus is small and pointed, while the first upper premolar is crowded out of the tooth-row, so that the canine and the large second premolar are in contact with each other. The two species differ also in the coat colour, *E. glaucinus* being much lighter than *E. auripendulus*. According to Dobson (1876: 715) the fur of *E. glaucinus* is "above, light brown at the base of the hairs, then chestnut-brown, the extreme tips greyish, so that the upper surface appears altogether grey; beneath similarly coloured but much paler". In the specimens of *E. auripendulus* seen by me the upper parts are blackish brown while the under parts are a shade lighter, but still dark brown.

***Eumops auripendulus auripendulus* (Shaw, 1800)**

Text-figs. 36a (head), 37c (canines and incisors), pl. 40 (skull)

Vespertilio auripendulus Shaw, 1800, General Zoology, 1 (1): 137.

Type locality. — "Guiana", restricted by Husson (1962: 240, 241) to "French Guiana" (= Guyane).

Synonymies. — Cabrera, 1958: 123, as *E. abrasus*; Goodwin, 1960: 5; Husson, 1962: 240.

Vernacular names. — (E) Temminck's Mastiff Bat.

Distribution. — The range of the species extends from the southern border of the Amazon basin northward to southern Mexico. The actual range of subspecies is

uncertain, but in view of the type locality of the species, we can safely accept that the nominate subspecies is found in Suriname.

Occurrence in Suriname. — Lammens (1844: 109) described a species from Suriname and identified it with *Vespertilio molossus* Pallas; as shown by Husson (1962: 243) it is most likely that Lammens's material actually belongs to the present species; this then would be the first Suriname record of *Eumops auripendulus*. Several authors later reported the species from Suriname (see Husson, 1962: 240), but the only more accurate locality indications are those by Jentink (1887: 288) "Maroni" (= Marowijne River) and Jentink (1888: 201) "Paramaribo". Husson (1962: 241) reported the species from the following localities:

1. Paramaribo, Suriname District, 4 males (nos. 12906, 12907, 12909, ZMA no. 1630, skins and skulls), 2 females (no. 12908, BMNH no. 52.1082, skins and skulls).
2. Plantation "Welgedacht C", south of Paramaribo, Suriname District, 2 males (nos. 12912, 12967, skins and skulls).
3. Summit of Mt. Hendrik, Emma Range, Saramacca District, about 4°10'N 56°10'W, 1 male (ZMA no. 1524a, skin and skull).
4. Slootwijk on Commewijne River, Commewijne District, about 5°50'N 54°52'W, 1 female (no. 12911, skin and skull).
5. Marowijne River, Marowijne District, 1 female (no. 12904, skull).
6. Suriname, without more precise locality indication, 1 male and 2 females (nos. 13011, skull; SMN no. 440-528, skins and skulls).

Since the publication of my 1962 paper, the Rijksmuseum van Natuurlijke Historie obtained the following additional Suriname material of this species:

7. Wageningen, northern Nickerie District, north-western Suriname, 1 female (no. 24793, skin and skull).
8. Paramaribo, Suriname District, 1 female (no. 24792, skin and skull).
9. Gansee on Suriname River (locality at present covered by Brokopondo Lake), Brokopondo District, January 1963, 1 male (no. 24791, skin and skull).

The species evidently is common in the coastal lowland area, but also occurs in the foothills of the interior.

Description. — Length of forearm varying from 56 to 63 mm; upper lip without vertical grooves or wrinkles; ears large, broad, rounded, when laid forward not reaching the extreme tip of the muzzle; the inner margins of the ears arising from one point on the forehead, united at their bases only; tragus small, linear, subacutely pointed, about 1 mm long and 2 mm high, with a broad base; antitragus about twice as long as high, half-cordate or half-oval, about 8 mm long and 4 mm high; wing membranes from the ankles; upper parts dark reddish brown to dark blackish brown, basal parts of the hairs buffy white; under parts somewhat paler, the sides more greyish; ears and membranes blackish.

Dental formula: $I \frac{1}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors in contact with the canines and with each other at their bases, their inner margins diverging; they are about half as high as the canines; the minute anterior upper premolar is crowded out of the tooth-row, so that the canine and the large second premolar are in contact; the second upper premolar is higher than the molars. Lower incisors subequal, bifid, and considerably shorter than the cingulum of the canines, crowded in a nearly semicir-

TABLE 32

External and skull measurements of eight specimens of *Eumops auripendulus auripendulus* (Shaw) from Suriname.

Museum	RMNH	RMNH	RMNH	ZMA	ZMA	SMN	RMNH	SMN
Reg. number	12906	12907	12909	1630	1524a	440-528	12908	440-528
Sex	♂	♂	♂	♂	♂	♂	♀	♀
Forearm	59.0	60.0	60.6	59.2	60.0	60.0	57.6	62.5
Third digit, metacarpal	60	60.5	60.8	60	60.5	60.5	59	63
1st phalanx	26	26	26.5	26	27	26	25	24.5
2nd phalanx	22.5	24	24	23.5	24	25	24	25
3rd phalanx	8	9	9	8	10	9	8	8
Fourth digit, metacarpal	57	59.5	57.8	59.5	58.5	58.5	57	61
1st phalanx	21	22	20.5	22.5	22	22	20.5	23
2nd phalanx	11	11.5	12.5	11	11	12	11	12
Fifth digit, metacarpal	32	34.5	33	34	33	32.5	31.5	33.5
1st phalanx	17.5	18	17.5	18	18.5	17.5	17	19.5
2nd phalanx	9	9	8	8.5	9	10	9	10.5
Tibia	18.5	19	20	18	17.5	18.5	17	18.5
Hind foot, with claws	11.5	11	11.5	11.5	-	11.5	11	11.5
Tail, from anus	-	50	-	46	47	47	46	48
Free end of tail	22	26	25	23	25	21	25	26
Skull:								
greatest length	23.0	23.6	23.1	24.8	23.7	23.7	22.9	23.0
condylobasal length	22.1	22.6	-	22.6	22.5	22.7	21.8	22.2
condyle to front of canine	21.9	22.4	-	22.4	22.4	22.0	21.5	22.0
basal length	20.5	20.5	-	20.1	21.1	20.8	19.5	20.3
palatal length	10.4	10.5	10.7	10.4	11.2	10.8	10.3	10.4
zygomatic breadth	14.6	14.3	15.2	15.3	15.1	14.6	14.2	14.6
breadth of braincase	11.0	10.8	11.1	11.6	11.2	11.0	11.0	11.1
mastoid breadth	12.5	12.3	13.0	12.4	12.4	12.6	12.3	12.5
postorbital constriction	4.6	4.5	4.8	4.8	4.6	4.8	4.7	4.5
width across molars	10.3	10.0	10.5	10.3	10.3	10.5	9.8	10.2
width across cingula								
canines	6.2	6.2	6.2	6.5	6.4	6.5	5.9	6.0
upper tooth-row, c - m ³	9.8	9.7	9.6	9.8	9.9	10.0	9.5	9.6
lower tooth-row, c - m ₃	11.0	10.9	10.2	10.6	10.9	10.9	10.3	10.6
length of mandible	17.2	17.8	17.5	17.7	18.0	17.2	17.2	17.5

cular row; the lower premolars are about equal in size, the anterior with a somewhat lower shaft than the posterior, the latter slightly lower than the first molar; the sagittal crest is distinct and well developed.

The external and skull measurements of some of my Suriname specimens are given in Table 32.

Remarks. — Husson extensively discussed the taxonomy and synonymy of the present species.

Eumops geijskesi Husson, 1962

Text-figs. 8a (interfemoral membrane), 36h (head), pl. 40 (skull)

Eumops geijskesi Husson, 1962, Zoologische Verhandlungen, Leiden, 58: 246-248.

Type locality. — "Suriname".

Synonymies. — Husson, 1962: 246.

Distribution. — Only known by the type specimens from Suriname.

Occurrence in Suriname. — The types are labelled "Suriname" and no more accurate locality is known.

Description. — The present species can at once be distinguished from all other Suriname Molossidae by the peculiar streak of white hairs on the ventral surface of the mesopatagium along the sides of the body. It shows a close resemblance to *Eumops auripendulus* but is much smaller in all its dimensions.

The ears are large and rounded, when laid forwards they reach the smooth margin of the upper lip; the inner margins of the ears are united on the forehead for an extremely short distance only. The tragus is small, linear, and rounded above, with a broad base: the height of the tragus is about 2 mm, in the middle it is somewhat more than 1 mm long. The half-cordate antitragus is about 7 mm long and 3 mm high.

The fur consists of very soft hairs, uniformly coloured from base to tip. On the dorsal surface the fur is of a uniform dark chocolate brown colour; anteriorly the fur extends to the forehead and the basal parts of the ears, so that about one half of the outer side of the ears is naked; laterally the fur extends on to the wing membranes up to a line connecting the proximal half of the upper arm and the knee; posteriorly the fur covers about one-third of the uropatagium.

On the ventral surface of the body the fur has exactly the same colour as on the dorsal surface; the ventral surface of the uropatagium is quite naked. In the basal part of the mesopatagium, along the sides of the body, there is a narrow longitudinal area, about 5 mm broad, covered by fur; this area is sharply set off from the fur of the body, because the hairs here are bright white to whitish in colour. This area of white fur extends between the proximal half of the upper arm and the proximal part of the thigh.

The wing membranes, attached from the ankles, are pale brownish, and slightly darker on the dorsal than on the ventral surface; except for the above mentioned narrow areas the wings are naked.

The free end of the tail is equal to or somewhat longer than the proximal part, which is enclosed in the interfemoral membrane. The calcar is about three times as long as the free border of the uropatagium, as can distinctly be observed in the spirit specimens. A distinct but relatively small gular sac is present in the males, this sac is rudimentary or absent (?) in the females.

Dental formula: $I \frac{1}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. The slender shafts of the forward projecting upper incisors are about half as high as those of the canines; the upper incisors are in contact with each other in the middle, their tips diverge, and the bases of the incisors touch those of the canines. The small first upper premolar is crowded out of the tooth-row by the canine and the large second premolar, which are in contact. The four lower incisors are subequal, bifid, and placed close together, the two inner being placed before and slightly below the outer so that their cutting edges are below those of the outer incisors. The latter are much shorter than the cingulum of the canines. The low but sharply defined sagittal crest runs from the middle of the

orbital region to the basioccipital, where it joins the lambdoidal crest. In all other respects there is the closest resemblance to Miller's (1907: 257-258) description of the skull of the genus *Eumops*.

External and cranial measurements of the holotype (female) and the female and male paratypes, respectively. Forearm (before skinning), 52.8, 51.0, 51.9; length of third metacarpal, 53.5, 53, 48; first phalanx 24, 23, 20; second phalanx, 20, 20, 15; third phalanx, 5.5, 7, 5; length of fourth metacarpal, 51, 49, 45; first phalanx, 20, 17.5, 15; second phalanx, 5.5, 6.5, 5; length of fifth metacarpal, 30.5, 28, 26; first phalanx, 15.5, 15, 13; second phalanx, 5, 5, 4; tibia, 17, 18.5, 18.5; hind foot with claws, 11, —, —; tail from anus, 42, 40, 40; calcar, 18, 16, 17 mm. — Skull (holotype and adult female paratype, respectively): greatest length, 20.1, 20.1; condyle to front of canine, 18.6, 18.7; basal length, 16.7, 17.3; palatal length, 8.8, 8.6; zygomatic breadth, 12.5, 12.3; breadth of braincase, 10.3, 10.3; height of braincase, 7.2, 7.0; mastoid breadth, 10.8, 10.9; postorbital constriction, 4.1, 4.1; width across molars, 8.9, 9.0; width across cingula canines, 5.0, 4.7; upper tooth-row, c-m³, 8.4, 8.2; lower tooth-row, c-m₃, 9.1, 9.1; length of mandible, 14.5, 14.6 mm.

Eumops trumbulli (Thomas, 1901)

Text-fig. 36g (head), pl. 41 (skull)

Promops Trumbulli Thomas, 1901b, Annals Magazine Nat. Hist., (7) 7: 190-191.

Type locality. — "Para", lower Amazon basin, Brazil.

Synonymies. — Cabrera, 1958: 127; Husson, 1962: 248.

Vernacular names. — (E) Greater Mastiff Bat.

Distribution. — The species has been reported from the type locality, from Peru, and from Suriname.

Occurrence in Suriname. — The first Suriname record of this species is by Jentink (1888: 201), who reported upon a specimen from Suriname as *Molossus perotis* (his specimen no. b); Jablonowski (1889: 48), in his study of the structure of the hairs of molossid bats, examined a specimen from Suriname of the Stuttgart Museum. Husson (1962: 249) listed the following Suriname specimens:

1. Paramaribo, Suriname District, 1 male (no. 13063, skin and skull).
2. Suriname, without more precise locality indication, 1 male (ZMA no. 1639, skin and skull), 1 female (SMN no. 293, skin and skull).

Since the publication of my 1962 paper the Rijksmuseum van Natuurlijke Historie received the following Suriname material of this species:

3. Zanderij, 40 km south of Paramaribo, Para District, 3 males (nos. 17858, 24789, 24790, skins and skulls), 1 female (no. 17857, skin and skull).

No other specimens have been seen by me.

Description. — Length of forearm varying from 70 to 73 mm; upper lip without deep vertical grooves or wrinkles; ears large and broad, rounded, inner margins

united by their bases only; tragus small, quadrate, superior margin about 3 mm, height about 4.5 mm; antitragus about twice as long as high, about 11.5 mm long and 5.5 mm high; wing membrane from the distal part of the tibia near the ankle. In the original description Thomas described the coat colour as follows: "General colour above more "hair-brown" than the rufous-brown of *P. perotis*. Under surface whitish brown, paler along the middle line; the long hairs on the throat whitish grey; face and chin blackish brown".

Dental formula: $I \frac{1}{2}$, $C \frac{1}{1}$, $P \frac{2}{2}$, $M \frac{3}{3}$. Upper incisors large, completely filling the space between the canines, in contact with the canines as well as with each other, except at the diverging tips; the canine with a distinct notch at the centre of the inner basal cingulum, visible in the buccal aspect of the teeth; first upper premolar small, scarcely exceeding the cingulum of the large second premolar, slightly crowded out of the tooth-row; the canine and the second premolar do not touch. Lower incisors subequal, bifid, much shorter than the cingulum of the canines, crowded in a nearly semicircular row; lower premolars about equal in size, the anterior with somewhat lower shaft than the posterior.

External and skull measurements of the examined specimens of lots 1 and 2 of the Leiden, Amsterdam and Stuttgart Museums, respectively; in parentheses some skull measurements of *Eumops perotis* (Schinz) are given, based on a strongly damaged skull from Concepcion, Argentina (BMNH no. 26.1.9.6., male). Forearm, 71.5, 73.0, 70.5; length of third metacarpal, 72, 73, 71.5; first phalanx, 30, 29, 27; second phalanx, 25, 27, 26; third phalanx, 9, 9, 7; length of fourth metacarpal, 71.5, 72, 69.5; first phalanx, 24, 23, 22.5; second phalanx, 11, 13, 10.5; length of fifth metacarpal, 40.5, 40.5, 38.5; first phalanx, 21, 21.5, 20; second phalanx, 10, 12, 11.5; tibia, 21, 22, 21; hind foot, 14, 14, 14; tail, from anus, 56, 54, 55 mm. — Skull: greatest length, 27.3, —, 26.6; condylobasal length, 26.3, —, 25.6; condyle to front of canine, 26.2, —, 25.3; basal length, 23.4, —, 23.0; palatal length, 12.1, —, 11.4; breadth of braincase, 12.4, —, 12.2; postorbital constriction, 5.0, —, 4.9; width across molars, 11.6, —, 11.1; width across cingula canines, 6.6, —, 6.5, (8.3); upper tooth-row, c-m³, 11.4, —, 11.1, (12.7); large premolar and first two molars, combined length, 6.9, —, 6.8, (8.1); lower tooth-row, c-m₃, 12.0, 12.3, 11.7, (13.7); first lower premolar, transverse diameter, 1.6, 1.5, 1.5, (1.9); first lower molar, transverse diameter, 1.9, 2.0, 1.8, (2.2); length of mandible, 20.3, 21.0, 19.6, (22.9) mm.

The present species is closely related to *Eumops perotis* (Schinz). The main differences between the two species are: (1) *E. trumbulli* is smaller than *E. perotis*, the length of the forearm of the former varies, as far as is known, from 70 to 73 mm, while in *E. perotis* these values are 74 and 80 mm; (2) the teeth of *E. trumbulli* are considerably smaller than those of *E. perotis*, as is clearly shown by the measurements given by Thomas (1901b) and by Sanborn (1949); (3) in *E. trumbulli* the cingulum of the canine shows a distinct notch on the inner side, while such a notch is not present in *E. perotis*.

Molossus molossus (Pallas, 1766)

Text-fig. 36d (head), pl. 41 (skull)

Vespertilio Molossus Pallas, 1766, *Miscellanea Zoologica*: 49-50.

Type locality. — "America". Restricted to Martinique, West Indies, by the lectotype selection by Husson (1962: 257).

Synonymies. — Cabrera, 1958: 131 (as *Molossus major major*); Husson, 1962: 251.

Vernacular names. — (E) Little Free-tailed House Bat.

Distribution. — The present species has a wide distribution in Central and South America, including the West Indies.

Occurrence in Suriname. — The first record of the species from Suriname is by Temminck (1826: 236) who gave a description and figure of his Suriname material under the name *Dysopes obscurus* (Geoffroy, 1805). Jentink (1887: 288-289; 1888: 200-201) reported the species from Paramaribo and the Marowijne River. Several other authors mentioned the species from "Surinam". The brothers Penard ("De Surinamer", 2 April 1905) indicated it as the most common bat of Suriname, which occurs in great numbers, spending the day-time in and under the roofs of houses, which hiding places are left at sundown. Judging by the collector's notes of my material the species is usually found inside houses, sheds and stables, under bridges and in culverts and tunnels, and it often becomes a serious nuisance. Wherever in popular publications on Suriname, bats are described as a pest, it is probable that this or one of the other common species (*Glossophaga soricina*, *Molossus ater*, or *Carollia perspicillata*) is meant. Husson (1962: 251, 252) listed the species from numerous localities in Suriname (lots 6, 7, 9-12, 14-18, 23-25, 27) of the list given below. I have now seen the following specimens:

1. Wageningen, northern Nickerie District, 2 males (nos. 25269, 25270, skins and skulls).
2. Cupido, on Maratakka River, about 12 km south of Wageningen, 1 female (no. 25268, skin and skull).
3. Kaysergebergte, a mountain range in the southern part of the Nickerie District at about 3°N 56°30'W, 11 specimens (no. 20974, skins and skulls).
4. Arawarra, near confluence of Wayombo River and Arawarra Creek, about 5°18'N 56°25'W, Saramacca District, 3 males (nos. 22246, 25264, 25266, skins and skulls), 3 females (nos. 25262, 25265, 25267, skins and skulls).
5. Boskamp, mouth of Coppename River, 1 male (no. 18839, skin and skull).
6. Garnizoenspad, west of Paramaribo, Saramacca District, 5 males (nos. 17415-17419, skins and skulls).
7. Kwattaweg, west of Paramaribo, Suriname District, 11 males (nos. 12956-12966, skins and skulls), 19 females (nos. 12968-12986, skins and skulls).
8. Plantation "Morgenstond", west bank of Suriname River just north-east of Paramaribo, 2 females (nos. 24693, 24694, skulls).
9. Combé, northern part of Paramaribo, 1 male (no. 12990, skin and skull), 4 females (nos. 12989, 12997, 17412, 25274, skins and skulls).
10. Paramaribo, 40 males (nos. 12892, 12939-12942, 12992, 17403, ZMA nos. 9213, 9562, skins and skulls), 3 females (ZMA nos. 9204, 9214, 9215, skins and skulls), 4 specimens (nos. 25261, 25313, skins and skulls).
11. Zorg en Hoop, southern part of Paramaribo, 1 male (no. 17404, skin), 1 female (no. 25275, skin and skull), 5 specimens (no. 18250, skins and skulls).

12. Plantation "Welgedacht C", about 6 km south-west of Paramaribo, 1 male (no. 12991, skin and skull).
13. Plantation "Peperpot", east bank of Suriname River, about 6 km south-east of Paramaribo, 1 female (no. 17408, skin and skull).
14. Jodensavanne, east bank of Suriname River about 50 km south-east of Paramaribo, Suriname District, 1 male (no. 17405, skin and skull), 1 female (no. 17408, skin and skull).
15. Republiek, about 35 km south of Paramaribo, Para District, 2 males (nos. 17413, 17414, skins and skulls).
16. Zanderij, about 40 km south of Paramaribo, 1 male (no. 17373, skin and skull).
17. Bosbivak near Zanderij, Para District, 1 female (ZMA no. A1883, skin and skull).
18. Upper Saramacca River, Brokopondo District, 3 males (nos. 12993-12995, skins and skulls), 1 juvenile female (no. 12996, skin and skull).
19. Five km east of Goliath Mountain, about 5°8'N 55°37'W, Brokopondo District, 1 male (no. 25312, skin and skull).
20. Brokobaka, 6 km north of Afobaka, west of Suriname River, 1 female (ZMA no. 9557, skin and skull).
21. Afobaka, west bank of Suriname River on north shore of Brokopondo Lake, 1 male (no. 18287, skull), 16 specimens (nos. 25226-25241, skins and skulls).
22. Mamadam Falls in Suriname River, locality now covered by Brokopondo Lake, Brokopondo District, 8 adult and 2 juvenile specimens (nos. 25216-25225, skins and skulls).
23. Tempati, Tempati Creek, upper Commewijne basin, southern Commewijne District, 1 male and 3 females (ZMA no. 4471, skins and skulls).
24. Nason (= Americankondre) on Marowijne River at about 4°48'N, 4 males (nos. 17407, 17409-17411, skins and skulls), 2 females (nos. 12987, 12988, skins and skulls), 1 specimen (no. 25250, skull).
25. Marowijne River, 1 male (no. 12953, skull).
26. Paloemeu airstrip (= Vincent Fajk's airstrip), upper Tapanahony River at about 3°18'N 55°28'W, Marowijne District, 1 male (no. 21657, skin), 1 female (no. 21656, skin and skull), 3 specimens (no. 18277, skins and skulls).
27. Suriname, without a more precise locality indication, 5 males (nos. 12948-12950, 13004, SMN no. 264/575-3, skins and skulls), 4 females (no. 12947, SMN nos. 264/575-1,2, 1632, skins and skulls), 4 skulls (nos. 12951, 12952, 12954, 12955).

Description. — Length of forearm varying from about 37 to 40.5 mm; muzzle short, truncated; ears short and broad, arising from a single point on the forehead, from which furthermore a well defined ridge extends forwards to the nostrils; tragus minute, linear, acutely pointed; antitragus more or less circular, about as wide as high; interfemoral membrane moderately developed, when stretched extending behind the relatively short hind feet; tibia relatively short; tail thick, enclosed in the interfemoral membrane, projecting for about half its length behind the posterior margin of the membrane; wings from the ankles; gular sac distinct in the males, small or rudimentary in the females. The fur is short and velvety. On the dorsal surface of the wing membrane it extends as far as the line connecting the basal third of the upper arm with the knee. Furthermore the dorsal surface of the wing membrane shows the following furred patches: (a) a band on the antebrachial membrane extending along the forearm, (b) a much less distinct band behind the forearm on the wing membrane, (c) a spot in the angle between the fourth and fifth metacarpals. On the ventral surface of the wing membrane the fur extends as far as a line connecting the elbow with the knee; loosely haired patches or bands are furthermore present along the forearm and the fifth metacarpal.

On the basal third of its ventral surface the interfemoral membrane is also provided with fur. Dorsally the toes bear long curved hairs. The colour is variable, on the dorsal surface of the body it varies from dark brown to dark greyish brown, on the ventral surface it is paler; the area around the gular sac is whitish. The dorsal surface has a mottled appearance caused by the fact that the basal part of the hairs is whitish or light yellowish brown, while the tips are dark greyish brown. On the ventral surface the basal parts of the hairs are whitish followed by a broad brownish band, while the extreme tips are yellowish. The wings are blackish brown above, somewhat paler below.

Dental formula: $I \frac{1}{1}$, $C \frac{1}{1}$, $P \frac{1}{2}$, $M \frac{3}{3}$. Upper incisors completely filling the space between the canines, touching each other and the cingulum of the canine; their height about one-third that of the canines. The upper premolar is nearly as broad as the first molar, its crown area being more than half the size of that of the first molar; externally its shaft is about twice as high as that of the molars. The lower incisors are distinctly bifid, they are much shorter than the cingula of the canines,

TABLE 33

External and skull measurements of ten specimens of *Molossus molossus* (Pallas) from Suriname.

Museum	ZMH	RMNH	RMNH	RMNH	RMNH	SMN	SMN	SMN	RMNH	RMNH
Reg. number	38862a	12956	12963	12993	12994	1632	264-575,1	264-575,2	12975	12988
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm	39.1	40.3	40.0	40.5	40.0	39.8	37.8	39.8	38.9	40.5
Third digit, metacarpal	41.5	40	40.5	41.5	41.5	41	39	42.5	39	41.5
1st phalanx	18.5	18	18	19	18	18.5	17	18	19	19
2nd phalanx	16	15	16	16.5	16	15.5	13.5	15	16	16
3rd phalanx	3	2	4.5	3.5	3	3.5	3	3	3.5	4
Fourth digit, metacarpal	41.5	39	39.5	41	40	40	38	41	38.	41.5
1st phalanx	15.5	15	15	16	15.5	15.5	14	15.5	16	16
2nd phalanx	3.5	3.5	4.5	6	5	4.5	3.5	4.5	3	3
Fifth digit, metacarpal	26	25	25	26	26.5	26	25.5	26.5	26	26
1st phalanx	9.5	10	10	10	11	10	10	10	11	10.5
2nd phalanx	6	5.5	6	6	6	6	5.5	6	4	6.5
Tibia	13	-	-	14	15	13	14	13	15	14
Hind foot	8	-	-	9	9	8.5	8	8	8.5	8
Tail	35.5	35	38	38	40	36	36	35	36	36.5
Skull:										
greatest length	17.0	17.2	17.4	17.3	17.5	16.8	16.1	16.5	16.9	16.8
condylobasal length	15.5	15.7	15.9	15.7	16.2	15.4	14.8	15.2	15.6	15.4
condyle to front of canine	15.5	15.6	15.8	15.7	16.1	15.4	14.7	15.2	15.4	15.4
basal length	13.7	14.0	13.9	14.0	14.3	13.5	12.8	13.2	13.5	13.5
palatal length	6.0	6.2	6.1	6.1	6.3	5.9	5.7	5.8	6.2	6.0
zygomatic breadth	11.0	11.1	11.2	11.2	11.3	10.6	-	-	10.5	10.6
breadth of braincase	9.0	9.2	9.0	9.1	9.1	8.7	8.7	8.7	8.8	8.8
height of braincase										
without crest	6.6	6.7	6.2	6.5	6.3	6.3	6.2	6.3	6.2	6.3
mastoid breadth	10.7	10.4	10.8	10.9	10.8	10.2	9.6	10.4	10.1	10.3
interorbital constriction	3.7	3.8	3.7	3.7	3.7	3.4	3.1	3.3	3.6	3.5
width across molars	7.6	8.0	7.9	8.1	8.1	7.5	7.2	7.4	7.5	7.6
width across cingula canines	4.8	4.6	4.5	4.5	4.6	4.5	3.9	4.1	4.1	4.2
upper tooth-row, c - m ³	6.3	6.4	6.2	6.3	6.4	6.3	5.9	6.1	6.2	6.1
lower tooth-row, c - m ₃	7.2	7.0	6.9	7.1	7.3	7.0	6.5	6.8	6.9	6.9
length of mandible	11.4	11.9	11.9	12.0	12.0	11.7	11.0	11.4	11.4	11.6

which on their inner sides touch or almost touch each other; the first lower premolar is in contact with both the canine and the second premolar, it is much smaller than and about half as high as the second premolar, the latter being about as high as the lower molars. The knife-like sagittal crest, extending from the base of the nasals to the lambdoidal crest, is better developed in the males than in the females; in the examined Suriname specimens the height of the sagittal crest varies in the males from 0.8 to 1 mm, in the females from 0.4 to 0.7 mm.

External and skull measurements of ten Suriname specimens are given in Table 33.

The examined series of Suriname *Molossus molossus* shows that animals that are in possession of the permanent dentition usually have a forearm length of 37 or over 37 mm, but a few exceptions do occur; the mean value of the forearm length in such specimens is about 39 mm; no significant difference between males and females was found by me in this measurement.

Remarks. — Husson (1962: 254, 256) cited Sanderson's (1939) observations on Suriname *Molossus*, which probably are based on the present species. Sanderson emphasized the fact that this species is very agile on the ground and walks with the help of its folded wings. The brothers Penard ("De Surinamer", 2 April 1905) mentioned that the tail is often used as a prehensile organ: 'The tail serves these bats, like in several monkeys, to pull themselves forward; they also use it when walking on level ground. Often the tail points straight up'.

The names *Molossus obscurus*, *Molossus rufus* and *Dysopes obscurus* have been used for the present species in the literature dealing with Suriname material.

***Molossus ater ater* E. Geoffroy, 1805**

Text-figs. 36b (head), 37d (canines and incisors), pl. 42 (skulls)

Molossus ater E. Geoffroy, 1805, Bull. Sci. Soc. Philomatique Paris, 3 (96): 379.

Type locality. — Not mentioned in the original publication. Restricted to "Cayenne, French Guiana" by Goodwin & Greenhall (1961: 286).

Synonymies. — Cabrera, 1958: 132 (as *Molossus r. rufus*); Husson, 1962: 259.

Vernacular names. — (E) Greater Free-tailed Bat.

Distribution. — The range of the species extends from southern Mexico through Central America to South America, where it occurs as far south as Paraguay and southern Brazil. The nominate subspecies has been reported from Venezuela, Trinidad and the Guianas south to Peru and the Mato Grosso, Brazil.

Occurrence in Suriname. — The first author to report this species from Suriname was Temminck (1841: 355), who mentioned a great number of specimens to which he assigned the name *Dysopes alecto* Temminck, 1827, a junior synonym of *Molossus ater*. Husson (1962) listed most other Suriname records of the species, which usually gave as the only locality "Surinam". The brothers Penard ("De Surinamer", 2 April 1905) mentioned that 'a second species of the genus *Molossus* [the first being *M. obscurus*] attains almost twice the size of *M. obscurus*, and has a bright reddish black

colour', with which they evidently mean the present species. They state that it is much rarer than *M. molossus*, and that it can be found in hollow trees near Paramaribo. Husson (1962: 262) reported that it is found "in sheds, stables, houses, and other buildings". The following Suriname material was listed in Husson's (1962) paper:

1. Plantation "Clevia", west bank of Suriname River just north-east of Paramaribo, Suriname District, 1 male (no. 13027, skin and skull).
2. Paramaribo, 3 males (nos. 12938, 21748, ZMA no. 1638, skins and skulls), 2 females (no. 21751, ZMA no. 1636, skins and skulls), 1 skull (no. 21754).
3. Plantation "Ma Retraite", Paramaribo, 3 males (nos. 13013, 13024, 13025, skins and skulls), 3 females (nos. 13059-13061, skins and skulls).
4. Plantation "Welgedacht C", about 6 km south of Paramaribo, 12 males (nos. 13012, 13015-13018, 13028-13033, skins and skulls), 11 females (nos. 13005-13008, 13050-13056, skins and skulls), 1 juvenile (no. 13062, skin and skull).
5. Plantation "Hanna's Lust", Blijdenhoop, just south of Paramaribo, 1 male (no. 13026, skin and skull), 6 females (nos. 13044-13049, skins and skulls).
6. Plantation "Peperpot", east bank of Suriname River, 6 km south-east of Paramaribo, Suriname District, 2 males (nos. 13002, 13003, skins and skulls).
7. Verlengde Pad van Wanica, south of Paramaribo, Para District, 10 males (nos. 13034-13043, skins and skulls), 3 females (nos. 13009, 13057, 13058, skins and skulls).
8. Berg en Dal, west bank of Suriname River, about 75 km south of Paramaribo, Brokopondo District, 2 males (ZMH no. 38862b, c, skins and skulls).
9. Suriname, without more precise locality indication, 4 males (nos. 12998-13000, 13020, skins and skulls), 5 females (nos. 13001, 13021, 24787, 24788, skins and skulls, no. 13019, skin), 2 specimens (no. 13022, skin and skull, no. 13065, skull).

Description. — Externally *Molossus a. ater* closely resembles *M. molossus*, but it is much larger in all its dimensions. In 42 males from Suriname the length of the forearm varies from 47.8 to 52.7 mm, in 39 females from 46.7 to 50.0 mm. Two colour phases occur, the one reddish brown, the other glossy blackish; in both phases the ventral surface is a shade lighter than the dorsal.

Dental formula: $I \frac{1}{1}$, $C \frac{1}{1}$, $P \frac{1}{2}$, $M \frac{3}{3}$. Skull and teeth very similar to those of *M. molossus*, but much larger. The height of the sagittal crest varies in the males from about 1.5 to 2.5 mm, in the females from about 0.8 to 1.5 mm.

The external and skull measurements of ten specimens from Suriname are given in Table 34.

Remarks. — The coat colour of the Suriname specimens of *Molossus ater ater* examined by me is subject to some variation. For instance, the specimen no. 13005 has a shiny black dorsal surface, on the ventral surface a very faint dark brown tinge is visible; in no. 13008 the dorsum is dark brown to blackish and the ventral surface is dark brown. In no. 13009, the dorsum is dark brown, contrasting strongly with the rufous ventral surface. In no. 13010 the dorsal surface is dark brown, the ventral surface being light brown with the exception of the chin and the area surrounding the gular sac, which are whitish as in *Molossus molossus* (Pallas). Miller (1913: 88) stated that the blackish phase of the species is apparently rare, the reddish brown phase being common. I found the opposite to be true in my Suriname material, which originates mainly from the Paramaribo region.

TABLE 34

External and skull measurements of ten specimens of *Molossus ater ater* E. Geoffroy from Suriname.

Museum	RMNH	RMNH	ZMH	RMNH	RMNH	RMNH	ZMA	ZMA	RMNH	RMNH
Reg. number	12999	12998	38862b	13002	13003	13001	1632	1636	13008	13007
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Forearm	51	49.5	50.7	49.8	52.5	47.0	49.0	47.0	49.5	50.5
Third digit, metacarpal:	52	52	50.5	50	52.5	49	50	48	51	50.5
1st phalanx	23.5	23	22.5	23	24	21	22	21	23	23
2nd phalanx	20.5	20	19.5	19	20	19	19	17	20	19
3rd phalanx	4.5	4	4	4	4	4	4	4	4	4
Fourth digit, metacarpal	51	50.5	50.5	49	51	47	49	46.5	50	49
1st phalanx	21	19.5	19.5	18.5	20	19	19	18	20	19
2nd phalanx	8	6	5.5	6	5	6	5	5	4	4
Fifth digit, metacarpal	31.5	31	32	32	32	30	30.5	29	31.5	31
1st phalanx	13.5	12	13	11.5	12	12	12.5	11.5	13	12.5
2nd phalanx	8.5	7	7	7	8	7	7	6.5	7	7
Tibia	18	19	19	19	20	17	17	18	-	-
Hind foot	11	11	11	12	11	11	10.5	11	-	-
Tail	53	50	53	52	60	47	45	51	55	54
Skull:										
greatest length	21.4	21.6	22.6	23.2	24.0	19.1	20.0	20.8	21.6	22.0
condylobasal length	19.8	19.7	20.0	20.8	21.1	17.7	18.2	18.8	19.9	20.2
condyle to front of canine	19.8	19.7	19.8	20.8	21.1	17.6	18.2	18.8	19.5	19.7
basal length	17.1	17.1	18.1	18.1	18.2	15.3	15.8	16.6	17.3	17.5
palatal length	8.1	8.1	8.2	8.1	8.4	7.0	7.2	7.4	7.9	7.7
zygomatic breadth	13.1	12.9	14.2	14.6	15.0	11.6	12.0	13.7	14.0	13.3
breadth of braincase	10.0	9.8	11.5	11.2	11.6	9.6	9.8	10.7	10.7	10.5
height of braincase										
without crest	7.7	7.5	7.6	8.1	7.9	7.0	7.5	7.3	7.6	7.3
mastoid breadth	12.6	12.8	14.0	14.8	14.6	11.3	11.6	12.8	13.4	13.1
interorbital constriction	3.9	3.7	4.5	4.2	4.6	3.7	3.9	4.1	4.4	4.2
width across molars	9.3	9.1	10.3	10.2	10.5	8.5	8.8	10.0	10.3	10.0
width across cingula canines	5.6	5.4	6.3	6.0	6.5	5.0	5.3	5.4	5.8	5.6
upper tooth-row, c - m ³	8.2	8.2	8.2	8.3	8.4	7.6	7.8	7.8	8.2	8.0
lower tooth-row, c - m ₃	9.3	9.4	9.1	9.2	9.5	8.6	8.6	8.4	9.6	9.0
length of mandible	15.1	15.1	15.5	16.1	16.6	13.2	13.8	14.7	15.1	15.1

Molossus trinitatus Goodwin, 1959

Molossus trinitatus Goodwin, 1959, American Mus. Novitates, 1967: 1-3.

Type locality. — "Belmont, Port of Spain, Trinidad, British West Indies".

Vernacular names. — (E) Trinidadian Free-tailed Bat.

Synonymies. — Goodwin & Greenhall, 1961: 289; Goodwin & Greenhall, 1964: 20.

Distribution. — The species is known from Trinidad and Suriname.

Occurrence in Suriname. — The first, and so far the only record of the present species from Suriname is the one by Husson (1973: 8) in a check-list of the mammals of Suriname; at that time it was considered by me a subspecies of *Molossus sinaloae* J. A. Allen. I have examined the following Suriname material of the species:

1. Paramaribo, Suriname District, 1 male (no. 13010, skin and skull).
2. Plantation "Welgedacht C", about 6 km south-west of Paramaribo, Suriname District, 1 male (no. 13014, skin and skull).

3. Zanderijweg near Zanderij, about 40 km south of Paramaribo, Para District, 1 female (no. 18256, skin and skull).

Description. — Goodwin & Greenhall (1961: 289) gave the following description of this species: "A medium-sized, blackish, free-tailed bat with base of fur whitish Fur relatively long, soft, and lax, reaching a length of 6.5 mm. on shoulders and extending on upper side of interfemoral membrane from base for one-third of its length; color of upper parts a dull dark Mummy Brown, the fur grayish white from base for about two-thirds of its length: under parts Mummy Brown, base of hairs whitish. Skull relatively long and slender for *Molossus*, with a relatively narrow braincase and long narrow rostrum; sagittal and occipital crests low and weakly developed; molariform tooth rows nearly parallel, only slightly divergent posteriorly; basisphenoid pits large and deep; posterior border of bony palate without median projection; anterior upper premolar relatively large". Length of forearm of the type, a semi-adult male: 49.3 mm. The skull measurements of the same specimen: greatest length, 22.0; zygomatic breadth, 12.7; breadth of braincase, 9.7; upper tooth row, c-m³, 7.9 mm. The measurements are taken from Goodwin & Greenhall, 1961: 289, who also provided figures of the species (pl. 35 figs. 4-6, text-fig. 101).

Remarks. — Some zoologists considered this form either synonymous with, or just a subspecies of *M. sinaloae* J. A. Allen. In my 1973 check-list I followed those who considered the present form a subspecies of Allen's species. However, Goodwin & Greenhall (1964: 20) brought forward convincing arguments in favour of retaining *Molossus trinitatus* as a good species. Not having seen any topotypical material myself, I am not in a position to give a well-founded personal opinion.

ORDER PRIMATES

No essential new data can at present be added to my 1957 revision of the monkeys of Suriname. In the publication referred to I dealt with the eight species doubtlessly occurring in this country, but I did not mention the reports of other species, chiefly indicated by native names (Sanderson, 1949: 768; Geijskes, 1954: 73). When visiting Suriname in 1963, I paid special attention to such "additional" species, but every time an actual specimen was obtained, it proved to belong to one of the forms I recorded in 1957. Because large areas in the interior of Suriname are still poorly known faunistically, we cannot ignore the possibility that additional species will be found, but as long as the reports are not substantiated by actual material, they should be treated with the utmost reserve.

As an example it may be noted here that Sanderson (1949: 768) stated to have seen in Paramaribo a monkey belonging to the genus *Lagothrix*, said to have come from the upper Suriname River District; in his revision of the genus *Lagothrix*, Fooden (1963: 214), however, gave as his opinion that the specimen must have been transported or mislabelled.

Another interesting example is the supposed occurrence of *Aotus trivirgatus trivirgatus* (Humboldt, 1812) in Suriname. The brothers Penard ("De Surinamer", 26 January 1906) gave (in Dutch) interesting information on the species, the free translation of which reads as follows: 'The small night-monkeys, *Nyctipithecus* or Netikees-keesies, occur very rarely in the Colony, at least they are not seen. They are somewhat larger than the "Monkie-monkies" [= *Saimiri sciureus*; see page 226], and have soft brown hair. A hunter gave the following account: We were camping on the edge of a savanna, near a big tree, which by a row of other trees was connected with the nearby forest. Every evening we heard shuffling and whistling in that tree, and it appeared that numerous creatures were moving along the branches. However, at day-time there was absolutely nothing to be seen. One night I went outside and shot my gun in the direction of the tree; a robust body was falling to the ground. We all got up, struck a light and we saw before us . . . a brownish monkey of a strange appearance with staring, bulging, owl-like eyes'.

It is evident that this short description cannot lead to a definite identification, while in certain respects it points to *Potos flavus flavus* (Schreber, 1774), which, in contradistinction to *Aotus*, is uniformly golden brown coloured. Moreover, Sanderson (1949: 768) stated: "It is remarkable that douroucoulis [= *Aotus trivirgatus*] are entirely unknown in Suriname, though apparently common in British Guiana. The name "Night-ape" applies to the kinkajou [*Potos flavus*] only and pictures of *Aotus* were not recognized by hunters, Jukas [= Djoekas, Bush-Negroes] or Amerindians". According to Cabrera (1958: 135-136) *Aotus trivirgatus trivirgatus* (Humboldt, 1812) is known from eastern Colombia, southern Venezuela, the Guianas and the Amazon

region. The occurrence of the species in Suriname, therefore, cannot be a priori excluded, but since no authentic Suriname material is known to me, it has not been included in the present publication.

Key to the Primates of Suriname based on external characters

- 1a. Terminal half or two-thirds of the tail naked beneath 2
 b. Tail entirely haired above and beneath. 3
- 2a. Body uniformly covered with black hairs (pl. 49)
Ateles paniscus paniscus, p. 229
 b. Back yellowish, olivaceous, or reddish brown; tail blackish or dark reddish brown *Alouatta seniculus straminea*, p. 214
- 3a. Tail distinctly bicoloured: the basal part is grizzled grey, the ultimate third or fourth part is black (pl. 48) *Saimiri sciureus sciureus*, p. 226
 b. Tail uniformly coloured all over. 4
- 4a. Hands and feet of an orange-red colour (pl. 50)
Saguinus midas midas, p. 232
 b. Hands and feet not orange-red 5
- 5a. Tail with conspicuously long woolly hairs, giving it a bushy appearance (pls. 43, 44) 6
 b. Tail with shorter, appressed hairs (pls. 46, 47) 8
- 6a. Head, extremities, and tail black; back covered with buffy to olive brown hairs. Chin with a beard of long black hairs (pl. 43)
Chiropotes satanas chiropotes, p. 209
 b. Back the same colour as the other parts of the body. 7
- 7a. Body, tail, and extremities covered with dark blackish-brown hair; face cream-coloured. Hands blackish (pl. 44 upper fig.) *Pithecia pithecia*, male, p. 211
 b. Body, shoulders, outer surface of limbs, and tail blackish brown, but the long apical ends of the hairs light yellowish; face blackish grizzled with light ochraceous buff. Hands blackish (pl. 44 lower fig.)
Pithecia pithecia, female, p. 211
- 8a. Tail and back of the same olivaceous brown colour; the frontal margin of the blackish head cap is triangular, reaching with the tip to the base of the nose (pl. 47) *Cebus olivaceus*, p. 223
 b. Tail blackish, distinctly set off from the brownish colour of the back. The frontal margin of the black head cap is practically straight and does not reach the upper margin of the nose (pl. 46) *Cebus apella apella*, p. 218

Key to the Primates of Suriname based on skull characters

As some monkeys are eaten by the inhabitants of Suriname, fragments of their skulls are often found in or near the cabins of Bush-Negroes and Amerindians. For this reason I have tried to use such skull characters as, in my opinion, usually may be observed on these fragments. However, it should be noted that the present key

may be used with good results only for the identification of skulls or skull-remains of adult specimens, in which the last molar is functional.

With "glabella" (see under 7a and 7b) is meant the median region of the frontal between the supraorbital ridges. The total length of the skull (given under the various species) is the distance between the anteriormost border of the premaxilla (without the incisors) to the posteriormost border of the os occipitale (including the crest, if present at all).

- 1a. Number of upper and lower cheek-teeth on each side 5 (three premolars and two molars) (see pl. 54 upper figs.). Crown length of upper cheek-teeth varying in 13 specimens from 9.0 to 10.0 mm (mean: 9.6 mm)
Saguinus midas midas, p. 232
- b. Number of upper and lower cheek-teeth on each side 6 (three premolars and three molars) (see pls. 54 lower figs.; pls. 51-53) 2
- 2a. Crown length of upper cheek-teeth (see pl. 52 lower figs.) more than 30 mm, varying in 16 specimens from 30.8 to 38.1 mm (mean: 34.9 mm).
Alouatta seniculus straminea, p. 214
- b. Crown length of upper cheek-teeth more than 10.5 mm and less than 30 mm . 3
- 3a. Crown length of upper cheek-teeth less than 15 mm (see pl. 54 lower figs.), varying in 13 specimens from 11.5 to 12.9 mm (mean: 12.5 mm).
Saimiri sciureus sciureus, p. 226
- b. Crown length of upper cheek-teeth more than 15 mm 4
- 4a. Least width of nasals and frontals between the orbits (see pl. 52 upper figs.) more than 7.5 mm, varying in 12 specimens from 9.6 to 13.2 mm (mean: 10.9 mm); crown length of upper cheek-teeth varying from 22.7 to 27.0 mm (mean: 24.7 mm). *Ateles paniscus paniscus*, p. 229
- b. Least width of nasals and frontals between the orbits less than 7.5 mm . . . 5
- 5a. Crown length of upper cheek-teeth less than 20 mm, varying in 14 specimens from 15.9 to 18.7 mm 6
- b. Crown length of upper cheek-teeth more than 20 mm, varying in 20 specimens from 21.1 to 24.1 mm 7
- 6a. Width across outer bases of upper canines (see pl. 51 upper figs.) varying in 7 specimens from 19.6 to 22.5 mm (mean: 20.7 mm) . *Pithecia pithecia*, p. 211
- b. Width across outer bases of upper canines (see pl. 51 lower figs.) varying in 7 specimens from 25.8 to 28.7 mm (mean: 26.9 mm)
Chiropotes satanas chiropotes, p. 209
- 7a. Glabella region convex; seen from the top, the anterior zygomatic root is visible in front of the lower border of the orbit (see pl. 53 upper figs.)
Cebus apella apella, p. 218
- b. Glabella region flattened; the lower border of the orbit projects more forward, so that the anterior zygomatic root is hidden in upper view (see pl. 53 lower figs.)
Cebus olivaceus, p. 223

FAMILY CEBIDAE

Chiropotes satanas chiropotes (Humboldt, 1812)

Pl. 43 (animal), pl. 51 lower figures (skull)

Simia chiropotes Humboldt, 1812, in: Humboldt & Bonpland, Recueil d'Observations de zoologie et d'anatomie comparée, (ed. 2) 1: 311-314.

Type locality. — "On les trouve dans les vastes déserts de l'Alto-Orinoco, au sud et à l'est des Cataractes", Venezuela, western Bolívar State (Humboldt, 1812: 313).

Synonymies. — Cabrera, 1958: 146-147; Husson, 1957: 20-21, pl. 2 (skull).

Vernacular names. — (E) Black Saki, Jacketed Monkey; (N) Satan-aap, Baard-aap; (S) Bisa, Kwataswageri, Afoitjé.

Distribution. — The species *Chiropotes satanas* Hoffmannsegg, 1807, has been reported from Peru, southern Venezuela, the Guianas and northern Brazil. This entire range is occupied by the subspecies *Chiropotes satanas chiropotes*, except for the area of the lower Amazon River, where the nominate subspecies *Chiropotes s. satanas* occurs south-east of the river.

Occurrence in Suriname. — The Black Saki is a rather common species in the interior of Suriname, living in the rain forests of the hills and mountains there. The fact that it does not occur in the coastal area explains why the presence of this characteristic species in Suriname has not been mentioned by authors of the 18th century. The first certain record of *Chiropotes satanas* in Suriname, to my knowledge, is that by Von Sack (1821 (2): 210), who stated that "another rare species of Sakka-winki" was sometimes brought down by the Amerindians from the Upper Saramacca, and then continued to give a recognizable description of this species. Lammens (1844: 93) gave a rather confused account of "Der Neger", of which he saw a single tamed female, which he thought to possibly be the same as Hartsinck's (1770: 96) "Neger-Aap" (a species of uncertain identity) and Fermin's (1765: 44; 1769: 129) "Singe gris, à tête noire" (which clearly refers to an African species). Lammens also gave original observations, which make it clear that his own specimen belonged to *Chiropotes satanas*. Kappler (1887: 54-55) dealt with material of this species from the Marowijne area, and gave a good description of this "schönste, bloss im gebirgigen Innern vorkommende Affe", which he considered rare. Also the brothers Penard ("De Surinamer, 26 January 1905) briefly described the species. Later authors occasionally mentioned the species from Suriname, so Geijskes (1954: 73) stated it to occur in mountain forests in the interior, where the animals are rather common. I have examined the following material from Suriname:

1. Kaboeri Creek, right branch of Corantijn River at about 5°14'N, Nickerie District, 1 female (no. 24091, skin and skull).
2. Stondansi Falls, Upper Nickerie River near confluence with Fallawatra River at about 5°5'N, 2 skulls (nos. 23456 (♂), 17768).
3. Lombok Falls, upper Nickerie River somewhat above Stondansi Falls, 2 males (nos. 24240, 24241, skins and skulls).
4. Paris Jacob Creek, upper Nickerie River somewhat above Lombok Falls, 1 male (no. 24093, skin and skull).

5. Lucie River, right tributary of Corantijn River at about $3\frac{1}{2}^{\circ}\text{N}$, 1 female (no. 17891, skin and skull).
6. Kayserberg airstrip near Zuid River, left tributary of Lucie River at about $3^{\circ}\text{S } 57^{\circ}30'\text{W}$, 1 male (no. 20607, skin and skull).
7. Forest near Sipaliwini airstrip on Sipaliwini River, near Brazilian border, south-eastern Nickerie District, south-western Suriname, 1 female (no. 18199, skull), 1 skull (no. 18202).
8. Forest between Raleigh Falls (upper Coppename River) and Voltzberg, Saramacca District, 3 males (nos. 18214, 20605, 20606, skins and skulls), 1 female (no. 20604, skin and skull).
9. Nassau Mountains, just west of Marowijne River, at about $4^{\circ}45'\text{N}$, Marowijne District, 1 male (no. 12514, skin and skull).
10. Upper Tapanahony, left tributary of upper Marowijne River, 1 skull (no. 21660).
11. Suriname, without more precise locality data, 1 male (no. 24188, skin and skull), 1 skull (no. 20608).

Description. — The following description is based on the above listed Suriname specimens. The species is characterized by the fact that the back is lighter (brownish) than the black head, legs, and tail. The long, dense and rather woolly hair of the back is of a dull brownish colour varying from yellowish umber to mummy brown. The hairs are straw coloured to brown, usually with a darker tip and sometimes with one or a few darker distal bands, which can give the colour of the back a slightly grizzled appearance. The rump may be reddish or chestnut. In strong contrast to the brownish colour of the back is the black colour of the rest of the body, which at most has a slight brownish hue especially on the hands, and in extreme cases may be very dark chestnut. The head is remarkable by the strong development of a beard in both sexes. This black beard consists of rather long hairs and extends from the bases of the ears, over the posterior part of the cheeks, to the chin. The face is almost naked. The dorsal surface of the head bears a high wig-like shock of hairs which shows a distinct parting in the middle; this parting ends in a whorl on the vertex. The ears are entirely covered by the hairs. The ventral surface of the body, from the chin to the base of the tail, is uniformly black, but the hairiness is rather sparse especially on the throat. The lines of separation between the brownish and black colours are not the same in all specimens. The shoulders and the proximal part of the outside of the front legs may be brownish or black. The tail is of approximately the same length as head and body combined. It is covered by very long hairs, which give it a bushy appearance. The hairs at the tip of the tail are at least of the same length as those at the base. The basal part of the hairs of the tail is brownish, the far larger distal part is black, and the black colour dominates so strongly, that the tail is always seen as black. The brownish colour is visible only by parting the hairs.

Dental formula: $I \frac{2}{2}, C \frac{1}{1}, P \frac{3}{3}, M \frac{3}{3}$. The skull of the present species (pl. 51) is immediately characterised by the relatively short upper incisors which are directed forwards, almost horizontally, and of which the inner pair is longer and wider than the outer. Furthermore the lower incisors are remarkable by their great length, being about $\frac{3}{4}$ of the length of the canines and about $3\frac{1}{2}$ to $4\frac{1}{2}$ times as long as wide in anterior view. A distinct diastema is present between the canines and the incisors, both in upper and lower jaw. The premolars and the molars form a con-

tinuous row and are of almost equal size, the anterior premolar and posterior molar being somewhat smaller than the teeth in between. The first premolar is placed against the canine in the upper jaw, there is a minute diastema in the lower. The posterior margin of the palate is truncate and is placed at the level between the last and penultimate molars.

The external measurements of an adult male and an adult female from the Raleigh Falls-Voltzberg region are, respectively: head and body, 437, 402; tail, with tuft, 416, 383; hind foot, with nails, 122, 121; ear, 33, 30 mm; weight 3500, 2500 grams. — Skull: total length, 86.5, 81.0; zygomatic breadth, 58.5, 55.2; crown length of upper cheek-teeth, 17.3, 15.9; width across outer bases of upper canines, 27.5, 25.5 mm. A juvenile male (no. 18214) of the same lot, collected 4 April 1963, had the following external measurements: head and body, 234; tail 282; hind foot, 86; ear, 27 mm; weight, 550 grams.

Remarks. — The species is protected in the area of Suriname to which the game laws apply (see p. xxxii); in the interior it is hunted by the Amerindians and Bush Negroes for its very savory meat (see Geijskes, 1954: 73). Lenselink (1972: 37-41), who studied the protein consumption in the Amerindian village of Alalapadoe (population: 450), north of the Sipaliwini River, found that during the month of March 8 specimens of *Chiropotes* were shot and eaten in the village. According to the brothers Penard ("De Surinamer", 26 January 1905) the species can do some harm to corn and cocoa crops.

The species lives in small groups of about 6 to 10 individuals, which are usually found in high trees. The young are often carried on the back of the females, like the young male (no. 18214) collected in the Raleigh Falls-Voltzberg area, where it was killed while the mother escaped. The young, which are caught by Amerindians when the mother is shot, are sometimes kept as pets and endure captivity quite well as they are rather hardy. The Penard brothers remarked that captive individuals continuously groom themselves, and can be dangerous by sudden attacks of blind fury.

In the literature dealing with mammals of Suriname the names *Pithecia chiropotes* (Humboldt, 1812), *Pithecia satanas* (Hoffmannsegg, 1807) and *Chiropotes sagulatus* (Traill, 1821) have been used for the present species.

Pithecia pithecia (Linnaeus, 1766)

Pl. 44 (animal), pl. 51 upper figures (skull)

Simia Pithecia Linnaeus, 1766, Systema Naturae, (ed. 12) 1: 40.

Type locality. — "Habitat in Guiana". Restricted by Vieira (1955: 380) to French Guiana.

Synonymies. — Cabrera, 1958: 150-151; Husson, 1957: 18-19, pl. 1 (skull).

Vernacular names. — (E) Pale-headed Saki; (N) Witkopaap, Pluimstaartaap, Roodbuikaap; (S) Wanakoe.

Distribution. — The species *Pithecia pithecia*, of which no geographical races are recognized by Cabrera, occurs in the Guianas and Brazil north of the Amazon River.

Occurrence in Suriname. — *Pithecia pithecia* is of rare occurrence, both in the lowlands of Suriname and in the interior. According to Sanderson (1949: 764) the Suriname Saki is "found only in the giant forests that border the open wet savannahs". Already Von Sack (1821(2): 209, 210) mentioned the species from Suriname, and gave recognizable descriptions of both male and female. Also Kappler (1887: 57) gave an excellent characterization of the two sexes which he recognized as such. The brothers Penard ("De Surinamer", 26 January 1905), on the contrary, still considered the male and female to belong to two distinct species (*Pithecia leucocephala* and *P. rufiventer* respectively). Several more authors dealt with Suriname material of this species. I have examined specimens from the following localities in Suriname:

1. Matapi on the east bank of the Corantijn River at about 5°N, Nickerie District, 1 male (no. 24092, skin and skull).
2. Forest near Sipaliwini airstrip, near Sipaliwini River close to the Brazilian border, Nickerie District, south-western Suriname, 1 male (no. 20610, skin and skull).
3. Plantation "Geijersvlijt", west bank of Suriname River north-east of Paramaribo, Suriname District, 1 female (no. 24205, skin and skull).
4. Surroundings of Paramaribo, 1 male (no. 21961, skull), 1 female (no. 24187, skull).
5. Kwatta, west of Paramaribo, 1 skull (no. 20611).
6. Santo Boma, between Paramaribo and Lelydorp, Suriname District, 1 male (no. 18241, skull), 1 female (no. 18242, skull).
7. Forest about 12 km north-east of Matta, about 12 km west of Zanderij, Saramacca District, 1 male (no. 17760, skin and skull).
8. Ganiakondre on Suriname River, a locality now submerged by the Brokopondo Lake, Brokopondo District, 1 male (no. 20609, skin and skull).
9. Shell ridge forest 14.5 km north of Moengotapoe, Marowijne District, north-eastern Suriname, 1 male (no. 12516, skin and skull).
10. Nassau Mountains, 13.3 km west of the Marowijne River at about 4°45'N, Marowijne District, 1 female (no. 12515, skin and skull).
11. Suriname, without more precise locality indication, 4 males (nos. 1262, 24215, 24216, skulls; no. 24220, skin and skull), 4 females (no. 1514, skin and skull; nos. 24217-24219, skulls).

Description. — The following description is based on the Suriname specimens listed above. One of the striking features of the present species is the sexual dimorphism, for which reason separate descriptions are provided here for males and females.

Male. The males can immediately be distinguished from all other Suriname monkeys by having the fur entirely black with the exception of the face, which is strikingly whitish. The hair of the back, the outside of the legs and the tail is dense, very long, lank, and rather coarse. The colour of these hairs in practically all specimens is black throughout. Two of the specimens are aberrant in that a few of the hairs on the outside of the hind legs (in specimen no. 24092) or on that of all four legs (specimen no. 17760) have yellowish tips or one or two yellowish bands in the extreme distal part. The black colour of the back extends forward to above the ears or beyond. The greater part of the face, including the entire front, the cheeks, the chin and the anterior part of the throat is white or slightly yellowish, but the upper and lower lips, the area around the nose and the area between the eyes are black. The black colour between the eyes narrows triangularly and in some specimens

continues posteriorly as a narrow dark median line traversing the white of the front. The facial hairs are much shorter than those of the back. The hairs on the cheeks are somewhat longer than those of the front and form distinct side-whiskers, which may be of a more yellowish colour than the hairs of the front. On the lips some sparse short white hairs may be observed. The white and black colours in this species are sharply delimited everywhere. The ears are rounded and black, they are entirely covered by the long black hairs of the posterior half of the head. The ventral surface of the body and the inside of the legs are distinctly more loosely haired than the dorsum, and the skin is visible here through the fur. The hairs, however, have the same black colour as those of the back. The hands and feet are also of a pure black colour. The tail is longer than head and body combined. Its hairs, both ventrally and dorsally, are like those of the dorsal surface of the body, giving the tail a very bushy appearance.

Female. The female differs from the male in that the hairs are less deeply black, but more of a dull dark brownish black. Most of the hairs have either a brownish tip or one or two brownish rings in their distal parts. On the legs and the tail, the basal part of the hairs is pale brownish, while on the back itself the basal part of the hairs is of the same colour as the distal part, in some cases showing a rather narrow pale brown ring. The length and texture of the hairs is as in the males. The colour of the hands and feet, like in the male, is black. The face is much darker than in the male and the white colour is restricted to two distinct oblique lines that run from the inner corner of the eye to the outer corner of the mouth. The front and the cheeks show some whitish hairs and acquire thereby a somewhat greyish tinge, the rest of the facial hairs, including the side-whiskers, is of the same colour as that of the back. The colour of the ventral surface of the body differs rather strongly from that of the back, being more russet, it extends also on the throat and the proximal part of the inside of the legs. The tail is unicoloured.

The young males have about the same colour as the females.

Dental formula: $I \frac{2}{2}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{3}{3}$. The external measurements of 5 males (nos. 20610, 24092, 17760, 21961 and 20609 respectively) are: head and body, 382, 378, 367, 350, 340; tail, with tuft, 475, 422, 420, 442, 470; hindfoot, with nails, 121, 118, 115, 119, 109 mm. The length of the ear of specimens 20610 and 24092 is 31 and 33 mm respectively and their weight 1750 and 2100 grams respectively. According to Sanderson (1949: 765) the average of the external measurements of three females from Suriname is: head and body, 359; tail, 389; hind foot, 110; ear, 28 mm; weight, 1512 grams.

The skull measurements of the adult male no. 20610 and the adult female no. 12515 are respectively: total length 75.7, 75.3; zygomatic breadth, 56.7, 49.6; crown length of upper cheek-teeth, p-m³, 18.7, 17.4; width across outer bases of upper canines, 22.4, 19.7 mm. In seven specimens the crown length of the upper cheek-teeth varies from 16.4 to 18.7 mm (mean: 17.8 mm), the width of the skull across the nasals from 3.7 to 6.0 mm (mean: 5.3 mm), and the width across the canines from 19.6 to 22.5 mm (mean: 20.7 mm).

Remarks. — Though the meat of the Suriname Saki is quite palatable, the animal is rarely hunted by the natives (Geijskes, 1954: 73; Husson, 1957: 19). Lenselink (1972: 40) stated that in the Amerindian village of Alalapadoe (population: 450) in the Sipaliwini area, during one month (March 1972) 4 specimens of this species were shot and eaten. Females are sometimes kept as pets, but as a rule the animals cannot endure captivity for a long time.

Pithecia lives in small groups of no more than ten specimens, sometimes solitary individuals do occur. They like to sit in the highest canopy of the entangled tree tops. When they are resting, the bushy tail hangs down; it is never used as a prehensile organ. Usually they move slowly, but when alarmed they can quickly disappear; they also can move rapidly on the ground, running like a cat.

The systematics of the genus *Pithecia* are not quite clear (see Tate, 1939: 220-221; Da Cruz Lima, 1945: 84-92; Cabrera, 1958: 148-151). The scanty material examined by me shows that at least the genuine *Pithecia pithecia*, in which the hands and feet are black, occurs in Suriname; for the present there is no indication available that also *P. monacha* (E. Geoffroy, 1812), in which the hands and feet are yellowish white or greyish, occurs there.

Some authors used the names *Pithecia leucocephala* (Audebert, 1797) and *Pithecia rufiventer* (Humboldt, 1812) for Suriname specimens of the present species.

***Alouatta seniculus straminea* (Humboldt, 1812)**

Pl. 45 (animal), pl. 52 lower figures (skull)

Simia straminea Humboldt, 1812a, in: Humboldt & Bonpland, Recueil d'Observations de zoologie et d'anatomie comparée, (ed. 2) 1: 355.

Type locality. — The type locality of the subspecies *A. seniculus straminea* is "les forêts du Grand-Parà", Pará, north-eastern Brazil. The type locality of the species (and the nominate subspecies) has been variously indicated as Cartagena, Colombia (e.g., by Cabrera, 1958: 157) and Cayenne (e.g., by Rode, 1938: 225). In the original description of *Simia seniculus*, Linnaeus (1766: 37) stated "Habitat Carthagenae in silvis ad fluvium" and described a specimen from that locality collected by a Mr. Jacquin. At the same time, however, Linnaeus referred to Brisson's (1756, Le Règne Animal: 206) description of "Le Singe rouge de Cayenne". Thus the syntypes of *Simia seniculus* are (1) the specimen from Cartagena examined by Linnaeus, and (2) the material from French Guiana dealt with by Brisson. As far as I know, no lectotype has ever been selected for the species and in order to prevent any confusion, I now select as such the specimen collected by Jacquin in Cartagena, and described by Linnaeus (1766). Thereby the type locality thus definitely becomes Cartagena, as already indicated by Cabrera (1958).

Synonymies. — Cabrera, 1958: 157-158; Husson, 1957: 21-26, pl. 3 (skull).

Vernacular names. — (E) Red Howler (Monkey); (N) Brulaap; (S) Baboen.

Distribution. — The species *Alouatta seniculus* (Linnaeus, 1766) is known from the northern part of South America: Colombia, Ecuador, Peru, Bolivia, Venezuela,

the Guianas and the Amazon region (Vieira, 1955: 383; Cabrera, 1958: 156-158). The subspecies *A. seniculus straminea* occurs in southern Venezuela, the Guianas and the Amazon region from the Rio Negro eastward to the Atlantic coast.

Occurrence in Suriname. — The Red Howler Monkey is quite common in wooded areas throughout the country, from the sand and shell ridges in the coastal region southward to the Brazilian border. It is one of the best known monkeys of Suriname and is mentioned in almost all accounts of the country. One of the oldest records is by Warren (1667: 14), who stated: "*Monkeys*, and *Baboons*, are so familiarly known in *England*, they need not a particular Description here; though one thing of the *Baboons*, wherein, I think, they differ from all others, I cannot omit inserting, which is, that at certain hours both of the night and day, they send so horrid a Roreing from their hollow Throats, that, to those un-wonted to such noises, nothing can seem at first more strange, and terrible, being easily to be heard above two miles off". During the "Operation Gwamba" 479 specimens were saved (Walsh & Gannon, 1967: 217); this shows that the animal is very abundant in the Brokopondo-Browns-weg region along the Suriname River. There is an indication that the animal prefers the forests along the rivers and on the ridges in the coastal plain near the sea coast. I have examined the following Suriname material:

1. Forest near Avanavero Falls in Kabalebo River, right tributary of Corantijn River at about 4°45'N, Nickerie District, 1 female (no. 24647, skin and skull).
2. Near Stondansi Falls in upper Nickerie River, near confluence with Fallawatra River at about 5°5'N, 1 male (no. 24648, skin and skull).
3. Forest near Sipaliwini airstrip, near Sipaliwini River close to the Brazilian border, extreme south-eastern part of Nickerie District, 3 males (nos. 17743, 17757, 17779, skins and skulls), 1 female (no. 20589, skin and skull).
4. Shell ridge forest near Totness, Coronie District, 1 male (no. 20591, skull).
5. Shell ridge forest at 21.6 km east of Totness, 0.6 km north of highway Totness-Paramaribo, Coronie District, 1 male (no. 12526, skin and skull), 1 female (no. 12524, skin and skull).
6. Forest along Coesewijne River, east tributary of lower Coppename River, Saramacca District, 1 male (no. 21662, skull).
7. Tibiti River, eastern tributary of Coppename River, near the confluence, 1 female (no. 12523, skin and skull).
8. Forest along Wayombo River, west tributary of Coppename River near their confluence, 1 male (no. 20588, skin and skull), 1 female (no. 20592, skin and skull).
9. Forest near Raleigh Falls in upper Coppename River, near Voltzberg, 1 female (no. 18213b, skin and skull) and its male young (no. 18213a, skin and skull).
10. Forest near Matta, 12 km west of Zanderij, Saramacca District, 1 male (no. 17778, skin and skull).
11. Near Paramaribo, Suriname District, 3 females (nos. 24276, 24277, 24283, skulls), 3 skulls (nos. 18237, 24284, 24285).
12. Santo Boma project, south-west of Paramaribo, Suriname District, 1 male (no. 21661, skull).
13. Forest along Gran Creek near Brokopondo Lake, Brokopondo District, 1 female (no. 18246, skin and skull).
14. Plantation "Lust en Rust", somewhat east of the Suriname River opposite Paramaribo, Commewijne District, 3 males (nos. 3914, 3915, 3924, skulls), 1 female (no. 3958, skull).
15. Plantation "Wederzorg", on south bank of Commewijne River about 20 km east of Paramaribo, 1 male (no. 4661, skull), 1 female (no. 4662, skull).
16. Forest about 10 km east of Jodensavanne, on Suriname River about 50 km south of Paramaribo, Commewijne District, 1 skull (no. 20536).

17. Sand ridge forest 10 to 11 km south of Wia Wia Bank, Marowijne District, north-east Suriname, 1 male (no. 12520, skin and skull).

18. 18.5 km north of Moengotapoe, north-eastern Suriname, 1 male (no. 12525, skin and skull).

19. High forest, 0.9 km north of Moengotapoe, 1 female (no. 12522, skin and skull).

20. Near Albina on lower Marowijne River, 1 male (no. 24281, skull), 2 females (no. 24286, skin and skull; no. 24288, skull).

21. Nassau Mountains at 12.4 km west of Marowijne River, Marowijne District at about 4°45'N, 1 male (no. 12521, skin and skull).

22. Suriname, without more precise locality indication, 2 males (nos. 209 and 24282, skulls), 4 skulls (nos. 1083, 24278-24280).

Description. — The following description is based on the Suriname specimens listed above. The species is characterized by its overall brown colour in various shades, by having a distinct beard, a prehensile tail with the distal ventral part naked, and above all by its howling sound.

The dorsal surface is covered by a dense, rather silky pelage, which varies strongly in colour. In the darkest specimens (e.g., no. 17779) this colour is dark russet brown on the shoulders, the median dorsal line and the rump, the dorsolateral parts being more yellowish; these colours gradually merge with one another. The pelage shows a distinct median whorl on the top of the shoulders. The head has the top and the cheeks covered with dark russet brown hairs, which are darker than those of the anterior part of the back; also the conspicuous beard of the animal is of this colour or darker (being partly blackish), although near the naked face it may show some lighter, more yellowish, hairs. The face is largely naked with a few scattered hairs. The ears are conspicuous, rounded, naked inside and of a rather human shape, they are only partly hidden by the fur. The outside of all the legs and the dorsal surface of the tail is of the same dark russet brown colour as the head, some scattered yellowish hairs may be seen on the shoulders. The ventral surface of the body is more sparsely haired; especially the breast and the inguinal region may be almost naked. These ventral hairs are brown, lighter than the anterior dorsal hairs, and sprinkled with a few yellowish hairs. The inside of the legs is sparsely haired proximally, more densely distally, the colour of the hairs being practically the same as that of the outside. The tail is longer than head and body combined, it is rather uniform in colour both dorsally and ventrally; the distal half of the ventral surface of the tail is naked and has the texture of a sole, the tail being intensively used as a prehensile organ.

In the lightest specimens (e.g., no. 18213b) the yellowish colour of the dorsolateral parts has expanded to such a degree that the entire back is straw coloured with a faint indication of a darker median line. The yellow colour reaches to or slightly beyond the whorl on the neck. The head is a dark russet brown as in the darkest specimens, or slightly lighter, the beard being lighter russet than the top of the head. The shoulders, the extreme upper part of the forelegs and the side of the neck are a mixture of russet and yellowish hairs, the russet dominating. The distal part of the front legs is dark russet brown. The hind legs are somewhat yellowish in their proxi-

mal anterior part, russet distally (sometimes sprinkled with yellowish). The entire tail has the hairs of a dark russet brown colour. The hairs of the ventral surface in these lightest specimens are only slightly lighter than those in the darkest specimens.

The variation in colour of the Suriname howler monkeys is most striking on the back, which may vary from dark russet brown with straw-yellowish lateral patches to entirely pale straw yellowish; the yellowish colour may extend some distance over the bases of the legs. The head, the rest of the legs and the tail always are russet brown, with a variation from reddish brown to blackish russet, the beards even may become orange yellowish, but can also externally show dark blackish hairs. No two specimens are alike. Husson (1957: 22-23) gave colour descriptions of some Suriname individuals. Too little material is available to make certain whether the colour is more or less the same within a population, and whether the populations from the interior and from the coastal region differ in colour or that the environment in which the animals live has any influence on the coloration of the individuals.

The following measurements were taken, respectively, from an adult male (no. 20588) from the Wayombo River region, and from an adult female (no. 18213b) from near the Raleigh Falls: head and body, 592, 522; tail, 642, 603; hind foot, with nails, 155, 142; ear, 36, 37 mm; weight, 7, 6.5 kilograms. — Skull: total length, 125.0, 109.6; zygomatic breadth, 83.2, 73.1; crown length of upper cheek-teeth, 36.2, 32.2 mm. This female, which was collected on 4 April 1963, carried a male young (no. 18213a) on its back; the measurements of the young are: head and body, 312; tail, 363; hind foot, 94; ear 36 mm; weight, 1250 grams. The males on an average are larger than the females.

Remarks. — Because of their value as food the Red Howlers are hunted by the inhabitants of Suriname (Geijskes, 1954: 72). Lenselink (1972: 40), in a study of the game used in a small Amerindian village (Alaladapoe, pop. 450, situated in the Sipaliwini area), found that in a single month (March 1972) 56 specimens of the present species were shot and eaten.

The Red Howler is well known because of its howling. This can be heard during the daytime, but also during the night, and especially in the early morning before sunrise. Kappler (1887: 52) gave an interesting account of it: "Jedesmal sass ein altes Männchen oben im Baum, hielt sich mit den Vorderfüßen und hatte den langen Greifschwanz, der auf der inneren Seite von der Spitze an etwa 9 Zoll aufwärts ganz unbehaart, schwarz und glatt wie eine Hand ist, um einen Ast geschlungen, während andere Männchen, Weibchen und Junge in verschiedenen Stellungen etwas niedriger sassen. Plötzlich hob der Alte ein entsetzlich röchelndes "Rochu, Rochu" an, das, nachdem es sich fünf- bis sechsmal wiederholt hatte, in ein Gebrüll überging, in das alle übrigen einstimmten, und zwar so stark, dass man befürchten musste, das Gehör zu verlieren. Es ist von einer solchen Stärke, dass man es in stillen Nächten wohl zwei Stunden weit hören kann, weil es etwa zehn Minuten lang anhält und dann verstummt". The animals live and travel together in troops. A troop consists of one adult male, some females and younger males. The published data on the size of

these troops do not agree: according to Kappler (1887: 51) this number is rarely more than ten, Geijskes (in Husson, 1957: 26) gave the number as five or six, while Sanderson (1949: 765) mentioned troops of twenty to forty individuals. Sometimes solitary males occur. The animals are slow-moving, and they often rest in the highest trees, where they also spend the night. The four legs and the prehensile tail are used in climbing; the animals jump only when pursued.

A female (no. 12524) collected in the Coronie District on 17 December 1948, carried a well developed foetus. As mentioned above, the female (no. 18213b) from Raleigh Falls collected on 4 April 1963, carried a male young on its back.

As has already been discussed by Husson (1957: 24-25) Humboldt, 1812, and not Geoffroy St. Hilaire, 1812, should be considered the author of the present subspecies.

In the literature dealing with the mammals of Suriname the names *Mycetes seniculus* (Linnaeus, 1766), *Alouatta macconnelli* Elliot, 1910 and *Alouatta seniculus* (Linnaeus, 1766) have been used for the present species.

***Cebus apella apella* (Linnaeus, 1758)**

Text-fig. 2a (teeth), pl. 46 (animal), pl. 53 upper figures (skull)

Simia Apella Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 28-29.

Type locality. — "Habitat in America" (page 29). Restricted by Elliot (1913: 80) to "Surinam, or Dutch Guiana". Hershkovitz (1958: 54) claims that Humboldt (1812a: 355) and E. Geoffroy (1812: 109) restricted the type locality of this species to French Guiana. However, the fact that these authors merely mention a locality (and not the type locality) for a species, makes it impossible to consider their action a type locality restriction. As the first type locality restriction for the species could be regarded Thomas's (1911: 128) remark: "No type locality available, but Guiana may be accepted by later authors". The first definite restriction is that by Elliot (1913: 80).

Synonymies. — Cabrera, 1958: 163; Hershkovitz, 1958: 54; Husson, 1957: 26-29, pl. 4 (skull).

Vernacular names. — (E) Brown Capuchin; (N) Mutsaap, Bruine Rolstaartaap, Zwarte Capucijneraap; (S) Keskesi, Mekoe, Granmonki.

Distribution. — According to Cabrera (1958: 163-168) the species *Cebus apella* (Linnaeus, 1758) occurs in the greater part of South America from Colombia, Venezuela and the Guianas in the north, southward through Ecuador, Peru, Brazil and Bolivia to Paraguay and northern Argentina. The nominate subspecies *C. apella apella* ranges from Colombia through Venezuela and the Guianas to the Amazon River.

Occurrence in Suriname. — *Cebus apella* is a common species in Suriname and is found in the forests from the coastal plain to the interior as far as the Brazilian border. It is well known and often kept as a pet, and therefore has been mentioned in many accounts of the country. However, most of the old descriptions are not

sufficiently detailed to make certain that the present and not the following species was meant. The first published figure of a Suriname specimen of *Cebus apella* is George Edwards's (1764: 222, pl. 312) figure of "the little Bush-tailed monkey from Surinam", which is an excellent illustration of the species. I have examined specimens from the following localities:

1. Hertenrits north of Wageningen, northern Nickerie District, 1 male (no. 20626, skull).
2. Near Koffiemaka, east of Wageningen, right bank of Nickerie River, 4 males (nos. 20615, 20616, 20618, 20619, skins and skulls), 3 females (nos. 20617, 20620, 20621, skins and skulls).
3. Awarra savanna near Maratakka River, 50 km south of Wageningen, 1 male (no. 24645, skin and skull).
4. Swamp area at the upper Maratakka River, 1 juvenile male (no. 25065, skin and skull).
5. Wakay, east bank of lower Corantijn River, below mouth of Kaboeri Creek, 1 male (no. 25628, skin and skull), 1 female (no. 23899, skin and skull).
6. Kaboeri Creek, east tributary of Corantijn River, at about 5°14'N, 1 male (no. 24565, skin and skull), 3 females (nos. 24564, 24566, 24646, skins and skulls).
7. Near Stondansi Falls in upper Nickerie River, near confluence with Fallawatra River at about 5°5'N, 1 female (no. 24644, skin and skull).
8. Near Blanche Marie Falls in upper Nickerie River at about 4°40'N, 1 female (no. 23951, skull).
9. Near Avanavero Falls in Kabalebo River, east tributary of Corantijn River at 4°45'N, 2 males (nos. 24567, 24568, skins and skulls).
10. Near Kayserberg airstrip near Zuid River, about 3°N 56°30'W, 1 male (no. 20622, skin and skull), 1 skull (no. 20625).
11. Forest near Sipaliwini airstrip, near Sipaliwini River close to the Brazilian border, extreme south-eastern Nickerie District, 3 males (nos. 17761, 17777, 17780, skins and skulls), 3 females (nos. 17759, 20612, 20613, skins and skulls).
12. Near Tibiti River, east tributary of Coppename River, near their confluence, Saramacca District, 1 female (no. 12532, skin and skull).
13. Forest near Bitagron on lower Coppename River, south of Wayombo River, 3 skulls (no. 20623a, b, c).
14. Forest near Raleigh Falls in upper Coppename River near Voltzberg, 2 males (no. 20614, skin and skull; no. 20624, skull).
15. Matta, about 12 km west of Zanderij, Saramacca District, 4 skulls (nos. 20632a, b, 20633, 20634).
16. Surroundings of Paramaribo, Suriname District, 5 skulls (no. 24272a-e).
17. Forest along Mapane Creek near Gododrai, upper Commewijne River, Commewijne District, 2 skulls (nos. 17771, 20718).
18. Sand ridge forests between Moengotapoe and Wia Wia Bank, northern Marowijne District, 4 males (nos. 12531, 12533, 12537, 12544, skins and skulls), 4 females (no. 12530, skin; nos. 12534-12536, skins and skulls).
19. Upper Lawa River near village Anapaike, Marowijne District, about 3°25'N, 1 female (no. 17892, skin).
20. Suriname, without more precise locality indication, 6 males (nos. 971, 2248, skins and skulls; nos. 24247, 24251, 24260, 24274, skulls), 3 females (no. 1043, skin and skull; nos. 24257, 24259, skulls), 9 unsexed skulls (nos. 24248-24250, 24252, 24261-24263, 24271, 24373). Several of these have been mentioned by Jentink (1887: 40, 41; 1892: 45, 46).

Description. — The following description is based on the Suriname specimens listed above. This species, which is close to *Cebus olivaceus*, is characterized by having the entire upper surface of the head quite dark, almost black; this colour extends from ear to ear and does not form a small delimited skull cap as in the next species. Anteriorly the dark colour extends to the eyes and as a rule does not end

in a distinct narrow triangular anteriorly directed point. The hairs of the upper surface of the head form two, usually distinct, tufts over the ears. The tail and the median line of the back are much darker than the rest of the back. The dorsal surface of the body is strongly variable in colour (much more so than in *C. olivaceus*), ranging from pale greyish brown to chestnut brown, and being lightest on the shoulders. A dark median line extends over the full length of the back. The hairs of the back are greyish brown, sometimes with a dark top or two dark distal rings, giving the back a much less grizzled appearance than in *C. olivaceus*. The upper surface of the head is entirely black. In the neck this black area narrows posteriorly into the median line of the back. The sides of the neck have the same colour as the dorsal surface of the back. The black colour of the head occupies the full width between the ears, and usually covers also the entire face and throat. The only pale colour on the face is then formed by a small tuft of whitish hairs before the ears and a white band above the eyebrows. The latter may be very distinct (especially in the young), or small, and even practically absent. The cheeks and the throat in some specimens are light, but there always remains a distinct black side-whisker-like strip reaching from the black upper surface of the head, in front of the ears, to the throat region. The ears are large, and hairy inside and out. In its proximal part the outside of the frontlegs is light greyish brown to yellowish white, the distal part is dark grizzled with whitish or yellowish, while the hand and the wrist are slightly or distinctly darker, usually not grizzled. The inside of the frontlegs is almost entirely black, but for a small lighter proximal part. The outside of the hind legs is distinctly darker than the back, and becomes darker distally. In the lightest specimens the outside is dark brown to blackish brown, grizzled with yellowish or pale brown. In the darkest specimens the greater part of the outside is uniformly blackish brown to black. The upper surface of the feet usually is black; in a few specimens it is grizzled. The hairs of the sides of the body are of the same colour as those on the back, or lighter, and are very long. On the ventral surface the hairs are much sparser than on the back and of about the same colour as those of the sides, varying from greyish brown to chestnut brown, light orange brown or yellowish brown. The hairs in the inguinal region often are darker to almost black, as are also the hairs of the inside of the hind legs. The tail is prehensile, it is about as long as head and body combined; it is usually entirely black, dorsally and ventrally, and hairy up to the tip. In a few specimens (nos. 17892, 17780) the tail shows some faint lighter rings.

The external measurements of an adult male and an adult female from the Sipaliwini region are, respectively: head and body, 488, 422; tail, 488, 463; hind foot, with nails, 132, 120; ear, 43, 37 mm; weight, 4.5 and 3.1 kilograms. The skull measurements of these two specimens are as follows: total length, 100.7, 91.0; zygomatic breadth, 80.8, 61.3; crown length of upper cheek-teeth, 23.5, 23.1 mm.

Remarks. — In the 1954 Suriname Game Ordinance as revised in 1970 the present species, under the name “Kesi-kesi (*Cebus apella apella*)”, is listed as game: it may be hunted from 1 May to 31 December. According to Geijskes (1954: 72) the animal

is often hunted by the inhabitants; its meat, however, is not as tasty as that of the other monkeys of Suriname. Lenselink (1972: 40) found that in the Amerindian village of Alalapadoe (population: 450), situated in the Sipaliwini area (south-western Suriname), in one month (March 1972) 50 specimens of *Cebus apella* were shot and eaten by the Indians.

Cebus apella is one of the best known monkeys of Suriname, because of its common occurrence and because it is often kept as a pet. It is intelligent and can endure captivity for years. In the forest, the Brown Capuchins have been observed in troops of up to thirty individuals, but pairs and single specimens occur as well. The animals are very active and climb with great agility, using also the tail as a prehensile organ. They are very noisy, calling to each other in a characteristic way. Kappler (1887: 54) described their call as "einen eigentümlich flötenartigen Ruf und Gewinsel", while the Penard brothers ("De Surinamer", 22 January 1905) stated that 'it sounds like a whistling "peetee-ko" changing, when the animals are alarmed, to a shrieking "kô-ko-ko"'. Babies and young individuals have been observed all through the year. A female from Moengo-tapoe, collected on 19 October 1948, was carrying a foetus. A young male was obtained at the same place in September of that year, while another young male was caught on 29 January 1971 near the Stondansi Falls.

According to Kappler (1887: 54) they eat fruit, nuts, birds' eggs and perhaps also young birds, but neither insects nor leaves. The brothers Penard ("De Surinamer", 22 January 1905) confirm the first part of Kappler's observations, but do include insects and honeycombs. During the period that the fruit of the Maripa palm is ripe (May, June), these monkeys are often observed in the palms, eating the fruit. They also like wild and cultivated cocoabeans and sometimes become quite destructive to cocoa plantations.

At first sight *Cebus apella* resembles *Cebus olivaceus* (see next species). However, the two species can readily be distinguished by the fact that in *C. apella* the black colour of the vertex reaches sideways to the bases of the ears and has the frontal margin about straight, while in *C. olivaceus* the black colour forms a rather small spot on the head and does not reach the ears; anteriorly it is triangular and ends in a narrow median point (see pls. 46, 47). Moreover, in *C. apella* the blackish brown colour of the tail is in sharp contrast to the brownish colour of the back, while in *C. olivaceus* the brownish tail is heavily lined with light yellowish (at least in its basal part), its colour gradually passing into the brownish colour of the back. The skulls of the two species closely resemble each other in size and shape; the most striking differences are given in the key on page 208. I took measurements of different parts of the skull, but the values obtained in the two species overlap in such a way that they cannot be used for a certain identification of a single skull.

The nomenclature of the present and related species has been the subject of many controversies, most recently discussed by Tate (1939: 208-214; 1954) and Hershkovitz (1949b: 324-380; 1955; 1959a). Tate used the specific epithet *apella* for the species which in the present publication is indicated with the name *Cebus olivaceus*,

while Hershkovitz used it for the present species. The holotype of *Simia apella* Linnaeus, 1758, was well described and figured by Linnaeus (1754: 1, pl. 1). Tate (1939, 1954) interpreted Linnaeus' specimen as "uncrested"; Linnaeus's figure indeed does not show hairy tufts above the ears of the specimen, but as both Tate and Hershkovitz have pointed out, and as is also shown by our material, these tufts are variable in size and may be very inconspicuous. In his description, Linnaeus did not comment on the presence or absence of hair tufts. In all other characters Linnaeus's specimen agrees perfectly with the present species. It differs from *C. olivaceus* by: (1) having the body fuscous with the tail and the feet black, (2) having the head entirely black above (from ear to ear), the black colour extending over the cheeks, with a white line above the eye brows. Therefore I fully agree with Hershkovitz that Linnaeus's *Simia apella* is based on a specimen of the present species, which consequently has to bear the name *Cebus apella*.

The great confusion that existed in the taxonomy and nomenclature of the present group is shown by the fact that later, Linnaeus (1766: 39, 42) twice described the present species as new, viz., under the names *Simia trepida* (p. 39) and *Simia Fatuellus* (p. 42). *Simia trepida* is based on Edwards's (1764: 222-223, pl. 312) "The Bush-tailed Monkey" from Suriname, which, as Edwards's plate clearly shows, is *C. apella*, being brown with a dark tail and with black hair covering the entire dorsal surface of the head; here too the light superciliary line is present. *Simia Fatuellus* is based on Brisson's (1756: 195) "Le Sapajou cornu", probably from French Guiana. Brisson's description clearly gives the colour pattern of *C. apella*: "Les poils qui couvrent sa face, ses côtés, son ventre, & ses jambes de devant, sont bruns; ceux qui couvrent le dessus de la tête, le milieu du dos, la queue, les jambes de derriere, & les 4 pieds, sont noirs". Brisson also stressed the presence of hair tufts on the head of the animal. Both Tate and Hershkovitz agree on the specific identity of *S. fatuellus* and *S. trepida* with the present species.

Another synonym of *Cebus apella* (L.) is undoubtedly *Cebus castaneus* I. Geoffroy St. Hilaire, 1851, which both Tate and Hershkovitz consider a synonym of *C. olivaceus* (= *C. nigrivittatus*). Geoffroy's (1851: 46) description is based on 3 specimens from Cayenne, which are described as being "d'un châtain roux. . . . avec les membres postérieurs, le bas des avant-bras, la queue et la ligne dorsale plus foncés", which is exactly as found in *Cebus apella*, and not as in *C. olivaceus*. Tate and Hershkovitz evidently based their identification of *C. castaneus* with *C. olivaceus* on Geoffroy's remark "le front et les côtés de la tête sont [p. 47:] aussi de cette dernière couleur [fauve-pâle roussâtre], mais en dessus il existe une calotte, rousse à l'occiput, noire sur le vertex, avec une ligne noire prolongée jusqu'à la partie antérieure du front". At a first glance the description of the "calotte" which anteriorly ends in a dark line seems to resemble that of *C. olivaceus*, but Geoffroy described *C. olivaceus* on p. 46 (under the name *C. capucinus*) as having the "calotte très-petite, avec une pointe en avant formée de poils noirs". *C. apella* also has a dark skull cap ("calotte"), which is not "très petite", but on the contrary very wide. In some of my specimens of *C.*

apella a narrow black median line starts from the middle of the wide anterior margin of the black skull cap reaching anteriorly as far as the base of the nose. It seems most likely that Geoffroy's description is based on a similar specimen of *C. apella*. This also would be in agreement with the locality Cayenne, which lies in the coastal area of French Guiana, while it is known that (at least in Suriname) *C. apella* is the common *Cebus* of the coastal region, *C. olivaceus* living farther in the interior.

In the literature on the mammals of Suriname the names *Cebus capucinus* (auct.) and *Cebus fatuellus* (Linnaeus, 1766) have been used for the present species. The genuine *Cebus capucinus* (Linnaeus, 1758) is a species which does not occur in Suriname. Walsh & Gannon (1967: 218) report on 3 specimens of "White-faced sapajou, *Cebus capucinus*" being saved in the Brokopondo area during the "Operation Gwamba"; it seems most likely that the present species is meant.

***Cebus olivaceus* Schomburgk, 1848**

Pl. 47 (animal), pl. 53 lower figures (skull)

Cebus olivaceus Schomburgk, 1848, *Reisen in British-Guiana*, 2: 246 (description), 247 (name).

Type locality. — Vicinity of "Our Village", at latitude 4°57'N 60°1'W, altitude about 1000 m, southern foot of Mount Roraima, Venezuela (p. 241).

Synonymies. — Cabrera, 1958: 169-170; Hershkovitz, 1949b: 347-349 (under *Cebus nigrivittatus*); Hershkovitz, 1958: 54-56 (under *Cebus nigrivittatus*); Husson, 1957: 29-32, pl. 5 (skull); Hill, 1960: xxi, 427-437, fig. 84 (animal), pls. 33-34 (animal) (under *Cebus griseus*).

Vernacular names. — (E) Weeper Capuchin; (N) Grije Capucijneraap; (S) Bergikeskesi.

Distribution. — According to Hershkovitz (1949b: 348, fig. 53), the range of the present species is "Venezuela, the Guianas, and in Brazil the territory embraced by the lower Amazonas and the Rio Negro".

Occurrence in Suriname. — *Cebus olivaceus* is far less common than *Cebus apella*, and does not, or very rarely, occur in the coastal area of Suriname. I have examined the following Suriname material:

1. Forest near Avanavero Falls in Kabalebo River, right tributary of Corantijn River at about 4°45'N, Nickerie District, 2 males (nos. 22402, 22403, skins and skulls).
2. Upper Maratakka River, northern Nickerie District, 1 male (no. 22401, skin and skull).
3. Forest near Sipaliwini airstrip, on the Sipaliwini River near Brazilian border, south-eastern Nickerie District, 1 male (no. 17772, skin and skull), 2 skulls (nos. 20629, 20630).
4. Emma Range, Saramacca District, 1 skull (no. 20628).
5. Goudplacer on railroad at about 95 km south of Paramaribo, Brokopondo District, 1 skull (no. 20631).
6. Near Brownsberg and Kabel on railway about 120 km south of Paramaribo, Brokopondo District, 1 male (no. 20627, skin and skull).
7. Nassau Mountains, 16 km west of Marowijne River at about 4°45'N, Marowijne District, 2 males (nos. 12528, 12529, skins and skulls), 1 female (no. 12527, skin and skull).

Description. — The following description is based on the Suriname specimens listed above. The species is characterized by having a small dark, almost black skull

cap, which anteriorly ends in a narrow point and which continues forward as a narrow dark line; the colour of the dorsal part of the tail is not different from that of the body. The dorsal surface of the body is light to dark greyish brown, with an olivaceous tinge. The median area, especially anteriorly, is somewhat darker than the rest. The shoulders are lighter than the remaining part of the dorsal surface. The hairs of the back are greyish, often with a light top, which gives the colour a slightly grizzled aspect. The top of the head is of the same colour as the back, with the exception of a striking very dark triangular to diamond-shaped area over the forehead. This dark area is distinctly less than half as wide as the distance between the ears. It narrows anteriorly to a slender point, which continues between the eyes as a dark median line. The forehead and the face are of a brownish grey colour which is distinctly lighter than that of the back. The hair on the head lies closely against the skull and does not show any tufts as are found in *C. apella*. The beard is absent or only barely indicated. The ears are distinct, rounded and hairy outside. The outside of the front legs is grizzled with white, grey and brown. The shoulders and upper arm usually are paler than the under arm, but the variation in colour is considerable: in some specimens (nos. 22401, 17772) the upper arm is almost white, in others (nos. 22402, 22403), it is only slightly lighter than the back. The hands and often also the wrist again are very dark brown. The outside of the hind legs is either of the same colour as the back or distinctly lighter. Here too the feet and ankles are very dark brown. The ventral surface of the body has the pelage very much sparser than the back, and of a somewhat lighter colour, the throat may be whitish or light greyish brown. The hairs on the inside of the legs are of the same colour as those of the outside but more widely spaced. The prehensile tail is as long as, slightly shorter or slightly longer than head and body combined. Dorsally and ventrally it is of the same greyish brown colour as the back. It is haired over its full length, the distal hairs being somewhat shorter than the proximal.

The external measurements of the adult male from the Sipaliwini area (no. 17772) and one of those from near the Avanavero Falls (no. 22403) are, respectively: head and body, 456, 450; tail, 486, 443; hind foot, with nails, 132, 138; ear, 41, 43 mm; the weight of the second specimen was 4250 grams. The skull measurements of the two specimens are, respectively: total length, 98.9, 98.4; zygomatic breadth, 65.5, 67.3; crown length of upper cheek-teeth, 22.5, 23.5 mm.

Remarks. — The Weeper Capuchin is hunted by the inhabitants of the interior of Suriname, but because of its scarcity it is not captured as frequently as *Cebus apella*. Lenselink (1972: 40, under *Cebus nigrivittatus*), in his study of the food of the Trio Indians of Alalapadoe, a village (pop. 450) in the Sipaliwini area of southwestern Suriname, found that during the month of his investigations (March 1972) 8 specimens of the present species were shot and eaten by the Indians, against 50 of *C. apella*. As stated by Geijskes (1954: 73, under *Cebus albifrons*), the meat of *C. olivaceus* is of the same quality as that of *C. apella*.

In my material there are far more males than females (7 ♂ to 1 ♀), which supports

Kappler's (1887: 54, under *Cebus fatuellus*) statement: "Man findet bei diesen Affen immer mehr Männchen als Weibchen". It would be interesting to ascertain whether or not this holds true also with larger series.

As already mentioned above the present species is a characteristic inhabitant of the interior of Suriname and seems to be absent, or exceedingly rare, in the coastal region. Geijskes's statement (in Husson, 1957: 32) that *Cebus olivaceus* replaces *C. apella* in the mountain forests is not completely correct, for in 1963 I obtained specimens of the two species from the wooded plains of the Sipaliwini area. An accurate investigation of the biotopes of the two species is desirable in order to determine their real habitat preferences.

HersHKovitz (1958: 54-56) objected to my earlier usage (Husson, 1957: 29-32) of the specific epithet *olivaceus* for the present species. HersHKovitz's philosophy on secondary homonyms, interesting as it may be, is not in accordance with the International Code of Zoological Nomenclature, and in his discussion he nowhere denies or tries to deny that my action to reject the epithet *nigrivittatus* Wagner, 1848, is correct under the provisions of the Code. As long as there is an officially recognized Code, one either should abide by it, or, if in a certain case the strict application leads to undesirable consequences, should submit to the International Commission on Zoological Nomenclature an application for suspension of the rules in that case. It is to be regretted that HersHKovitz evidently did not do either.

My 1957 arguments to reject the specific epithet *nigrivittatus* Wagner, 1848, still are in accordance with the provision of the 1961 Code or its 1964 revised edition, even though I published them before 1961. Von Pusch (1942: 195) namely, considered *Cebus nigrivittatus* Wagner, 1848, and *Chrysothrix nigrivittatus* Wagner, 1846, to be both members of the genus *Cebus* and therefore rejected the younger of these two secondary homonyms, viz., *nigrivittatus* Wagner, 1848. Under Article 59 (b) of the present Code, Von Pusch was perfectly justified, even compelled, to do so. As this action by Von Pusch (1942) took place before 1960, the junior homonym cannot be revived by an author who thinks that the two species are not congeneric (Article 59 (c)), therefore the epithet *nigrivittatus* Wagner, 1848, remains permanently rejected.

HersHKovitz's (1958: 56) remark that *Cebus olivaceus* Schomburgk, 1848, is invalidated by the fact that Fischer (1829: 41-42) placed *Gastrimargus olivaceus* Spix, 1823, in the genus *Cebus* is incorrect. It would have been correct if some author before 1960 had rejected the specific name *Cebus olivaceus* Schomburgk, 1848, on that account (see Code Art. 59 (b)), but as far as I know no such action has ever been undertaken, and HersHKovitz does not cite any either. As the two species *Cebus olivaceus* Schomburgk, 1848, and *Gastrimargus olivaceus* Spix, 1823, at present are placed in different genera, the two names can both be used (Article 59 (b)).

In my opinion the name *Cebus nigrivittatus* Wagner, 1848, is not sufficiently established to justify the use of the plenary powers of the International Commission on Zoological Nomenclature for its validation. Therefore the valid name of the species, *Cebus olivaceus* Schomburgk, 1848, is retained here.

The status of supposed subspecies of the present species is rather confusing. Hershkovitz (1949b: 348-349) as well as Cabrera (1958: 169-170) recognized five subspecies of this species (which they named *Cebus nigrivittatus*); four of these had originally been described as good species. As Hershkovitz (1949b: 348) remarked, his recognition of these subspecies was only provisional. He did not provide the characters to distinguish them, and in some cases they evidently were only recognized because of the position of the type locality (so, on p. 344, under *Cebus castaneus*, Hershkovitz remarked: "On the assumption that the monkey originated somewhere along the coast of French Guiana, it could hardly be synonymized with *olivaceus*, which according to Schomburgk, does not occur anywhere below 3,000 feet in the Mount Roraima region"). The lack of good characters combined with the fact that the five type localities all are situated in a restricted area (northern Venezuela to French Guiana, and not farther south than the upper Rio Branco, an area of less than 2000 km long and 500 km wide), makes the status of these subspecies rather uncertain and for the time being they are best ignored. Only when large series from various localities throughout the area become available, a reliable conclusion can be reached in this matter. Also for that reason a rather elaborate description is here provided of my Suriname material. The subspecies *castaneus* Geoffroy mentioned before in this paragraph, in my opinion must be considered a synonym of *C. apella* (see p. 222).

In the literature on Suriname mammals the synonym *Cebus nigrivittatus* Wagner has been used for this species as well as the incorrect names *Cebus albifrons* and *C. apella* and the synonym *C. fatuellus* of the latter.

Saimiri sciureus sciureus (Linnaeus, 1758)

Pl. 48 (animal), pl. 54 lower figures (skull)

Simia sciurea Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 29.

Type locality. — "Habitat in India". Corrected by Thomas (1911: 129) to Guiana; restricted by Tate (1939: 218) to "Kartabo, British Guiana".

Synonymies. — Cabrera, 1958: 173-174; Husson, 1957: 33-34, pl. 6 (skull).

Vernacular names. — (E) (Common) Squirrel Monkey; (N) Eekhoornaap, Doods-kopaap; (S) Monkimonki.

Distribution. — The species *Saimiri sciureus* (Linnaeus, 1758) has a wide range of distribution in South America north of the tropic of Capricorn. The nominate subspecies, *S. sciureus sciureus*, occurs in Venezuela, the Guianas and the northern part of the Amazon basin.

Occurrence in Suriname. — The Squirrel Monkey is one of the most common monkeys in Suriname; it was already known to the early authors (e.g., Warren, 1667: 14, who mentioned it under the name "Marmazet"). It has a preference for the lower forests and shrubs in swamps, savannas, and along the banks of rivers, where it lives in large troops of sometimes more than a hundred individuals. I have exam-

ined specimens from the following localities:

1. South bank of Lucie River, left tributary of Corantijn River, 3°10'-3°30'N, Nickerie District, 1 skull (no. 18015).
2. Cupido on Maratakka River, about 12 km south of Wageningen, northern Nickerie District, 1 male (no. 23945, skin and skull).
3. Awarra savanna at Maratakka River, about 120 km south of Wageningen, 1 male (no. 23954, skin and skull).
4. Blanche Marie Falls, upper Nickerie River, Nickerie District at about 4°40'N, 2 males (nos. 22731, 22732, skins and skulls).
5. Forest near Matta about 12 km west of Zanderij, Saramacca District, 2 males (nos. 17783, 20553, skins and skulls), 1 female (no. 17785, skin and skull).
6. Plantation "Clevia", north-east of Paramaribo on Suriname River, Suriname District, 3 males (nos. 20556, 20557, 20559, skins and skulls), 2 females (nos. 20555, 20558, skins and skulls).
7. Plantation "Geijersvlijt", north-east of Paramaribo, south of "Clevia", on Suriname River, 1 skull (no. 24176).
8. Paramaribo, Suriname District, 2 males (no. 3960, skin and skull; no. 24327, skull), 15 skulls (no. 24172a-0).
9. Near New Amsterdam, at confluence of Suriname and Commewijne Rivers, Commewijne District, 1 male (no. 20563, skin and skull).
10. Forest near Peninika boarding school on Commewijne River just south of confluence with Peninika Creek, Commewijne District, 1 male (no. 20561, skin and skull), 2 females (nos. 20560, 20562, skins and skulls).
11. About 15 km north of Moengo, Marowijne District, north-eastern Suriname, 3 males (nos. 12539, 12541, 12543, skins and skulls), 2 females (nos. 12540, 12542, skins and skulls).
12. Langamankondre, north of Albina on Marowijne River, Marowijne District, 2 males (nos. 18223, 18224, skins), 1 female (no. 18225, skin).
13. Suriname, without more precise locality indication, 7 males (nos. 4668, 5042, 24182, 24191, 24195, skulls; nos. 24196, 24198, skins and skulls), 7 skulls (nos. 742, 24175, 24189, 24190, 24192-24194).

Description. — The following description is based on the above listed Suriname specimens. The species is immediately characterized by the greyish body with orange brown forearms and hind feet and the long tail which has the distal third black. The dorsal surface of the body is grizzled olive grey, darkest in the median line, with a golden tinge in the posterior median area; this golden colour extends forwards as a narrowing median band reaching as far as the neck. The hairs of the back are of a dark brown, almost black colour with about 3 broad pale bands in the distal part. In the middle and the posterior part of the back the bands on the hairs are yellowish brown (causing the golden colour), on the rest of the back they are more whitish. The extent of the pale and dark colour on the hairs determines the intensity of the overall grey colour. The grey colour also extends over the upper part of the outside of the forearms and over the larger part of the outside of the hind legs. The head has on top the same grizzled olive grey colour as the anterior part of the back, but around the eyes the hairs are white and form a strikingly white mask, which is sharply set off from the grey of the forehead. Because of the white mask, the grey colour of the forehead is pointed in the middle. The anterior part of the cheeks, the area around the mouth, the throat, the ears and the side of the neck also are white. The ears are large, rounded, with long white hairs inside and out and are distinctly

visible. The white colour of the ears is separated from the white mask around the eyes by the grey colour of the posterior part of the cheeks. The skin around the mouth and the nose (when dried) is black, some whisker-like black hairs are placed there among the white; similar black hairs form a kind of indistinct brow over the eyes. The lower arm of the front legs from the elbows down is ferrugineous orange brown, in the hind legs this brown colour only covers the feet, the rest of the outside of the legs is grizzled grey like the upper surface of the body, the inside is more whitish, basally, more yellowish farther distally. The entire ventral surface of the body is of a soft whitish pubescence, as is also the lower part of the base of the tail. The tail itself is longer than head and body combined; it is not prehensile and is entirely covered by hair which in the basal $\frac{2}{3}$ of the dorsal surface is grizzled grey like the body or slightly darker; on the ventral surface this $\frac{2}{3}$ is whitish basally and grizzled greyish distally, being lighter than dorsally. The distal $\frac{1}{3}$ of the tail is black, and ends in a tuft; the black hairs are unicolored. The separation of the grey and black portions of the tail is rather sharp.

The external measurements of an adult male (no. 20561) and an adult female (no. 20560) from near Peninika are, respectively: head and body, 318, 312; tail, without tuft, 408, 401; tail, with tuft, 440, 430; hind foot, with nails, 86, 89; ear, 28, 28 mm; weight, 1150 and 1250 grams. The skull measurements of these two specimens are respectively: total length 64.0, 64.8; zygomatic breadth, 42.5, 43.0; crown length of upper cheek-teeth, 12.5 and 12.9 mm.

Remarks. — According to Geijskes (1954: 73) the Squirrel Monkey is rarely hunted by the inhabitants, because the animal is of small size and the meat has a peculiar taste. Lenselink (1972: 37-41), who studied the protein consumption in the Amerindian village of Alalapadoe (population: 450) in the Sipaliwini area of south-western Suriname, noted that during one month (March 1972) only a single specimen of *Saimiri* was shot and eaten by the Indians of the village, compared to more than 140 specimens of the seven other species of monkeys together.

The species lives in large groups; according to Kappler (1887: 55) often more than a hundred individuals live together. They are very agile and quick, climb and jump with great ease and use their tail, which is not prehensile, as a balancing organ. When the animal sleeps or rests the tail is often wrapped around the shoulders. They live mostly in the lower forest and shrubs rather than among the highest trees; even the long spines of the Awarra palms (*Astrocarym segregatum* Drude) do not seem to bother them. As to the sounds that they produce, Kappler (1887: 56) stated "Fühlen sie sich behaglich, so schnurren sie wie ein Kätzchen; erschreckt, lassen sie einen kurz abgestossenen schrillen Gaumenlaut hören, im Zorne ein Geschrei wie Elstern". The brothers Penard ("De Surinamer", 26 January 1905) indicate that when the animals move around in the bush they make 'a soft whistling sound like "peeta-ko", which changes to a screaming sound when the animals are alarmed'. According to this source the food consists mainly of insects, like bees, wasps, flies, cockroaches, etc., which they know how to catch very cleverly, while also honey is eaten. Kappler

(1887: 56), who kept several of these monkeys as pets, one for more than 13 years, fed them with bread, milk and bananas, and remarked that in nature they ate fruit, insects and bird's eggs. When the oranges are ripe, the Squirrel Monkeys can be destructive in the plantations of the coastal plain by plundering the citrus trees. They have proved to be very nice pleasant pets, rather sensitive to cold. Kappler observed that when left free outside, they would climb on the back of pigs, and had themselves carried around in that way in the savannas. This reminds of Warren's (1667: 14) story about this species: "The *Marmazet* . . . though far less than a *Monkey*, is Commander of all those lofty Dwellers, riding them from Tree to Tree at his pleasure, they not being able to shake him off, and in stead of Spurs, to provoke their speed, he bites them by the Ears".

The generic name *Chrysothrix* instead of *Saimiri* has been used by some authors in publications on the mammals of Suriname.

***Ateles paniscus paniscus* (Linnaeus, 1758)**

Pl. 49 (animal), pl. 52 upper figures (skull)

Simia Paniscus Linnaeus, 1758, *Systema Naturae*, (ed. 10) 1: 26.

Type locality. — "Habitat in America meridionali: Brasilia". As pointed out by previous authors (e.g., Kellogg & Goldman, 1944: 15-16), Linnaeus's *Simia paniscus* is a composite species. The original description namely, is based on (a) "The four-fingered Monkey" "Simia 2. Fusca major, palmis tetradactylis . . ." of P. Browne (1756: 489), and (b) the "Guariba Brasiliensibus" of Marcgraf (1648: 226, fig.). The former species is the one at present usually indicated as *Ateles paniscus*, the second is *Alouatta belzebul* (Linnaeus, 1766). There is no indication that Linnaeus had actual specimens at hand when drawing up this description. As far as I know no lectotype has ever been selected for this species and an irresponsible revisor might make *Simia paniscus* and *Alouatta belzebul* synonyms by selecting Marcgraf's specimen as such. Therefore, I here select as the lectotype of *Simia paniscus* Linnaeus, 1758, the specimen described by P. Browne (1756: 489) as "Simia 2. Fusca major, palmis tetradactylis, caudâ praehensili ad apicem subtus nudâ. The four-fingered Monkey". According to Browne, his specimen (i.e., the lectotype of *Simia paniscus*) was "a native of the main continent" (evidently South America). Linnaeus (1758), by indicating "Brasilia" as the (type) locality of the species, evidently considered both Marcgraf's and Browne's specimens to originate from there, and we can not prove him either right or wrong, although it is more likely that Browne's animal came from British Guiana. However this may be, at present there is no good reason not to accept Brazil as the type locality of *Ateles paniscus*. Several restrictions of this type locality have been made. Thomas (1911: 127) proposed as such "Pernambuco", but this must be wrong as the species does not occur there. Kellogg & Goldman (1944: 11) gave as restricted type locality "French Guiana", but this, as it is situated outside Brazil, is not correct either. Finally Husson (1957: 35) restricted the type locality to

'Rio Jamundá near Faro, north bank of Rio Amazonas, Pará, Brazil', within the type locality as cited by Linnaeus (1758) for the species, and known to be within the range of the species (see Kellogg & Goldman, 1944: 17).

Hershkovitz (1958: 54) claimed that Linnaeus (1766: 37) "redetermined" the type locality as "America meridionali". Actually Linnaeus (1766) did nothing of the kind. The type locality, i.e., the locality of the type material, is given by Linnaeus (1758) in the original description as Brazil and nothing else. The fact that he, without giving his reason, in the 12th edition of his *Systema Naturae* indicated the range of the species as "America meridionali" does not mean that he "redetermined" the type locality; he might, for instance, have obtained additional (therefore non-typical) material from other parts of South America. As long as Linnaeus did not provide his reasons for this 1766 locality (not type locality) indication, one is not allowed to interpret this as a redetermination, restriction, or enlarging of the type locality. Neither can one claim that the record by a later author of a locality within the range of the species (like E. Geoffroy's (1803: 6) reference to "La Guyane") is a type locality restriction. A type locality restriction has to be clearly marked as such.

Synonymies. — Cabrera, 1958: 178-179; Kellogg & Goldman, 1944: 11, 15-17; Hershkovitz, 1958: 54; Husson, 1957: 34-37, pl. 8 (skull).

Vernacular names. — (E) (Guiana) Black Spider Monkey; (N) (Zwarte) Spinaap, Slingeraap; (S) Kwata.

Distribution. — The species *Ateles paniscus* (Linnaeus, 1758) is known from the Guianas, Brazil, Peru, and Bolivia. The nominate subspecies *A. paniscus paniscus* occurs in the Guianas and in Brazil north of the Amazon River.

Occurrence in Suriname. — The Black Spider Monkey is one of the common monkeys in the forests of the interior of Suriname, where it inhabits by preference the mountainous regions; it is not found in the lowland forests of the coastal region (Kappler, 1887: 53; Geijskes, 1956: 18, 20). Sanderson (1949: 762) remarked: "Professor Stahel. . . states that this species is extraordinarily numerous on the higher slopes of the hinterland, especially above 2000 ft. It is also met with over certain flooded areas along a belt 8 to 15 miles from the coast where they congregate in large troops at the beginning of the wet season, when the hunters often meet with them on the ground. During the rest of the year they live in pairs (often of the same sex) or in small family parties". The first Suriname record of the species is the one by Warren (1667: 14), who described it under the name "Quotto".

I have examined material from the following Suriname localities:

1. Forest near Kaboeri Creek, tributary of Corantijn River at about 5°14'N, Nickerie District, 1 male (no. 24643, skin and skull).
2. Forest near Lucie River, branch of Corantijn River, between 3°15' and 3°45'N, 1 female (no. 17893, skin and skull).
3. Near Stondansi Falls, upper Nickerie River near the confluence with the Fallawatra River at about 5°5'N, 1 female (no. 24642, skin and skull).
4. East bank of Fallawatra River, above the confluence with the upper Nickerie River, 1 female (no. 25616, skin and skull).
5. Forest near Sipaliwini airstrip, near Sipaliwini River close to the Brazilian border, ex-

treme south-eastern part of Nickerie District, 1 male (no. 20598, skin and skull), 6 females (no. 20599, skin and skull; nos. 18212, 20600-20603, skulls).

6. Forest near Raleigh Falls in upper Coppename River near Voltzberg, Saramacca District, 1 male (no. 20597, skin and skull), 5 females (nos. 18203, 20593-20596, skins and skulls).

7. Near Tibiti River, eastern branch of the lower Coppename River, 1 male (no. 12517, skin and skull).

8. Coppename River, Saramacca District, 1 female (no. 24320, skull).

9. Plantation "Geijersvliet", on Suriname River north-east of Paramaribo, Suriname District, 2 skulls (nos. 24319, 24321).

10. About 10 km east of Jodensavanne, Mapane region about 50 km south of Paramaribo, Suriname District, 2 skulls (nos. 23953, 24094).

11. Nassau Mountains at 20.1 km west of the Marowijne River, about 4°45'N, Marowijne District, 2 males (nos. 12518, 12519, skins and skulls).

12. Suriname, without more precise locality indication, 2 females (nos. 963, 1765, skulls), 5 skulls (nos. 24322-24326), 1 specimen, sex unknown (no. 2034, skin and skull).

Description. — The following description is based on the above listed Suriname specimens. The Suriname *Ateles* is characterized by its entirely deep rather glossy black pelage and its flesh coloured face. The dorsal surface of head and body is covered by a dense pelage of very lax and very long deep-black hairs, which at the midline of the back may be up to 15 cm long. The face is almost naked and shows only few short scattered black hairs. The ears are naked inside and out and of a human type; they are largely obscured by the long hairs of the head. The legs and the basal half of the tail show the same long hairs as the dorsal surface. The front legs show 4 well developed fingers each provided with a distinct nail, the thumb is strongly reduced or absent and does not carry a nail; in the hind legs all 5 toes are normally developed. The ventral surface of the body has the hairs black, somewhat shorter and less dense than the dorsal hairs. The hairs of the dorsal parts of the tail diminish gradually in length distally. In the distal half the ventral surface of the tail is entirely naked and is used for prehensile purposes.

In the living animal the naked face is flesh-coloured or reddish. Warren (1667: 14) described it as follows: "his Face is Red, with hair hanging a little over his Forehead, and his Aspect is almost like an old *Indian-Womans*".

The external measurements of two adult females (nos. 20594 and 18203 respectively) collected on 5 April 1963 in a forest near the Raleigh Falls, are: head and body, 550, 543; tail, 856, 771; hind foot, with nails, 202, 199; ear, 37, 37 mm; weight, 10 and 11 kilograms. The skull measurements of these two specimens are as follows: total length, 120.9, 116.4; zygomatic breadth, 68.2, 69.1; crown length of upper cheek-teeth, 24.8 and 26.5 mm.

The above mentioned female (no. 18203) from the Raleigh Falls region was carrying a mature male foetus, of which the measurements are: head and body, 161; tail, 199; hind foot, 59; ear, 21 mm; weight, 350 grams. A female (no. 24642) collected on 1 February 1971 near Stondansi Falls, carried a young female on its back. The external measurements of the adult and the young are, respectively: head and body, 562, 235; tail, 755, 395; hind foot, with nails, 185, 106; ear, 38, —; weight, 9 kg and 1025 grams.

Remarks. — According to Geijskes (1954: 72) the meat of the present monkey is

excellent and therefore the animal is intensively hunted by the Bush-Negroes and Amerindians. Already P. Browne (1756: 489) remarked that the animal is "a part of the food of the Indians", and Kappler (1887: 53) stated that this species "wie der Brüllaffe, dem Buschneger das beliebteste Wildpret ist". Lenselink (1972: 40) indicated that in the Amerindian village of Alalapadoe (population: 450) in the Sipaliwini area of south-western Suriname, during one month (March 1972) 11 specimens of this species were shot for food by the Indians.

Ateles paniscus is very agile and is able to move rapidly through the forest. When chased, the progress of the animals is so swift that it is impossible to follow them on the ground. When disturbed by hunters, they try to hinder the pursuit by smashing down dead branches from the canopy of the forest. They prefer the high forest and hardly ever are seen on the ground. According to Kappler (1887: 53) their food is purely vegetarian and they have a predilection for treebuds, but they never eat insects. The brothers Penard ("De Surinamer", 22 January 1905), however, remarked that insects and small birds are included in their diet.

The Amerindians of the interior prefer to shoot the animals with arrows poisoned with 'oerali' (= curare), as otherwise the monkeys, when shot, grab hold of branches with their long prehensile tail and remain hanging in the trees even after they have died; the poison of the oerali arrow paralyzes the animal, which then drops to the ground. Although the Suriname *Ateles* generally is of solitary occurrence, several individuals have been observed sleeping together in a high tree. The Penard brothers ("De Surinamer", 22 January 1905) claimed that they do live in rather large groups.

Mating and birth evidently are not confined to restricted seasons, young animals being met with throughout the year. A litter consists of one young only.

In the literature dealing with the mammals of Suriname the name *Ateles ater* F. Cuvier, 1823, has often been used for the present species.

FAMILY CALLITRICHIDAE

Saguinus midas midas (Linnaeus, 1758)

Pl. 50 (animal), pl. 54 upper figures (skull)

Simia Midas Linnaeus, 1758, *Systema Naturae*, (ed. 10) 1: 28.

Type locality. — "Habitat in America". Restricted to "Dutch Guiana" by Husson (1957: 37). Hershkovitz (1958: 53) remarked that Schreber (1775: 132) restricted the type locality of the present species to Suriname. Actually Schreber did not do such a thing, he only reported the species from Suriname, an action which certainly does not constitute a restriction of a type locality. Also Gmelin (1788: 41) and many subsequent authors mentioned localities, but definitely did not restrict type localities, for the species. The first attempt to restrict the type locality of *Simia Midas*, that I know of, is the one by Thomas (1911: 128), who indicated the type locality as "West Indies"; Thomas evidently was led to this "restriction" because the first author referred to by Linnaeus (1758: 28) under *Simia Midas* was G. Edwards (1751

(4):196, pl. 196), who gave a good description and an excellent figure of the present species, based on a specimen which was said to originate from the West Indies. As the species does not occur in the West Indies (unless one extends this term to include the Guianas), this restriction is invalid.

Cabrera (1958: 195) stated that Von Humboldt (1812) restricted the type locality of the species to French Guiana, but this is not correct either: Von Humboldt (1812: 320) only stated "Le *Tamarin nègre*, de Cayenne (*Simia midas*, Linn.), mange volontiers de la viande cuite. . . .", but no restriction is given at all. The first positive restriction that I know of is the one by Husson (1957: 37).

Synonymies. — Cabrera, 1958: 195 (under *Leontocebus*); Husson, 1957: 37-38 (under *Marikina*), pl. 7 (skull); Hershkovitz, 1958: 53-54.

Vernacular names. — (E) Red-handed Tamarin; (N) Surinaamse Zijde-aap, Sagoewijntje; (S) Sagoewenki.

Distribution. — The species *Saguinus midas* (Linnaeus, 1758) occurs in the Guianas and in the Amazon basin. The nominate subspecies, *S. midas midas*, has the same range of distribution, with the exception of the area between the Rio Negro and the Japura River (eastern Amazon basin).

Occurrence in Suriname. — The Red-handed Tamarin is quite common in savanna forests and along the banks of rivers, but also in the woods of the sand ridges in the coastal region. In many of the very early popular accounts on the fauna of Suriname a species is mentioned as Cusharee (Warren, 1667: 14), Cuscary and Sagovin (Herlein, 1718: 171, 173), Sagevin (Pistorius, 1763: 61, 62), Sagouin (Fermin, 1765: 29), Saccawinkee (Bancroft, 1769: 135), with which evidently the present species is meant, but most descriptions are incomplete or partly erroneous. I have examined material from the following Suriname localities:

1. Nieuw Nickerie, mouth of Corantijn River, Nickerie District, 1 female (no. 16851, skin and skull).
2. Washabo, east bank of Corantijn River at about 5°12'N, 1 female (no. 24089, skin and skull).
3. Near Avanavero Falls in Kabalebo River, tributary of Corantijn River, about 4°45'N, 1 male (no. 24090, skin and skull).
4. Awarra savanna on Maratakka River about 120 km south of its mouth near Wageningen, 1 male (no. 22546, skin and skull), 1 female (no. 22561, skin and skull).
5. Near Stondansi Falls in upper Nickerie River near the confluence with the Fallawatra River, about 5°5'N, 2 males (nos. 22562, 22572, skins and skulls), 1 female (no. 22563, skin and skull).
6. Forest near Sipaliwini airstrip, near Sipaliwini River close to the Brazilian border, extreme south-eastern part of Nickerie District, 4 males (nos. 20568-20570, 20585, skins and skulls), 3 females (nos. 20554, 20582, skins and skulls; no. 20583, skin).
7. Forest near Raleigh Falls in upper Coppename River near Voltzberg, Saramacca District, 3 males (nos. 20571, 20573, 20574, skins and skulls), 2 females (nos. 20572, 20575, skins and skulls).
8. Forest near Matta, about 12 km west of Zanderij, Saramacca District, 1 male (no. 17796, skin and skull), 2 females (nos. 20564, 20584, skins and skulls).
9. Brownsberg near Brownsweg, west of Brokopondo Lake, Brokopondo District, 1 male (no. 17809, skin and skull), 1 female (no. 20565, skin and skull).

10. Forest near Lombé on Suriname River, in the area now covered by the Brokopondo Lake, Brokopondo District, 2 females (nos. 17790, 20566, skins and skulls).

11. Between Kabel and Abontjima, area now covered by the Brokopondo Lake, Brokopondo District, 1 specimen (no. 18210, skin and skull).

12. Forest near Peninika boarding school on Commewijne River, just south of confluence with Peninika Creek, Commewijne District, 3 males (nos. 20577, 20578, 20581, skins and skulls), 3 females (nos. 20576, 20579, 20580, skins and skulls).

13. About 3.4 km north of Moengotapoe, northern Marowijne District, 1 specimen (no. 12513, skin and skull).

14. Forest near Langamankondre, mouth of Marowijne River, Marowijne District, 1 female (no. 20567, skin and skull).

15. Suriname, without more precise locality indication, 2 males (nos. 1867, 1873, skulls), 5 females (nos. 390, 21028, 24184, skins and skulls; nos. 24200, 24201, skulls), 4 skulls (nos. 20318, 24203, 24204, 24246).

Description. — This description is based on the above listed Suriname material. The most striking character of this small monkey is the combination of a pure black head and orange-rufous hands and feet. The hairs of the dorsal surface of the body are rather long and soft. The anterior area of the back is pure black, the posterior part is black grizzled with whitish, cream or pale brown. The black area usually covers the head, neck, shoulders, and the anterior part of the back, including the proximal part of the front legs. The grizzled area extends from there backwards to the base of the tail and the proximal part of the hind legs. In some specimens the grizzled area reaches farther forwards and then includes the shoulders and the neck; in these specimens, however, the head and the larger part of the outside of the front legs remain black; in these same specimens the grizzled area also extends posteriorly for some distance on the base of the tail. The hairs of the grizzled area are partly entirely black, while a great number has a whitish or pale brownish ring at some distance below the top; in some of the latter a second, darker brownish ring is visible more proximally. The hairs of the head, the underside of the body, the inside of the legs and the entire tail (except for the extreme basal dorsal part) are pure black. The ears are large, conspicuous and truncated, they are naked to the unaided eye, but do show a few scattered hairs, especially in the basal part, when examined with a lense. The hairs of the ventral surface of the body are more loosely placed so that in places the skin is visible. The forelegs are black above the wrist, the upper surfaces of the hands are strikingly orange rufous, this colour being sharply separated from the black. Also in the hind legs the upper surfaces of the feet and the ankles are orange rufous. Here the basal part of the outside of the legs is grizzled, but a black area separates the grizzled area from the orange rufous; in the darkest specimens this black area extends from the ankles to the knees, in the most grizzled specimens the black area is reduced to a narrow strip just above the ankles. The tail is distinctly longer than head and body combined. It is not prehensile and is covered with long densely placed appressed black hairs which form a tuft at the end.

The external measurements of a male (no. 20577) and a female (no. 20580), both adult, from the Peninika region, are, respectively: head and body, 278, 257; tail, without tuft, 380, 391; tail, with tuft, 415, 408; hind foot, with nails, 70, 72; ear,

33, 32 mm; weight, 650 and 600 grams. The skull measurements of these two specimens are, respectively: total length, 51.8, 51.3; zygomatic breadth, 34.8, 35.3; crown length of upper cheek-teeth, 9.8, 9.8 mm.

The female (no. 20580) from the above locality, collected on 10 May 1963, was carrying two suckling juveniles on her back. An adult male (no. 20578), collected on the same date at the same locality, carried a female juvenile (no. 20579) on his back; the measurements of this adult male and the juvenile female are, respectively: head and body, 246, 163; tail, with tuft, 427, 296; hind foot, with nails, 72, 49; ear, 31, 28 mm; weight, 510 and 135 grams.

Remarks. — The Red-handed Tamarin is too small to be of interest for the hunters of Suriname. Lenselink (1972: 40), in his study of the food habits of the inhabitants of the Amerindian village of Alalapadoe (population: 450) in the Sipaliwini area of south-western Suriname, noted that during one month (March 1972) only 5 specimens of this species were shot by the Indians and used for food. According to Kappler (1887: 56) the animals occur in groups of up to twenty individuals; a number of five to twenty was recorded by Geijskes (in Husson, 1957: 38). In the cited publications, Kappler as well as Geijskes reported that the species not infrequently lives together with *Saimiri sciureus* (see p. 226) and *Cebus apella* (see p. 218).

In its movements, the Red-handed Tamarin is quite slow, leaping from one tree to another and grasping the smaller branches with its claws. Sanderson (1949: 767) observed that "an individual leaped from the top of a palm tree to the ground, a distance of 50 ft. and was unharmed". The tail is not prehensile and is used as a balancing organ in climbing and jumping. The animals have a liking for fruit and are very agile in capturing insects, on which they chiefly feed.

The species can be kept as a pet, it is quite inoffensive but rather sensitive. According to the brothers Penard ("De Surinamer", 29 January 1905) rain and cold weather make them retire, and they only become active in the sunshine and then produce continuously a soft whistling sound like "pee-ta-kee"; it is much less noisy than *Saimiri sciureus*.

In the literature dealing with the mammals of Suriname, the generic names *Hapale*, *Leontocebus*, *Marikina*, *Midas*, *Mystax*, and *Tamarin* are often used instead of *Saguinus*. As pointed out by Hershkovitz (1958: 53-54), the generic name *Saguinus* Hoffmannsegg, 1807, is the first valid generic name "for the group of marmosets characterized by normal lower canines", to which the present species belongs. Some authors incorrectly used the name *Midas ursulus* (Hoffmannsegg, 1807) for the Red-handed Tamarin of Suriname.

ORDER EDENTATA

The recent Edentata have a restricted distribution, occurring from Kansas (U.S.A.) in the north via Central America down to the province of Santa Cruz in Argentina (see Barlow, 1967: fig. 27, map of distribution). The name Edentata (= without teeth) is in so far misleading that in only one of its three recognized families, viz. the Myrmecophagidae (anteaters), the skull is completely toothless (pls. 62, 63).

In the species of the second family, the Bradypodidae (tree sloths), the skull has no incisors or true canines, while the structure of the crown of the remaining teeth is more or less conical and rather simple, without a pattern of folds and grooves (pl. 64). A characteristic of the dentition of the Bradypodidae of Suriname is the difference in size between the first (anterior) tooth in the upper jaw and the succeeding teeth. In *Bradypus* (pl. 64 upper figure) the first conical tooth is smaller than the second, while in *Choloepus* (pl. 64 lower figure) the first tooth is caniniform and much larger than the next tooth.

In the same way, the skulls of the third family, the Dasypodidae (armadillos) have no incisors or canines, but the number of the conical teeth, which are of about equal size, varies greatly (pls. 65, 66, 67): the skulls of the genera *Euphractus*, *Cabassous* and *Dasyypus* have about 7 to 10 conical teeth in each side of the upper jaw, while in *Priodontes* (pl. 66 upper figure) this number varies from about 17 to 20 or even more.

The following keys, one based on external characters and one on skull characters, are restricted to the Edentata of Suriname, of which I have examined material. Two other species of Dasypodidae may occur in Suriname, but since no records from that country are known to me, they are omitted from the key (see further page 254).

Key to the Edentata of Suriname based on external characters.

- 1a. Dorsal surface of head, body and tail covered with a bony carapace or armour (pl. 56 lower figure, pls. 60, 61): family Dasypodidae 2
- b. Dorsal surface of head, body and tail covered with fur 6
- 2a. Ears close together on the top of the head (fig. 38a). The scales composing the scapular and pelvic shields of the dorsal surface much smaller than those of the middle of the back; number of movable bands varying from 7 to 11. 3
- b. Ears set wide apart, placed on the sides of the head (fig. 38b). No essential differences among the scales of the armour 4
- 3a. Two or three rows of bony projecting scutes are present at the knee of the hind leg (fig. 38c); usually five toes on the forefoot
- Dasyypus kappleri kappleri*, p. 261
- b. No such bony scutes present on the hind leg (fig. 38d); four toes on the forefoot
- Dasyypus novemcinctus novemcinctus*, p. 263
- 4a. Number of movable bands 5 to 7. Deep glandular pits are usually distinctly

- visible in the median line of the posterior (pelvic) shield.
- Euphractus sexcinctus sexcinctus*, p. 254
- b. Number of bands I1 to I3 5
- 5a. The small or minute scales of the tail are widely spaced, often worn off, becoming more abundant, placed closer together, and better developed towards the end of the tail. Second and third toes of the forefeet with large claws, the third slightly longer and stronger than the second
- Cabassous unicinctus*, p. 259
- b. The scales of the tail are placed close together, alternating. The third toe of the forefeet with a very large and strong claw, about three or four times as long and broad as the second toe *Priodontes giganteus*, p. 258
- 6a. Tail equal to, somewhat longer or somewhat shorter than the length of head and body: family Myrmecophagidae 7
- b. Tail rudimentary or reduced, less than one tenth of the length of head and body: family Bradypodidae 9
- 7a. Hairs coarse and long; tail bushy. Head with extremely elongate muzzle (pl. 55). General colour of the body dark grey-brown to blackish, pattern on the throat and shoulders black, bordered with white
- Myrmecophaga tridactyla tridactyla*, p. 239
- b. Hair short and smooth, or dense and silky. Tail partly naked at tip, prehensile. General colour of the body golden brown or yellowish 8
- 8a. Number of claws on the forefoot four, of which the third is enlarged, the others are reduced or suppressed. The fur is short and smooth. Length of head and body up to 60 cm (pl. 56 upper figure)
- Tamandua longicaudata longicaudata*, p. 241
- b. Number of claws on the forefoot two. The fur is dense, soft and silky. Length of head and body up to 25 cm (pl. 57)
- Cyclopes didactylus didactylus*, p. 245
- 9a. Number of claws on the forefoot three. Tail short, less than one tenth of the length of head and body. Hair short and crisp. Face whitish with brown circum-orbital areas (pl. 58) *Bradypus tridactylus*, p. 247
- b. Number of claws on the forefoot two. Tail rudimentary. Hair long (pl. 59). Face brownish *Choloepus didactylus*, p. 251

Key to the Edentata of Suriname based on skull characters

- 1a. Upper and lower jaws without teeth. Zygomatic arch interrupted and strongly reduced (pls. 62, 63) 2
- b. Upper and lower jaws with teeth. Zygomatic arch complete or, if incomplete, with the parts well developed (pls. 64-67) 4
- 2a. Nasals about as long as the frontals (pl. 62). Condylbasal length in 10 specimens up to 375 mm, interorbital constriction up to 46.8 mm
- Myrmecophaga tridactyla tridactyla*, p. 239

- b. Nasals shorter than the frontals (pl. 63). Condyl basal length up to 140 mm, interorbital constriction up to 30 mm 3
- 3a. Rostrum (and nasals) extremely short when compared with the braincase (pl. 63 lower figures). The condyl basal length varies in 12 specimens from 40.5 to 52.4 mm, the interorbital constriction from 7.7 to 11.3 mm
- Cyclopes didactylus*, p. 245
- b. Rostrum (and nasals) not extremely short when compared with the braincase (pl. 63 upper figures). The condyl basal length varies in 12 specimens from 112.5 to 135.7 mm, the interorbital constriction from 22.5 to 28.2 mm
- Tamandua longicaudata longicaudata*, p. 241
- 4a. Zygomatic arch incomplete, but the parts are well developed (pl. 64). Number of teeth in the upper jaw on each side 5 (very rarely 4) 5
- b. Zygomatic arch complete (pls. 65-67). Number of teeth in the upper jaw on each side more than 5 6
- 5a. The first (anterior) tooth of the upper jaw is smaller than the next tooth and the space between them is less than the length of the crown of the second tooth (pl. 64 upper figure). Alveolar length of the upper tooth-row less than 30 mm, varying in 12 specimens from 22.5 to 25.7 mm (mean: 24.4 mm).
- Bradypus tridactylus*, p. 247
- b. The first (anterior) tooth of the upper jaw is much larger than the next tooth, and widely separated from that tooth (pl. 64 lower figure). Alveolar length of upper tooth-row more than 30 mm, varying in 12 specimens from 33.2 to 44.0 mm (mean: 39.9 mm) *Choloepus didactylus*, p. 251
- 6a. Rostrum relatively long and narrow (pls. 67, 66 upper figures). 7
- b. Rostrum relatively short and broad (pls. 65 and 66 lower figures) 9
- 7a. Number of teeth on each side of the upper jaw more than 12 (pl. 66 upper figure). Condyl basal length about 180 mm *Priodontes giganteus*, p. 258
- b. Number of teeth on each side of the upper jaw less than 10, varying from 7 to 9 (usually 8). The posterior tooth of the upper jaw situated at about the level of the zygomatic root (pl. 67) 8
- 8a. The palate is distinctly keeled on the sides (pl. 67 upper figure). The greatest length of the skull in 2 specimens is 127.9 and 133.0 mm, the alveolar length of the upper tooth-row is 28.8 and 32.0 mm . . . *Dasypus kappleri kappleri*, p. 261
- b. The palate is rounded on the sides without any keel (pl. 67 lower figure). The greatest length of the skull varies in 7 specimens from 101.6 to 111.2 mm (mean: 108.1 mm), the alveolar length in 9 specimens is from 22.7 to 25.9 mm (mean: 24.5 mm). *Dasypus novemcinctus novemcinctus*, p. 263
- 9a. The premaxilla is toothless (pl. 66 lower figure). The zygomatic arch in side view is distinctly broadened in the centre. The alveolar length of the upper tooth-row varies in 5 specimens from 30.0 to 32.6 mm. Number of teeth on each side usually 9. Frontals distinctly swollen *Cabassous unicinctus*, p. 259
- b. The premaxilla has one tooth on each side (pl. 65). The zygomatic arch in side

view is normal. The alveolar length of the upper tooth-row is in 3 specimens 37.4, 39.0 and 40.5 mm. The number of teeth on each side is 9. The frontals are more flattened *Euphractus sexcinctus sexcinctus*, p. 254

FAMILY MYRMECOPHAGIDAE

***Myrmecophaga tridactyla tridactyla* Linnaeus, 1758**

Pls. 55 (animal), 62 (skull)

Myrmecophaga tridactyla Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 35.

Type locality. — “Habitat in America meridionali”. Restricted by Thomas (1911: 132) to Pernambuco (= Recife), north-eastern Brazil.

Synonymies. — Cabrera, 1958: 202.

Vernacular names. — (E) Giant Anteater; (N) Grote Miereneter, Mierenbeer; (S) Tamanúa.

Distribution. — The species *Myrmecophaga tridactyla* Linnaeus, 1758, occurs in Central and South America from eastern Guatemala and southern British Honduras to northern Argentina and southern Brazil. The nominate subspecies *M. tridactyla tridactyla* ranges from Venezuela and the Guianas to Peru, southern Brazil and northern Argentina.

Occurrence in Suriname. — The Giant Anteater is an inhabitant of the wooded areas of the sand and shell ridges as well as of the savannas and the highlands. It is not surprising that this remarkable animal drew the attention of early authors dealing with Suriname. Warren (1667: 12) already extensively dealt with “The *Ant-Bear*”, which he described as being “about the bigness of an ordinary *Hog*, of a black and grey Colour, having a Long-Brush-Tail like a *Fox*, or *Squirrel*, with which, he shelters his whole Body from the Rain, his Head is small, his Snout about a foot long from his Eyes, he has no Teeth, and a Mouth not big enough to thrust in two fingers, his Tongue is round, and small, which he can put out a foot beyond his Mouth to lick in *Ants*, never feeding upon anything else; he is very strong, especially in his Fore-parts, and has sharp Claws above an Inch and a half long, with which, he can strike dangerously, but his Pace is slow, and therefore easily avoided. . . .”. The brothers Penard (“De Surinamer” 3 december 1905) remarked that the species has a preference for savannas and open plains that are provided with shrubbery, while they only are found in woods or swamps when attracted by the presence of numerous ants in these localities. Sanderson (1949: 784) remarked that “the animal is found on the cultivated lands near the coast, but is plentiful in the flood forest”; records of its occurrence in the interior of Suriname were unknown to Sanderson. Heyde (1949: 441) dealt with individuals observed by him in an area about 25 kilometres south of Paramaribo. Appelman (1964: 110) reported the species from Sipaliwini savanna. Apparently no specimens were saved in the Brokopondo region during the “Operation Gwamba”, because Walsh & Gannon (1967: 217-219) did not mention the species in their list of rescued animals, and, moreover, noted (p. 93):

"We caught none of these, though we were told they should be in the area"

I myself have examined material from the following Suriname localities:

1. Sipaliwini savanna, 2 km from Meyers farm, north of upper Sipaliwini River near the Brazilian border, Nickerie District, south-western Suriname, 1 specimen (no. 24310, skull and claws).
2. Karel François on lower Saramacca River, Saramacca District, 1 female (no. 10457, skin and skull).
3. Shell ridge near Groningen, on lower Saramacca River, Saramacca District, 1 juvenile female (no. 7483, skin and skull).
4. Near Afobaka on Suriname River just north of Brokopondo Lake, Brokopondo District, 1 tail.
5. Suriname, without more precise data, 1 male (no. 7650, skull), 6 females (nos. 1164, 2123, 18767, 18772, 18775, 25140, skins and skulls), 1 juvenile, (no. 25141, skin), 2 skulls (SMN nos. 164, 1096).

Description. — The most striking characters of this well-known animal are (1) the elongated, cylindrical snout, (2) the black wedge-shaped stripe or band on the throat and the shoulders, bordered with white, and (3) the long, bushy tail (see pl. 55). Apart from the stripe described under (2) above, the general colour of the body is rather uniformly dark grey-brown or blackish; the hairs are coarse and stiff, being longest on the tail. The forefoot has four claws, of which the third is much larger than the others; the hind foot has five subequal claws. The jaws are completely toothless (pl. 52). In its colour and morphology the species shows little variation throughout its range of distribution.

The external measurements of the semi-adult female from Karel François and of an adult male mentioned by Sanderson (1949: 784) are, respectively: head and body, 886, 1260; tail, with tuft, 650, 790; hind foot, with claw, 132, 165; ear, 48, 55 mm; weight, 12.5 and 21.4 kilograms. The skull measurements in 10 specimens of different age are: condylobasal length, 162-375; interorbital constriction, 33.2-46.8; breadth of the braincase, 46.9-62.5; greatest length of the mandible, 160-320 mm; see also Reeve (1940).

Remarks. — Although the Giant Anteater is entirely harmless, inoffensive, useful and not very much esteemed as food, and on top of all is fully protected in the coastal area of Suriname, it still is intensively hunted there. The brothers Penard ("De Surinamer", 10 December 1905) already remarked that Indians whenever they saw an anteater would try to kill it 'because it is so easy to kill this helpless animal'. And this is true to this day: a more stringent enforcement of the protection laws for this species is very urgently needed, lest it becomes extinct in northern Suriname. Kappler (1887: 68) and the Penards ("De Surinamer", 10 December 1905), whom we owe most of the following information on the Suriname Giant Anteaters, remarked that its meat is dark red, coarse, somewhat sour and musky; it is eaten by Indians and Bush-negroes, but it is not in great favour; as Warren (1667: 12) said: "his flesh is none of the Sweetest, but if well sawc'd with hunger, it will down".

As indicated by its name the main diet of the Anteater consists of ants, which, according to Heyde (1949: 440) largely belong to the species *Atta sexdens* (Linnaeus,

1758), which can cause great damage to the crops; the anteater is thus a positive factor in the control of this pest. Kappler (1887: 68), who dissected several anteaters, found in their stomachs nothing but ants, termites and small beetles. With its powerful claws the anteater breaks open ant- and termite-nests and when the insects come out in quantities they are lapped up by the anteater with its long sticky tongue which is rapidly moved in and out of the narrow mouth. In captivity it will eat other food: the Penard brothers mentioned in this connection bread, milk and finely chopped meat; Appelman (1958: 102-103) fed an anteater in the Rotterdam Zoo with lettuce (which was eagerly accepted), milk, buttermilk, barley- and oat-flakes, raw eggs and tomato juice, but found that it refused meat. Dr. D. C. Geijskes (pers. comm.) who kept a half grown anteater in captivity in Paramaribo, at times would let it roam freely around in the garden. The animal would then search for ant nests and seemed to prefer those of the fire ant, *Solenopsis saevissima* (F. Smith). Dr. Geijskes confirms the reports that the species does accept milk.

The Giant Anteater is not at all aggressive, but when attacked knows how to defend itself well; with its very strong and sharp claws and with its tail the animal can inflict considerable damage to its opponents. It is said that, to defend itself, it throws itself on its back, so that all four legs can be used against the attacker. Apart from man, the species seems to have no special enemies and is left alone by most other animals.

It is rather slow; when it flees it has a clumsy galloping gait and can be overtaken by a running human. When walking, it turns the claws inward and touches the ground only with the sides of its feet and not with its nails. It does not climb and neither burrows. To rest, it lays down on its side, curls up, covers the head with the front legs and uses the tail as a cover for the whole body. It is mainly nocturnal but can sometimes also be seen in the daytime. When agitated it produces a grunting sound. The litter consists of a single young per year, which according to the brothers Penard ("De Surinamer", 10 December 1905) is carried on the back of the mother for about one year, until it reaches about 1/4 of her size.

In many publications the name *Myrmecophaga jubata* Linnaeus, 1766, has been used for the present species.

Tamandua longicaudata longicaudata (Wagner, 1844)

Pl. 56 upper figure (animal), pl. 63 upper figures (skull)

M.(myrmecophaga) longicaudata Wagner, 1844, J. C. D. Schreber, Die Säugthiere, (suppl.) 4: 211 (named on page 210: *M. tetradactyla* var. 8).

Type locality. — "... in Guiana oder überhaupt im nordöstlichen Theil von Südamerika". Restricted by Cabrera (1958: 203) to "al interior de Surinam".

Synonymies. — Cabrera, 1958: 203; Krumbiegel, 1940a: 162-178, figs. 1-7; Schröder, 1937.

Vernacular names. — (E) Unstriped Tamandua, Yellow Tamandua, Lesser Anteater; (N) Termieteneter, Mierenfluitter, Kleine Miereneter; (S) Mirafroiti.

Distribution. — According to Cabrera (1958: 203) the species *Tamandua longicaudata* (Wagner, 1844) is known from southern Venezuela, British Guiana, Suriname, northern Brazil, Mexiana Island, eastern Colombia, Ecuador and Peru. The nominate subspecies *T. longicaudata longicaudata* has the same range of distribution, except Mexiana Island, where the subspecies *T. longicaudata mexianae* Hagmann, 1908, is stated to occur. The exact range of the species is unknown (see further under Remarks).

Occurrence in Suriname. — The Unstriped Tamandua is a common mammal in the wooded areas and forests from the coastal region to the Brazilian border. So far as I can find, Pistorius (1763: 54) was the first author to report that three species of anteaters are found in Suriname; his description of the present species, however, is extremely meagre indicating only that it is intermediate in size between the two other species. Fermin (1765: 23) reported the species as *Tamandua minor cinerea*, but hardly gave more details than the difference in size with the two other species of anteater. Many of the later authors added very little to our knowledge of the species, or published confused information, e.g., Stedman (1796: 329, pl. 74), whose description of the "Tamandua" does not fit the present species and also is clearly based on a species different from the one figured by him as Tamandua, while this figure does not show the present species but the Giant Anteater. Kappler (1887: 69) as usual gave a correct and worth while account of the species (under the name *Myrmecophaga tetradactyla*). The fact that during the "Operation Gwamba" (Walsh & Gannon, 1967: 218) no less than 261 specimens of this species were saved in the Brokopondo area shows that the species is quite frequent in the Suriname foothills.

I have examined Suriname material of the present species from the following localities:

1. Koffiemaka Creek, east of Wageningen, northern Nickerie District, 1 female (no. 18194, skin and skull).
2. Corantijn River, exact locality unknown, 1 female (no. 18765, skin and skull).
3. Halfway between the Awarra savanna and the Amerindian village of Cupido on the Maratakka River, about 5°30'N 56°45'W, Nickerie District, 1 female (no. 24681, skin and skull).
4. Forest near the Raleigh Falls, upper Coppename River near Voltzberg, Saramacca District, 1 female (no. 18193, skin and skull).
5. Garnizoenspad, Stoepenveer, north-eastern Saramacca District, about 5°47'N 55°25'W, 1 male (no. 17769, skin and skull).
6. Plantation "Clevia", west bank of Suriname River, north-east of Paramaribo, Suriname District, 3 females (nos. 17770, 18189, 18191, skins and skulls).
7. Paramaribo and surroundings, 1 female (no. 24680, skin and skull), 2 skulls (nos. 17287, 18236).
8. Wood near Zorg en Hoop, southern part of Paramaribo, 1 female with young (no. 10455, skin and skull).
9. Pad van Wanica, south of Paramaribo, Suriname District, 1 juvenile female (no. 18222, skin).
10. Along highway from Paramaribo to Afobaka, about 43 km south of Paramaribo, Para District, 1 female (no. 17801, skin and skull).

11. Zanderij, Para District, 1 male (no. 22552, skin and skull).
 12. Plantation "Slootwijk" near Meerzorg, west bank of Commewijne River just above confluence with Cottica River, Commewijne District, 1 male (no. 17749, skull).
 13. Forest near Peninika boarding school, near confluence of Peninika Creek and upper Commewijne River, Commewijne District, 1 female (no. 18192, skin and skull).
 14. Due north of Moengotapoe at 5.5 km from the sea-shore, on the eighth shell ridge counted from the sea-shore, Marowijne District, 1 specimen (no. 10461, skin).
 15. Forest near Langamankondre, mouth of the Marowijne River, 1 female (no. 18190, skin and skull).
 16. Between Nassau Mts. and Marowijne River at 10.4 km west of Marowijne River, about 4°45'N, 1 female (no. 10462, skin and skull).
 17. Between Nassau Mts. and Marowijne River at 11.5 km west of the river, about 4°45'N, Marowijne District, 1 juvenile, probably female (no. 16063, skin and skull).
 18. Suriname, without more precise locality indication, 1 male (no. 1163, skin and skull), 3 females (nos. 1181, 1773, skins and skulls; no. 18766, skull), 7 specimens, sex unknown (nos. 25129-25132, skins; no. 25133, skin and skull; nos. 1008, 25127, skulls).

Description. — The coat colour of the Unstriped Tamandua of Suriname shows a considerable variation. The colour of the body varies from golden to blackish, while the tips of the hairs are always yellowish. In some dark coloured specimens an indication of a dark collar around the neck may be seen, but it never is so sharply defined and black as in *Tamandua tetradactyla* (Linnaeus). The forelegs and the hind legs are always of a yellowish colour. Usually a median area of a colour lighter than the rest of the body can be seen extending from the shoulders to about the middle of the back; this area is distinctly wider in front than behind. The fur is coarse and dense. The ears are blackish, sparsely haired on the posterior surface. The muzzle from the eyes to its tip is blackish brown. The long tail is prehensile; its basal part is densely haired, while the terminal part is almost naked, in some specimens showing brownish spots. The snout is elongated and tubular, it ends in a small terminal mouth-opening, and contains a long tongue. The jaws are completely toothless. The number of claws of the forefoot is four, the third is enlarged (the skeleton shows that there are five fingers but the fifth is not visible externally and lacks the claw); the hind foot has five subequal claws.

The external and skull measurements of 14 specimens from Suriname are enumerated in Table 35.

TABLE 35

External and skull measurements of 15 specimens of *Tamandua longicaudata longicaudata* (Wagner) from Suriname in the Leiden Museum.

Reg. number	17749	22552	10455	10455	10462	17770	17801	18189	18190	18191	18192	18193	18194	24680	24681
Sex	♂	♂	♀	juv	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀
Head and body	-	582	522	234	-	596	486	590	430	593	566	576	575	470	560
Tail	-	613	522	234	-	583	523	613	462	580	583	589	613	470	560
Hindfoot with claw	-	98	102	59	-	105	104	104	-	-	103	109	113	90	105
Hindfoot without claw	-	88	-	-	-	-	-	93	89	94	-	-	103	82	95
Ear length	-	55	55	28	-	56	48	52	48	52	55	58	49	50	57
Weight, grams	-	6000	3750	550	-	6500	3750	5500	2500	7500	5250	5000	5500	-	5000
Condylbasal length skull	112.5	135.7	128.6	-	118.7	134.4	114.8	133.7	106.0	129.5	127.3	126.5	133.2	-	-
Interorbital constriction	23.6	24.0	24.5	-	24.2	28.2	25.0	24.0	22.5	27.2	25.9	23.8	26.3	-	-
Breadth braincase	39.0	41.3	-	-	38.5	-	38.9	42.0	37.2	42.0	40.2	40.3	42.5	-	-
Length of mandible	-	-	-	-	105.3	-	-	114.7	-	-	-	-	-	-	-

Remarks. — The Tamandua is fully protected in the northern part of Suriname. It is not too well appreciated as food and in the interior it is hunted only if no other game is available (Geijskes, 1954: 77). In his study of game as food for the inhabitants of the Amerindian village of Alalapadoe (population: 450) in the Sipaliwini region of south-western Suriname, Lenselink (1972: 40) found that during a full month (March 1972) only a single specimen was shot for food by the Indians.

Heyde (1949: 441-443) pointed out that the Tamandua feeds mainly on termites, so that in his opinion the commonly used name Lesser Anteater is more or less misleading, and that the name Termieteneter (= termite-eater) would be more appropriate for the species. As stated by other authors, e.g., Kappler (1887: 69) the Tamandua also does eat ants, but these form, according to Heyde, only a very small percentage of its food. Also bees and honey are said to be part of the diet of this species (e.g., by the brothers Penard, "De Surinamer", 10 December 1905), but in Heyde's opinion the Tamandua then is eating the termites, that live together with the stingless bees of the family Meliponidae, and in the process of eating the termites also swallows several bees.

An interesting observation on the drinking habits of this species was told me by Dr. D. C. Geijskes. A Tamandua, which Dr. Geijskes had kept in captivity for some time, was set free, and immediately climbed a large koffiemama tree (*Erythrina glauca* Willd., fam. Papilionacea); there it right away started to drink from one of the bromeliads which grew plentifully in the tree.

This same specimen gave a clear proof of its great strength. After it was caught, it was placed in a large wooden box, over the top of which wooden boards were firmly nailed in place; during the night, however, the Tamandua managed to pry the boards loose and escaped from the box.

In contrast to the Giant Anteater, the present species is almost exclusively arboreal, it is an excellent climber, and uses its legs and its prehensile tail for climbing. It is seldom seen on the ground, and then it is rather clumsy in its movements, walking on the outside of its feet like the Giant Anteater.

Heyde (1949: 441) noted that the species makes a somewhat snoring sound, which inspired its native names "Mirafroiti" and "Mierenfluiter", both of which mean ant-whistler. When excited it produces a more grumbling sound.

According to the brothers Penard ("De Surinamer", 10 December 1905) the Tamandua, when agitated, secretes a liquid with a most unpleasant smell. Heyde thought that the disagreeable smell of the animal is caused by termites.

The systematic position of *Tamandua longicaudata* forms a still unsettled problem. I prefer, at least for the present, to follow the authors (e.g., J. A. Allen, 1904c: 339-340; 1904b: 385, and Cabrera, 1958: 203), who considered the Unstriped Tamandua to be a good species, distinct from *T. tetradactyla* (Linnaeus, 1758) (see also the systematic revisions by Schröder (1937), Krumbiegel (1940a) and Reeve (1941)).

In the literature on mammals of Suriname the name *Tamandua tetradactyla* (Linnaeus, 1758) is generally used for the present species.

Cyclopes didactylus didactylus (Linnaeus, 1758)

Pl. 57 (animal), pl. 63 lower figures (skull)

Myrmecophaga didactyla Linnaeus, 1758, *Systema Naturae*, (ed. 10) 1: 35.

Type locality. — "Habitat in America australi". Restricted by Thomas (1911: 132) to Suriname.

Synonymies. — Cabrera, 1958: 206; Krumbiegel, 1940a: 178-184, 186, fig. 8 (map).

Vernacular names. — (E) Two-toed Anteater, Pygmy Anteater, Silky Anteater, Dwarf Anteater; (N) Wespeneter, Dwergmiereneter, Kleinste Miereneter; (S) Likanoë, Likan.

Distribution. — The species *Cyclopes didactylus* (Linnaeus, 1758) ranges from southern Mexico eastward to South America as far south as Bolivia, central and southern Brazil. The nominate subspecies *C. didactylus didactylus* is known from the Guianas and north-eastern Brazil.

Occurrence in Suriname. — As stated above, Pistorius (1763: 54) was the first author to recognize three species of anteaters in Suriname. He described the present form as follows: "De derde soort, die 't allerkleinste en bleek graauw van hair zyn, hebben een lange dikke Steert, en zodanige kragt in haar voorste Pooten, dat ze een Hond met haare Klaauwen kunnen dood drukken" (the third species is by far the smallest, with a pale grey fur; it has a long thick tail, and the strength in its forelegs is such that with its claws it can squeeze a dog to death).

Later authors as a rule characterized the present species rather well. The Pygmy Anteater occurs in forests, and according to Sanderson (1949: 785) it is "only encountered around the wet savannah belt". During the "Operation Gwamba" 161 specimens were saved in the Brokopondo region (Walsh & Gannon, 1967: 218). So far, the species has not been reported from the interior of Suriname, but it seems to be not rare in the coastal plains and the foothills. Kappler (1887: 69) stated it to be rather rare, while the Penard brothers ("De Surinamer", 17 December 1905) remarked that in Suriname it is still more numerous than the preceding species. I have examined the following Suriname material:

1. Wageningen, northern Nickerie District, 1 specimen (no. 17859, skin and skull).
2. Plantation "Pomona", 5e rijweg naar Kwatta, west of Paramaribo, Suriname District, 1 specimen (no. 17860, skin and skull).
3. Agricultural Experimental Station (Cultuurtuin), Paramaribo, 1 female (no. 17288, skin and skull).
4. Paramaribo and surroundings, Suriname District, 3 specimens (nos. 486, 25121, skins and skulls; no. 17861, skull).
5. Afobaka, west bank of Suriname River, just north of Brokopondo Lake, Brokopondo District, 1 female (no. 22551, skin and skull).
6. Suriname, without more precise locality indication, but most specimens probably from near Paramaribo, 2 males (no. 25126, skin; no. 17875, skin and skull), 6 females (nos. 17862, 17872, 17873, 17874, 17876, 17877, skins and skulls), 8 specimens (nos. 25122-25125, skins; nos. 17878-17881, skulls).

Description. — The coat colour of the Pygmy Anteater of Suriname is rather uniform, being light greyish yellowish with a silvery gloss, ventrally yellowish. A

brownish stripe, the extent of which is subject to some variation, runs on the dorsal surface from about the neck to the rump; there is a similar brownish stripe on the ventral surface, tapering backwards from about the throat to about the anus. The ears are small and concealed under the dense, soft and silky fur. The extreme tip of the densely haired, prehensile tail is naked as are also its ventral distal two-fifths; the distal dorsal end of the tail is more yellowish than the proximal part, which is concolorous with the back. The forefoot has two claws, of which the outer is much stronger and larger than the inner; the hind foot has four subequal claws. The rostrum (and nasals) of the skull is extremely short when compared with the braincase (pl. 63 lower figures), the snout being therefore not elongated as in *Myrmecophaga* and *Tamandua*. The jaws are completely toothless.

The external measurements of a male and a female as mentioned by Sanderson (1949: 785) are, respectively: head and body, 230, 244; tail, 235, 218; hind foot, 34, 29; ear, 13, 12 mm; weight, 374 and 284 grams. The corresponding measurements of the above mentioned female specimen from Afobaka are: head and body, 168; tail, 230; hind foot, 34; ear, 13 mm; weight, 230 grams. Some skull measurements of 12 Suriname specimens are listed in Table 36.

TABLE 36

Skull measurements of 12 specimens of *Cyclopes didactylus didactylus* (Linnaeus) from Suriname in the Leiden Museum.

Reg. number	17875	17288	17862	17873	17874	17876	17877	22551	17859	17860	17861	17878
Sex	♂	♀	♀	♀	♀	♀	♀	♀	-	-	-	-
Condylbasal length skull	49.8	48.0	45.6	47.7	51.5	40.5	45.2	43.9	42.4	44.2	52.4	45.5
Interorbital constriction	11.3	8.5	9.9	9.3	9.8	9.8	9.2	8.8	7.7	9.0	10.4	10.1
Breadth of braincase	23.9	23.0	23.3	23.5	24.1	21.9	23.0	22.9	22.5	23.3	23.9	22.5

Remarks. — The meat of this species is rarely eaten (Penard brothers, "De Surinamer", 17 December 1905). The animals are not aggressive, but will defend themselves with the claws of their forelegs when attacked; Pistorius' above cited remark that they can kill dogs, however, seems rather unlikely. Although they are harmless and quite useful, the animals often are senselessly killed. The species feeds mainly on wasps and wasp pupae, as already remarked by Von Sack (1821(1): 237-239) and many later authors. Heyde (1949: 443-444) mentioned the wasp *Synoeca surinama* (Linnaeus) as providing the main share of the diet of *Cyclopes*. The Pygmy Anteater, which is a nocturnal animal, attacks the wasps at night, destroying the nest and devouring the adult wasps and the brood. According to several sources the species also eats ants and termites, be it to a lesser degree.

Like *Tamandua*, *Cyclopes* is practically exclusively arboreal, living in dense and high forests. It is an excellent climber and in its movements uses its prehensile tail. Its movements are rather slow. In the daytime it rests, curled up in a ball, in hollow trees or on forked branches, often holding on to a branch with its tail.

There is one young per litter; the newly born young are carried on the back of the mother.

The native names Likanoe or Likan are derived from the habit of the animals to lick their front paws; this habit was mentioned already by Von Sack (1821 (1): 237). Lammens (1844: 106) remarked: "Es pflegt sich die Füße zu lecken, und darum hat man es Lek Handje (Leckhändchen) genannt". The Penard brothers ("De Surinamer", 17 December 1905) explain the name as follows: 'Likkan is derived from the word Lick Hand, indicating the way in which the food is collected. The Likkan, namely, continuously licks its forepaws, which thereby obtain a red colour. As soon as the paws are sufficiently covered with saliva, the Likkan places them on ants or other insects that it wants, these stick to the paws, which then are brought to its mouth. But the Likkan also uses its long sticky tongue like the other anteaters do'. Heyde (1949: 443) stated (in translation): 'The name Lik-anoe is derived from the peculiarity of the Pygmy Anteater to lick its front paws as a sign of hunger, when in captivity it does not receive its proper food'. This evidently still is a subject that needs some closer attention.

Reeve (1940) published an extensive comparative study on the skulls of the Myrmecophagidae, in which also the present (and previous) species are dealt with.

Suriname is the (restricted) type locality of the present species. Therefore it is very desirable that a good series of specimens should become available in order to compare the specimens of Suriname with other geographical races hitherto distinguished.

FAMILY BRADYPODIDAE

Bradypus tridactylus Linnaeus, 1758

Pl. 58 (animal), pl. 64 upper figures (skull)

Bradypus tridactylus Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 34.

Type locality. — "Habitat in Americae meridionalis arboribus". Restricted by Thomas (1911: 132) to Suriname.

Synonymies. — Cabrera, 1958: 210; Tate, 1939: 173-174; Thomas, 1917a.

Vernacular names. — (E) Three-toed Sloth; (N) Drieteenluisaard, Drievingerige Luisiaard, Zonluisaard, Ai; (S) Sonloiri.

Distribution. — *Bradypus tridactylus* Linnaeus, 1758, of which most authors do not recognize geographical races, is known from southern Venezuela, the Guianas, and Brazil north of the Amazon River.

Occurrence in Suriname. — The Three-toed Sloth is one of the very common mammals in Suriname, it was already known to the earliest authors dealing with the Suriname fauna (e.g., Warren, 1667: 14, 15; Pistorius, 1763: 60; Fermin, 1765: 1, 2, etc.). It is most frequent in the wooded lowland areas of the coastal plain, and is still found in the direct neighbourhood of Paramaribo. During the "Operation Gwamba" 2104 specimens were saved in the Brokopondo region (Walsh & Gannon, 1967: 217), which is about 20% of the total number of saved animals. Tate (1939: 174) noted that "Sloths appear to be rare in the Guiana highlands country", while

Sanderson (1949: 782) remarked: "This species is fairly common upon the coastal plain and along the courses of all the rivers; in fact, wherever the Bush-Papaw trees (*Cecropia*), of which they are inordinately fond, are to be found". In this respect it is worth while to note that during a four weeks collecting trip that I made in 1963 in the Sipaliwini area in the far interior of Suriname, close to the Brazilian border, not a single specimen of *Bradypus* was seen. I have examined the following Suriname material of the species:

1. Near Samika Creek, Wageningen, northern Nickerie District, north-western Suriname, 1 adult and 1 juvenile female (nos. 16068, 16069, skins and skulls).
2. Wageningen, in Australian Pine (*Casuarina equisetifolia*) behind the hotel, 1 male (no. 18160, skin and skull).
3. Awarra savanna along Maratakka River south of Wageningen, 1 male (no. 25618, skin and skull).
4. Near Arawarra Creek, upper Nickerie River at about 5°15'N, Nickerie District, 1 male (no. 24667, skin and skull).
5. Brasil near Calcutta on lower Saramacca River, about 50.5 km due west of Paramaribo, Saramacca District, 1 male (no. 18161, skin and skull).
6. Plantation "Clevia" on west bank of Suriname River north-east of Paramaribo, Suriname District, 4 males (nos. 16059', 17798, 18159, 18162, skins and skulls; no. 16059' is a juvenile belonging to female no. 16059), 8 females (nos. 16059, 16060, 16060', 16061, 16070, 16071, 17786, skins and skulls; no. 18164, skin; nos. 16060 and 16060' are a female and its young).
7. Forest near St. Benedictus school, Leysweg, just west of Paramaribo, 1 male (no. 17766, skin and skull).
8. Paramaribo and close surroundings, 1 male (no. 2551, skin), 1 female (no. 18163, skin and skull), 19 skulls (no. 17204a-s).
9. Zorg en Hoop, southern part of Paramaribo, Suriname District, 1 male (no. 17751, skin and skull), 3 females (nos. 18158, 16062, 16062', skins and skulls; no. 16062' is the young of 16062).
10. Near Nieuw Amsterdam, east bank of Suriname River near confluence with Commewijne River, Commewijne District, 1 female (no. 10456, skin and skull).
11. In high tree of sand ridge south of Wiawia Bank, north of Moengotapoe (seventh ridge counted from the sea-shore), Marowijne District, 1 female (no. 10459, skin and skull).
12. West bank of Marowijne River east of Nassau Mountains, at about 4°45'N, 1 female (no. 10458, skin and skull).
13. Between Nassau Mountains and Marowijne River at 5.1 km west of the river, 4°45'N, Marowijne District, 1 female (no. 10460, skin and skull).
14. Suriname, without more precise locality indication; in most cases, however, probably near Paramaribo, 2 males (nos. 18780, skin; 21583, skin and skull), 2 females (nos. 18781, 21585, skins and skulls), 6 specimens (nos. 21584, 24480-24484, skins and skulls), 4 skulls (nos. 5056, 20313, 21581, 24421).

Description. — *Bradypus tridactylus* is a species with a pronounced sexual dimorphism. Between the shoulders the males show a big deep black stripe surrounded by a yellowish or brownish orange area, usually named the 'speculum', which as a blackish brown stripe continues backwards about as far as the rump; the speculum as well as the black stripe are bordered by a wide streak of pale yellow, which is surrounded by hairs of the same drab or chocolate brown colour as those of the head and the neck. Such a speculum is absent in the females (see also Krumbiegel, 1941c: 57-60). The coat colour of the Three-toed Sloth is subject to rather wide individual variation as to the size and shape of the speculum in the males, as well as to the

general coloration. The hairs are more or less crisp on the dorsal parts, longer and coarser on the ventral parts. The face of the animals is yellow; this colour extends down the throat. The top of the head, the neck and the shoulders are drab or chocolate brown. The females do not have a speculum but show an irregular dark brown median line from the neck to about the middle of the body. The crisp hairs of the dorsal surface are pale yellow; the arms are more brownish than the back. The chin and the throat are pale yellow mixed with light orange-brown; the long and coarse hairs of the ventral surface of the body and the hind legs are light greyish, intermixed with pale yellow, especially on the belly. In living specimens the coat often has a greenish colour, due to the presence of algae that grow in the hairs; the same peculiarity occurs with the hairs of *Choloepus* (see next species). The tail is extremely short, about one tenth of the combined length of head and body. The forefoot as well as the hind foot has three large, hooked claws.

The first tooth (the so-called pseudo-incisor) in the upper jaw is small, about half the thickness of the second tooth (pseudo-canine), the latter being somewhat larger than the succeeding three teeth (see pl. 64 right upper figure).

The external and skull measurements of 18 adult specimens (8 males, 10 females) from Suriname are given in Table 37. The external measurements of 5 juvenile and 1 semi-adult specimen are the following: head and body, ♂: 183, ♀: 196, 212, 232, 273, 394; tail, ♂: 18, ♀: 24, 22, 22, 28, 27; hindfoot without claw, ♂: 45, ♀: 46, 64, 50, 60, 82 mm; weight, ♂: 235, ♀: 225, —, 475, —, 1200 grams.

Remarks. — The meat of the Three-toed Sloth is eaten by the Amerindians and the Bush-Negroes (Kappler, 1887: 72; Geijskes, 1954: 73), but evidently is not a special delicacy. The animal does no harm and is fully protected by law in the northern part of Suriname. The hunters obtain it either by shooting, or by simply chopping down the tree or branch on which it is found. The Penard brothers ("De Surinamer", 26 November 1905) mentioned that the sloth has little to fear from the Felidae, but that snakes and birds of prey are its main enemies; among the latter, they mentioned especially the Harpy Eagle *Harpia harpyja* (Linnaeus), under the nest of which often numerous bones of sloths can be found.

Bradypus tridactylus is a diurnal animal, it is almost purely arboreal and lives solitary. It climbs with its long hook-shaped claws and its usual position is hanging down from a more or less horizontal branch, holding on with its claws. Its movements as a rule are very slow, and even when trying to flee it cannot, by any stretch of imagination, be called fast. On the ground it moves with difficulty. Kappler (1887: 72) said on this account: "Es ist bloss zum Dasein auf den Bäumen geschaffen, denn die Stellung seiner Füsse erlaubt ihm nicht, auf dem Boden zu gehen, sondern nur zu kriechen, deshalb sucht es immer mit den Vorderfüssen etwas zu ergreifen, woran es sich weiter ziehen kann. Dieses gelingt ihm um so besser, je rauher und unebener der Boden ist. Da kann es 15 bis 20 Fuss in der Minute zurücklegen. Einen Baum von 50 Fuss Höhe erklettert es leicht in 8 bis 10 Minuten. Es hängt sich am liebsten an einen Ast, den es umfassen kann, und gleicht so, unbeweglich hängend, einem Termitennest".

The slow deliberate movements, and the seemingly fixed expression on its face give the animal a rather clumsy and stupid appearance. Unexpectedly, the species is a rather good swimmer and it may even cross wide streams; the brothers Penard describe its swimming as being 'more of a kind of floating, whereby the crooked legs are used as paddles'. The Sloth sleeps curled up hanging from a tree branch. Because its specialization for arboreal living, it is only found in the woods, never in shrubbery or in the savannas.

Its food consists of leaves, those of the *Cecropia* (fam. Moraceae) are said to be its favourite, but also other kinds are eaten. So Kappler (1887: 71) mentioned *Spondias* (fam. Anacardiaceae), and De Carvalho (1960), basing herself on observations made in a park in Belem (Brazil), cited *Hevea* (Euphorbiaceae), *Elizabetha* (Leguminosae) and *Ceiba* (Bombacaceae) as trees on which the species feeds.

The sound of *Bradypus tridactylus* is a plaintive "ai, ai" (the brothers Penard, "De Surinamer", 26 November 1905). This sound is the cause that the name Ai is used for the species in many languages. Warren's (1667: 14, 15) charming picture of the animal, which "sits Spending those Idle hours. . . . in whistling such tunes as himself is too lazy (and, I believe, no body else would think good enough) to Daunce after", unfortunately is clearly not based on direct observations.

The litter of the Sloth consists of a single young. The young is carried by the mother on her back for a considerable period. Five of the females of the present collection carried a young, which varied in length from 183 to 273 mm; these specimens were taken in the months March (twice), April, May and June.

A name frequently used for the present species in the older literature on the mammals of Suriname is *Bradypus cuculliger* Wagler, 1831.

***Choloepus didactylus* (Linnaeus, 1758)**

Pl. 59 (animal), pl. 64 lower figures (skull)

Bradypus didactylus Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 35.

Type locality. — "Habitat in Zeylona". Corrected by Thomas (1911: 132) to Suriname.

Synonymies. — Cabrera, 1958: 211; Tate, 1939: 172-174.

Vernacular names. — (E) Two-toed Sloth, Two-fingered Sloth, Unau; (N) Twee-teenluisaard, Tweevingerige Luisiaard; (S) Skapoeloiri.

Distribution. — The species *Choloepus didactylus* (Linnaeus, 1758), of which no geographical races are recognized, occurs in Venezuela, the Guianas and Brazil north of the Amazon River.

Occurrence in Suriname. — Fermin (1765: 2) already remarked that two species of sloth are found in Suriname, while Stedman (1796: 153, pl. 16) provided descriptions and figures characterizing the two. Many subsequent authors dealt with the occurrence of both species in Suriname and observed that the present species is the rarer of the two. This is confirmed by the fact that during the "Operation Gwamba"

840 individuals of *Choloepus* were saved in the Brokopondo region against 2104 of *Bradypus* (Walsh & Gannon, 1967: 217).

The Two-toed Sloth is found in the wooded area of the lowlands of the coastal region of Suriname, as well as in the interior. According to Sanderson (1949: 784) the species is "taken both from very old, overgrown coffee plantations and from the tall, virgin flood forest". He further noted that the animals are "not met with or heard of on the drier continental plain of the foothills". I have seen several specimens from the interior of Suriname, while not a single specimen of *Bradypus tridactylus* was observed there by me, neither have I seen specimens of the latter species collected there by others. It seems likely therefore that the range of the Two-toed Sloth in Suriname is more extensive than that of the Three-toed Sloth; whether or not *Choloepus* is more common in the interior of Suriname than in the coastal region, as is sometimes said, cannot be decided from the available data. The following Suriname specimens of *Choloepus didactylus* have been examined by me:

1. South bank of Lucie Rivier, tributary of Corantijn River, Nickerie District, 1 male (no. 18007, skull).
2. Near Sipaliwini airstrip, north of Sipaliwini River near Brazilian border, south-eastern Nickerie District, 2 females (nos. 18178, 18179, skins and skulls).
3. Posogroenoe (= Granmankondre) on Saramacca River, east of Ebba Top, about 4°20'N, Saramacca District, 1 female (no. 18186, skin and skull).
4. Plantation "Clevia" on west bank of Suriname River, north-east of Paramaribo, Suriname District, 2 males (nos. 18180, 18181, skins and skulls), 3 females (nos. 18182, 18183, 18185, skins and skulls).
5. Leiding 5 and Leysweg, about 15 km west of Paramaribo, 1 specimen (no. 18184, skin and skull).
6. Near Paramaribo, 1 female (no. 3961, skull), 9 skulls (no. 17206a-i).
7. Agricultural Experimental Station (Cultuurtuin), Paramaribo, Suriname District, 1 skull (no. 18188).
8. Forest near Ganiakondre on Suriname River opposite Gansee (locality now submerged by the Brokopondo Lake), Brokopondo District, 1 male (no. 18177, skin and skull).
9. Suriname, without more precise locality indication, but most probably from near Paramaribo, 1 male (no. 1679, skin and skull), 9 females (no. 11417, skull; nos. 322, 24494, skins; nos. 1039, 1156, 1670, 1673, 18779, 24489, skins and skulls), 7 specimens (nos. 24460, 24461, 24470, skulls; no. 18778, skin; nos. 24486, 24496, 24500, skins and skulls).

Description. — The fur of the Two-toed Sloth consists of long, rather smooth hairs, which on the dorsal surface of the body are longer than on the ventral. The individual variation of the coat colour is rather great. As a rule the neck, the shoulders and the limbs are brownish; the forehead and the dorsal and ventral surfaces are ivory yellow to brownish white. The species does not show striking sexual dimorphism: the males do not have a speculum as in *Bradypus tridactylus*. The tail is absent or vestigial. The forefoot has two hooked claws, the hind foot three. The first tooth of the upper jaws is caniniform, large and triangular in outline, much larger than the four succeeding teeth (pl. 64 right lower figure), and is widely separated from them.

In Table 38 external and skull measurements of 15 Suriname specimens of this species are listed.

Remarks. — The meat of the Two-toed Sloth is excellent and it is said to taste

like mutton; it is greatly esteemed by the inhabitants of Suriname, who shoot the animals or obtain them by cutting down the tree in which they are discovered (Geijskes, 1954: 73; Kappler, 1887: 72).

The main enemies of the Two-toed Sloth, apart from man, are large birds of prey, like the Crested Eagle, *Morphnus guianensis* (Daudin), and the Harpy Eagle, *Harpia harpyja* (Linnaeus), as has been stated by Kappler (1887: 72) and by the brothers Penard (1908: 409, 411). Also the larger cats evidently feed on this species: the female (no. 18179) from Sipaliwini had probably been attacked by an Ocelot, *Leopardus pardalis melanurus* (Ball), which had ripped an opening of 95 by 50 mm in the belly of the sloth and eaten the intestines.

Like *Bradypus tridactylus*, the present species is diurnal, it likewise is strictly arboreal, and only rarely descends to the ground. It furthermore resembles the Three-toed Sloth in being able to swim. According to Kappler (1887: 72) it lives and behaves exactly like *Bradypus*, but is stronger and less slow in its movements. The brothers Penard ("De Surinamer", 3 December 1905), on the contrary, claim that *Choloepus* is 'still more lazy' than *Bradypus*. They also remarked that *Choloepus* is more aggressive than the other species, and has been seen to kill a dog. Dr. Geijskes confirmed (pers. comm.) that *Choloepus* is more aggressive than *Bradypus*; when fighting, it tries to hit its opponent with the claws of its front legs.

A green alga (probably *Cyanoderma choloepi*) is found in the hairs of *Choloepus*, and may give a greenish tinge to the fur. When the animal is preserved in alcohol, the preservative will be coloured green by the chlorophyll dissolved in it. The fur of this species is also the habitat for a small moth (*Bradypodicola* sp., fam. Pyralidae), the larva of which seems to feed on the algae and perhaps also on the hairs and skin products. This moth has repeatedly been found on Suriname specimens of the Two-toed Sloth, but never on those of the Three-toed Sloth, even though the latter species likewise is known to carry green algae in its fur (*Cyanoderma bradyi* and *Trichophilus welckeri*). The algal species seem to live exclusively on one species of host.

Many interesting zoo observations on reproduction and behaviour of the present species have been published by Schneider (1939).

FAMILY DASYPODIDAE

The Dasypodidae or armadillos can be readily distinguished from all other mammals of Suriname by the bony carapace or armour, which covers the dorsal surface of head, body and tail. This armour includes several movable transverse bands across the middle of the back, the number of which is a character that can be used for the separation of some genera and species. As the armadillos are mainly nocturnal it is difficult to collect them. Moreover they can very quickly disappear into the ground: the speed with which they can dig a burrow being quite remarkable. They also can run very fast, surprisingly for such clumsy looking animals. For these reasons specimens are rare in most museum collections.

In the material of Dasypodidae from Suriname examined by me five species are

represented: *Euphractus sexcinctus sexcinctus*, *Priodontes giganteus*, *Cabassous unicinctus*, *Dasypus kappleri kappleri*, and *Dasypus novemcinctus novemcinctus*. When dealing with the Dasypodidae of Suriname, the brothers Penard ("De Surinamer", 31 December 1905) stated positively that *Dasypus villosus* and *Dasypus minutus* also occur there. For their identification they must have based themselves on Cabanis (1848: 782), who listed these species for the fauna of British Guiana, although indicating each of them with an asterisk, the explanation of which is given by him on page 771 (footnote): "Die mit einem Sternchen bezeichneten Species sind von mir beobachtet, aber keine Exemplare davon an das Berliner Museum eingesendet worden". It is most unlikely that these two species should occur either in Suriname or in British Guiana, for the known range of *Dasypus villosus* (now *Chaetophractus villosus* (Desmarest, 1804)) is central and eastern Argentina (see Cabrera, 1958: 214; Moeller, 1968: fig. 13, map), and that of *Dasypus minutus* (now *Zaedyus pichi* (Desmarest, 1804)) is Argentina (see Cabrera, 1958: 217-218; Moeller, 1968: fig. 15, map). It must be admitted that the descriptions given by the Penards agree rather well with these two species, but it is likely that these descriptions were taken from the literature and were not based on material actually examined by them.

In her extensive paper on the phylogeny of the Dasypodidae, Moeller (1968) published maps (figs. 3 and 6) of the geographical distribution of *Dasypus septemcinctus* Linnaeus, 1758, and of the genus *Tolypeutes*, suggesting that the north-western limit of the two taxa must be somewhere in the Guianas, and might extend sufficiently far west to include Suriname. Linnaeus (1758: 51) gave as locality of his *Dasypus septemcinctus* "Habitat in Indiis", which locality was restricted by Cabrera (1958: 226) to "Pernambuco" (= Recife, north-eastern Brazil). Linnaeus (1758: 51) noted as the locality of his *Dasypus tricinctus* (now *Tolypeutes tricinctus*) "India orientali". As the species does not occur in the East Indies, its type locality was corrected by Thomas (1911: 141) to "Surinam". Sanborn (1930: 61-62; 1930a: 504), however, doubted that the species occurs in Suriname and designated as its corrected type locality "Pernambuco, Brazil". Moeller's suggestion is worth while to note. However, I have not seen Suriname specimens of either species, and no positive records of them from Suriname are known to me. Therefore both are left out of consideration here, and I restrict myself only to the five species of which I have seen Suriname material. Further investigation, especially in the savanna regions, is necessary to confirm or disprove the occurrence of more than five species of Dasypodidae in Suriname.

***Euphractus sexcinctus sexcinctus* (Linnaeus, 1758)**

Text-fig. 38b (head), pl. 60 (animal), pl. 65 (skull)

Dasypus sexcinctus Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 51.

Type locality. — "Habitat in America Meridionali". Restricted by Thomas (1911: 141) to "Para" (= Belém, northern Brazil).

Synonymies. — Cabrera, 1958: 216; Krumbiegel, 1940: 56-59.

Vernacular names. — (E) Six-banded Armadillo; (N) Zesbandig Gordeldier.

Distribution. — The species *Euphractus sexcinctus* (Linnaeus, 1758) is known from Guyana, Suriname, and northern and eastern Brazil, occurring southward to Bolivia, Paraguay, north-eastern Argentina and Uruguay (see Moeller, 1968: fig. 11, map). The exact western limit in South America is unknown. The nominate subspecies *E. sexcinctus sexcinctus* has been reported from Guyana, Suriname and the lower Amazon area.

Occurrence in Suriname. — As far as I know the species was reported from Suriname for the first time by Jentink (1888: 214) under the name *Dasypus sexcinctus*, no. "b. (alc.) Femelle semi-adulte. Surinam. Du Musée de M. van Lidth de Jeude, 1866". The specimen mentioned by Jentink on the same page under *Chaetophractus villosus* as no. "c. (alc.) Mâle semi-adulte. Surinam. Du Musée de M. van Lidth de Jeude, 1866." proves also to be *Euphractus sexcinctus*. These two specimens are still preserved (in alcohol) in the Leiden Museum, they originate from the Th. G. van Lidth de Jeude museum, part of which was bought in 1866 by the Leiden Museum (see Boeseman, 1970: 198). In his 1887 Catalogue Jentink mentioned on page 296 a skeleton of *Chaetophractus villosus* from Suriname, obtained in 1843 from the dealer G. A. Frank; this skeleton also proved to belong to the present species. Other records of the species from Suriname are doubtful (see under Remarks, below), and its actual distribution within Suriname is unknown. The only accurate localities that I know of are those from the Sipaliwini area listed below where Dr. M. S. Hoogmoed collected the material in 1968 and 1970.

The occurrence of the species in the savanna area in the northern part of the country, e.g., near Zanderij, is quite well possible, because it seems very unlikely that the specimens of the Van Lidth de Jeude collection were obtained far in the interior.

The following specimens have been examined by me:

1. Sipaliwini savanna near Sipaliwini River, extreme south-western part of Suriname, near Brazilian border, about 2°N 56°W, Nickerie District, among rocks on top of hill in the savanna, 1 male (no. 20528, skin and skull).
2. Sipaliwini savanna, near Meyers farm, not far from previous locality, 1 skull fragment (upper jaw) (no. 19647).
3. Paru savanna near Rio Paru, north of Viergebroeders Mts., slightly east of the previous localities, on Brazilian territory, just across the Suriname border, 1 male (no. 20527, skin and skull).
4. Suriname, without more precise locality indication, 1 male (no. 17212, in alcohol, = Jentink, 1888: 214, as *Chaetophractus villosus*, no. c), 1 female (no. 17213, in alcohol, = Jentink, 1888: 214, as *Dasypus sexcinctus*, no. b), 1 skull (no. 21036, = Jentink, 1887: 296, as *Chaetophractus villosus*, no. a).

Description. — The general colour of the carapace of *Euphractus sexcinctus*, in which the scales are of about the same size over the entire body, is brownish or greyish; the lower edge of the sides, the edge of the posterior shield and the tail are yellowish. Each scale of the dorsal shield has two stiff whitish hairs on its posterior edge, which, however, can become partly worn off by age. The ears are placed at the

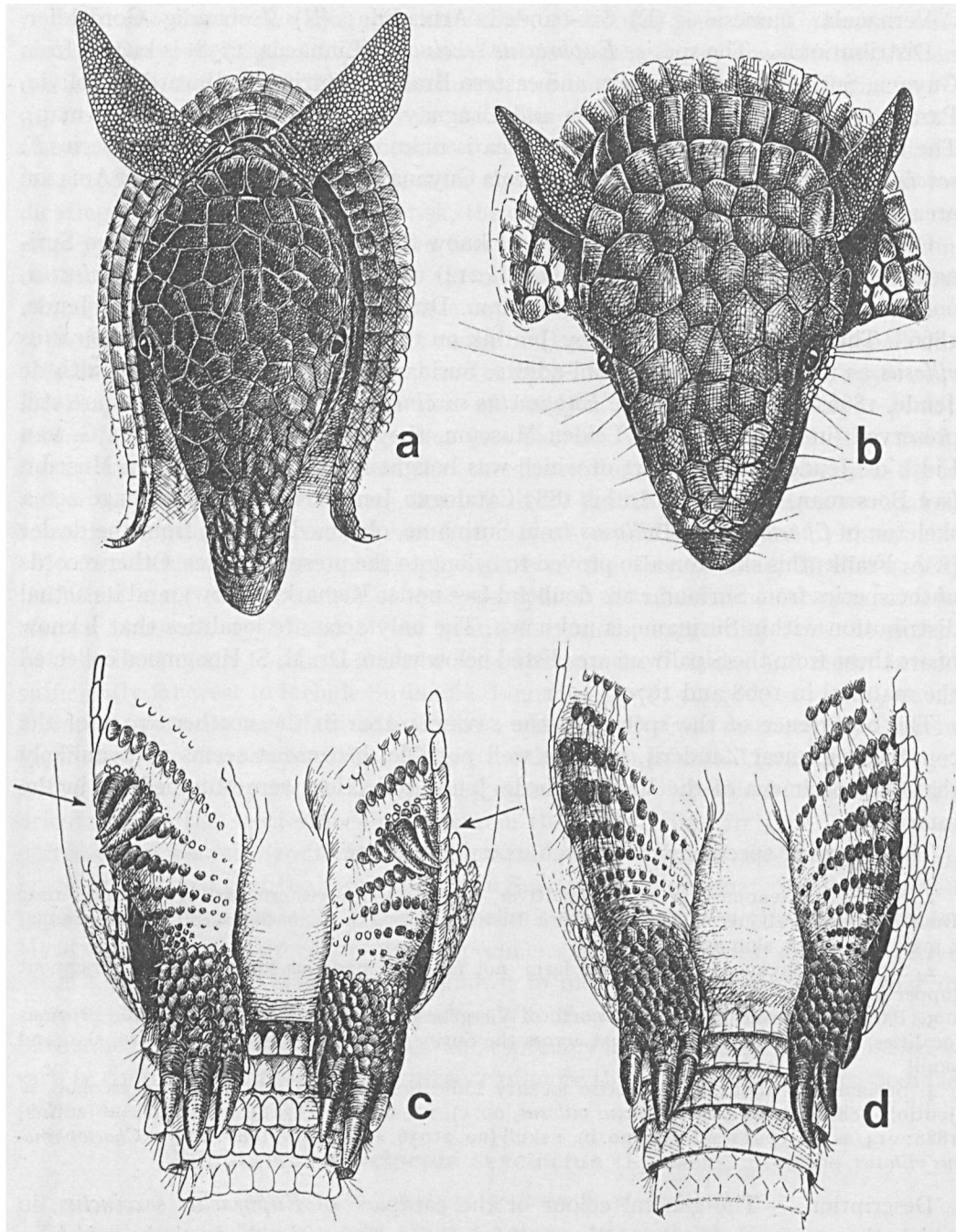


Fig. 38. a, *Dasyurus novemcinctus novemcinctus* L., head in dorsal view; b, *Euphractus sexcinctus sexcinctus* (L.), head in dorsal view; c, *Dasyurus kappleri kappleri* Krauss, hind legs in ventral view (arrows indicate the rows of bony projecting scutes at the knee); d, *Dasyurus novemcinctus novemcinctus* L., hind legs in ventral view.

sides of the head (see fig. 38 b). The number of movable bands on the body is 6 or 7; the scales of the basal part of the tail form distinct rings, on the rest (about four-fifths) of the tail they are alternately placed and do not telescope. The median area of the pelvic (posterior) shield shows above the base of the tail three or four openings of dorsal glands (see Pocock, 1913: text-fig. 195; Krumbiegel, 1940: 58-59, figs. 7, 8); these glandular pits form a striking character by which the species can immediately be distinguished from the other armadillos of Suriname. The forefoot has five toes with moderately developed claws, of which the third is the longest; the hind foot also has five toes. The skull has a quite characteristic shape which is well illustrated on plate 65. The total number of teeth is usually 38 (9 in each upper and 10 in each lower jaw).

The external measurements of the two not full-grown males from Sipaliwini are: head and body, 295, 292; tail, 165, 162; hind foot, with claw, 65, 67; ear, 30, 30 mm; weight, —, 1750 grams. The skull measurements of these same specimens are: greatest length, 89.2, 84.3; zygomatic breadth, 50.4, 48.5; interorbital constriction, 23.1, 22.8; alveolar length of upper tooth-row, 40.5, 37.4; total length of mandible, 69.4, 64.1 mm.

Remarks. — Kappler (1887: 70) used the name *Dasypus sexcinctus* erroneously for material having all essential characters of *D. novemcinctus*. In the "Encyclopaedie van Nederlandsch West-Indie" (1914: 262, under *Dasypus*) Kappler's statement that *D. sexcinctus* is the most common armadillo occurring in Suriname, was copied; the characters mentioned by Kappler were, however, omitted and replaced by a character essential for the true *Euphractus sexcinctus*, namely the 6 or 7 movable bands between the anterior and the posterior shield. The result is, therefore, that *E. sexcinctus* according to the "Encyclopaedie" is the most common armadillo in Suriname, which definitely is not true.

The brothers Penard ("De Surinamer", 31 December 1905) also dealt with the Six-banded Armadillo; a free translation of their Dutch text runs as follows: 'According to Schomburgk also the Pojoe or Ercoubest [sic] or Yellow-leg Armadillo, *Dasypus sexcinctus*, may occur in the Guianas, especially in the savannas near Berbice. The authors, however, have never seen any specimen of this species. Also the Amerindians do not seem to know it'. Cabanis (in Schomburgk, 1848: 782) used the name *Dasypus encoubert* Desmarest and noted only: "Kommt häufig auf der Savanne am Berbice vor". The description of *Dasypus sexcinctus* given by the Penards fits rather well for the present species.

According to Walsh & Gannon (1967: 219) three specimens of the present species were saved during the "Operation Gwamba", but these authors were not certain of their identification, since they stated that the specimens were "possibly Naked-tailed armadillo, *Cabassous unicinctus*".

Priodontes giganteus (E. Geoffroy, 1803)

Pl. 61 upper and middle figures (animal), pl. 66 upper figures (skull)

Dasypus giganteus E. Geoffroy, 1803, Catalogue Mammifères Muséum National Hist. Nat. Paris: 207-208.

Type locality. — “Le Paraguay”, central South America.

Synonymies. — Cabrera, 1958: 218.

Vernacular names. — (E) Giant Armadillo; (N) Reuzengordeldier; (S) Granman-kapasi.

Distribution. — The genus contains only this single species, of which no geographical races have been described. It is known from south-eastern Venezuela and the Guianas southward to north-eastern Brazil and Paraguay. The exact range of distribution is unknown (see Moeller, 1968: fig. 8, map).

Occurrence in Suriname. — Although Warren (1667: 11) mentioned that “of the greater [of the Armadillos], I saw one weighed Eighty Pounds”, the first author who gave pertinent information concerning the occurrence of the Giant Armadillo in Suriname was Krauss (1862: 19), who mentioned a specimen from a forest in the Marowijne region, probably near Albina. This specimen formed part of a series collected by A. Kappler in Suriname (see also Kappler, 1887: 69-70). The brothers Penard (“De Surinamer”, 31 December 1905) gave the forests and savannas of Suriname as the habitat of the species; according to them, swamps are visited only in the dry season when they are dried out. Geijskes (1954: 77) stated that the species is found in the hills of Suriname. Sanderson (1949: 786) observed a specimen “ascending a bank of the Coppename River, ten miles south of Kaaimanston”, and noted that “the species is apparently not rare but very local”. In the daily Paramaribo newspaper “De West” of 26 January 1972, on page 3, a photograph is published of a Giant Armadillo shot near the Amerindian village Alalapadoe, situated north of the Sipaliwini River, south-western Suriname. During the “Operation Gwamba” 7 specimens were saved in the Brokopondo region (Walsh & Gannon, 1967: 219). I myself examined a specimen, probably from the Paramaribo region, sent by H. H. Dieperink between 1826 and 1835 to the Leiden Museum (see Jentink, 1887: 295, no. a; 1888: 213, no. a, under *Priodontes gigas* Cuvier), and a specimen collected by A. Kappler, preserved in the Stuttgart Museum (SMN no. 357, ♂ ad.), possibly being the same specimen as the one mentioned by Krauss (1862).

Description. — The Giant Armadillo belongs to the group of Dasypodidae of which the ears are set widely apart, and of which the scales of the armour are rather uniform in size and shape. The scales of the tail are not arranged in rings and are placed close together, alternating. The number of bands varies from 11 to 13. The colour of the carapace is dark brown, the lower edge usually being yellowish white. The length of head and body varies from 80 to 100 cm in adults; the length of the tail is about 50 cm, being always distinctly less than that of head and body combined. The third toe of the forefeet is very stout and has a very large and strong

claw, the toe being about three or four times as long and broad as the second toe; the third toe measures about 20 cm in adults. The weight of an adult specimen is about 50 kg or even more.

Apart from its great size the most striking character of the skull is the total number of teeth, which varies from 65 to 98. The three skulls examined by me show that there is some variation in the total number of teeth, while the number in each half of the jaws, in a single individual, also may be different: right upper jaw, 20, 18 and 18; left upper jaw, 19, 20 and 18; right lower jaw, 20, 21 and 17; left lower jaw, 18, 19 and 17 (total number in each skull, respectively: 77, 78 and 70). Some skull measurements of the Stuttgart Museum specimen (SMN no. 1760, ♀, collected by A. Kappler in 1873, see pl. 36 upper figs.) are: greatest length, 197.5; zygomatic breadth, 81.0; interorbital constriction, 49.1; alveolar length of upper tooth-row, 69.0 (right), 71.1 (left); median length of nasals, 74.0; median length of frontals, 66.0 (right), 73.7 (left); greatest length of mandible, 155.0 mm.

Remarks. — The meat of the Giant Armadillo has a peculiar penetrating taste and therefore is rarely eaten by the Bush-Negroes (Geijskes, 1954: 77). According to the brothers Penard ("De Surinamer", 31 December 1905) the food of these animals consists of fruit, roots, tubers and insects, most of which is obtained by digging. Kappler (1887:69), who dissected several specimens, found in their stomachs only beetle larvae, caterpillars, maggots and worms.

The animals can dig extremely well and extremely fast: a man with a spade cannot keep up with them. Once they are inside their burrow it is practically impossible to pull them out. They use their powerful and sharp claws also to defend themselves and for breaking open ants' nests (Geijskes, 1954: 77).

In the literature on Suriname mammals the present species often has been indicated with the name *Dasypus gigas* Cuvier, 1822.

***Cabassous unicinctus* (Linnaeus, 1758)**

Pl. 61 lower figure (animal), pl. 66 lower figures (skull)

Dasypus Unicinctus Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 50.

Type locality. — "Habitat in Africa". This type locality certainly is erroneous and Thomas (1911: 141) corrected it conditionally to "Surinam if *Cabassous* occurs there, which is not as yet certainly known". Now that the occurrence of the present species in Suriname is definitely known (see below), we may accept Suriname as the corrected type locality.

Synonymies. — Cabrera, 1958: 220.

Vernacular names. — (E) Naked-tail Armadillo, Twelve-banded Armadillo, Eleven-banded Armadillo, Broad-banded Armadillo; (N) Cabassou, Naaktstaart Gordeldier.

Distribution. — According to Cabrera *Cabassous unicinctus*, of which no geographical races are recognized, occurs in the Guianas and eastern Brazil.

Occurrence in Suriname. — The brothers Penard ("De Surinamer", 31 December

1905) remarked that *Cabassous unicinctus* is of common occurrence on the sandy savannas of the interior, where it lives solitary or in pairs; it is rare in swampy regions and occurs there only in the dry season. This statement, however, needs confirmation, because Kappler (1887: 70) was of the opinion that the species is rare in Suriname, which seems more in agreement with the fact that only few specimens are present in museum collections. Sanderson (1949: 785-786) collected only a single specimen, and noted: "No further specimens were obtained, though we offered a large price for them and searched diligently in all localities. This seems to confirm the statements of the hunters that the animal is rare". Krauss (1862: 19) reported a specimen from the Marowijne River area, possibly from the neighbourhood of Albina, under the name "Dasypus (Xenurus Wglr.) 12-cinctus Schreb. (D. gymnurus Ill.)". Jentink (1887: 295, no. a; 1888: 213, no. c) under the name *Xenurus duodecemcinctus* Schreber, mentioned a skeleton and a mounted specimen from Suriname without exact locality. These (male) specimens are still in the Leiden Museum (nos. 21040 and 24343 respectively). During the "Operation Gwamba" 3 armadillos were saved in the Brokopondo region, which Walsh & Gannon (1967: 219) identified as "Six-banded armadillo, *Euphractus sexcinctus*", but they did not exclude the possibility that these specimens were the "Naked-tailed armadillo, *Cabassous unicinctus*". Unfortunately no decision can be reached on this point as no material was preserved. I myself examined an adult female (no. 18219, skin and skull) from Powakka, near Zanderij, caught on 25 October 1965 at nightfall in a pineapple plantation. Further the specimens mentioned by Jentink, already referred to above, and 3 skulls. These skulls, property of the Stuttgart Museum (SMN nos. 1124, 1516 (♀) and 1995 (♂)), were collected by A. Kappler in "Surinam", in the years 1863, 1874 and 1874 respectively.

Description. — Externally *Cabassous unicinctus* in many respects closely resembles *Priodontes giganteus*, and at a first glance it may be mistaken for a young individual of the last mentioned. The two species resemble each other in the following characters: (1) the ears are placed on the sides of the head, (2) the various scales of the armour do not essentially differ in size and shape, (3) the number of movable transverse bands on the back varies from 10 to 13, and (4) the second and third toes of the forefoot are far more strongly developed than the first and fifth toes. There is, however, a striking difference between the two species in the structure of the tails. In *Cabassous* the tail is slender, the scales are isolated and not grouped in distinct or telescoping rings; the vernacular name "Naked-tailed Armadillo" is derived from the character that the tail is not covered by a true armour like that found in the other armadillos of Suriname. The colour of the carapace is dark brownish or blackish, the lateral edges being yellowish white. The skulls of *Priodontes* and *Cabassous* show, apart from their size, great differences, which are well shown in the photographs on plate 66. Further, the total number of teeth in *Cabassous unicinctus* varies from 30 to 38, usually there are 9 teeth on each side of the upper and lower jaws. In some respects the skull of *Cabassous* closely resembles that of *Euphractus sexcinctus* (see

pl. 65). The main differences are: (1) in *Cabassous* the premaxilla is toothless, (2) in side view the zygomatic arch is distinctly broadened in the centre, (3) the alveolar length of the upper tooth-row varies from 30.0 to 32.6 mm (measured in 5 specimens), while in *Euphractus sexcinctus* this length is more than 35 mm (measured in 3 specimens). Moreover, in *Cabassous* the frontals are distinctly swollen, in *Euphractus* they are more flattened, but this difference is conspicuous only when the skulls of both forms can be directly compared.

The external measurements of the adult female from Powakka, naar Zanderij, are: head and body, 400; tail, 190; hind foot, with claw, 85; ear, 42 mm; weight, 3.8 kilograms. The skull measurements of this specimen are: greatest length, 88.4; zygomatic breadth, 48.8; interorbital constriction, 28.2; alveolar length of upper tooth-row, 32.2; greatest length of mandible, 68.1 mm.

In the four other skulls examined the greatest length varies from 77.4 to 85.4; the zygomatic breadth from 41.0 to 46.7; the interorbital constriction from 25.7 to 27.2; the alveolar length of the upper tooth-row from 30.0 to 32.6; and the greatest length of the mandible from 58.1 to 66.2 mm.

Remarks. — According to Kappler (1887: 71) *Cabassous unicinctus* in Suriname is not eaten by the inhabitants, because of the unpleasant taste of its meat. In the literature I found no data on the food of *Cabassous* in Suriname. Walker (1964 (1): 497) noted, however, that the related species *C. centralis* (Miller, 1899) from Central America is known to "feed mainly on termites and ants, dug out of litter and soil, which they apparently locate by scent".

***Dasyopus kappleri kappleri* Krauss, 1862**

Text-fig. 38c (hind legs), pl. 67 upper figures (skull)

Dasyopus Kappleri Krauss, 1862, Archiv Naturgeschichte, 28 (1): 24-34, pl. 3 figs. 1-2 (skull).

Type locality. — "Aus den Urwäldern des Marowiniflusses in Surinam" (Krauss, 1862: 19).

Synonymies. — Cabrera, 1958: 223-224; Hamlett, 1939: 335.

Vernacular names. — (E) Kappler's Armadillo; (S) Maka-kapasi.

Distribution. — The species *Dasyopus kappleri* Krauss, 1862, is known from Peru, Ecuador, Bolivia, southern Venezuela, the Guianas and the Amazon Basin (Pará, Brazil). Hamlett (1939: 335) noted its range as "probably . . . throughout the dense forest of the Amazon and Orinoco basins". The nominate subspecies *D. kappleri kappleri* is known from southern Venezuela, the Guianas and Pará.

Occurrence in Suriname. — The species was originally described by Krauss (1862) from the forests along the Marowijne River, probably in the neighbourhood of Albina near the mouth of the Marowijne River. It is doubtful whether the record of the brothers Penard ("De Surinamer", 31 December 1905) of *Dasyopus kappleri* actually refers to this species (see below under Remarks). As Geijskes (1954: 77) already observed, very little is known of the habits and occurrence of this species.

I have examined the following material from Suriname:

1. Bitagron, east bank of Coppename River, at about 5°8'N, Saramacca District, shot at night on a forest trail, 1 male (no. 20962, skin and skull).
2. Hebiweri, upper Coppename River near Tonckens Falls, about 4°23'N, Saramacca District, 1 male (no. 20964, skull).
3. Marowijne River, probably near Albina, 1 adult male, 1 adult female, 2 juvenile skulls (Museum Stuttgart; type material).
4. Suriname, without more precise locality indication, some skulls.

Description. — The most striking external characters by which both *Dasypus kappleri* and *D. novemcinctus* (see p. 263) can be distinguished from the other armadillos of Suriname are the following: (1) the scales composing the anterior (shoulder) and posterior (pelvic) shields of the dorsal surface of the body are much smaller than those of the movable bands in the middle of the back; (2) the ears are close together on the top of the head; (3) the scales of the tail are combined into groups, each group forming a ring which articulates with or partly telescopes into the one immediately in front of it (while in the other armadillos of Suriname, where there are distinct rings on the tail, these never are telescoping).

In *Dasypus kappleri* there are two or three rows of enlarged scales with claw-like projecting scutes at the knee of the hind leg (see fig. 38c); such bony claw-like scutes are lacking in *D. novemcinctus* in which at that place the armour is smooth.

In the present species the number of movable bands is 7 or 8. The forefoot usually has 5 toes, of which the outer is very small or lacking. The general colour of the head, the dorsal surface of the body and the base of the tail is bluish or brownish, this colour becoming yellowish on the sides of the body and on the distal part of the tail. The ventral surface is yellowish; it is sparsely covered with scattered hairs. The adults of *D. kappleri* are distinctly larger and more heavy than those of *D. novemcinctus*; those of the first mentioned species can weigh 8 kilograms or more, of the second 3 to about 6 kilograms (see also Hamlett, 1939: 329).

The skulls of the two species closely resemble each other (see pl. 67). The most reliable character to separate the two forms is the fact that the palate posteriorly of the tooth-row in *D. kappleri* is distinctly keeled on the sides, while in *D. novemcinctus* this part of the palate is rounded on the sides. The number of teeth in the upper jaw of *D. kappleri* is 8 or 9, in the lower usually 8; the total number of teeth varies from 32 to 34. Krauss (1862) and Lönnberg (1928: 2-11) published rather extensive and detailed descriptions of the present species.

The external measurements of the adult male from Bitagron are: head and body, 535; tail, 445; hind foot, with claw, 112; without claw, 105; ear, 35 mm; weight, 10.5 kilograms. The skull measurements of the male specimens from Bitagron (no. 20962) and Hebiweri (no. 20964), respectively, are the following: greatest length, 127.9, 133.0; zygomatic breadth, 49.4, 53.9; interorbital constriction, 26.5, 29.0; alveolar length of upper tooth-row, 28.8, 32.0; greatest length of mandible, 102.6, 106.9 mm.

Remarks. — In the Suriname Game Ordinance of 1954 as revised in 1970, *Dasypus kappleri*, together with *D. novemcinctus*, is placed on the list of game; hunting for these species is allowed from 1 May to 31 December. The species is eaten by the Bush-Negroes, as I could verify myself in Bitagron in April 1963.

As mentioned above, Krauss (1862) reported the species from forests, also Hamlett (1939) considered it an inhabitant of dense forests. This is confirmed by the specimen from near Bitagron (no. 20962) which was caught on a forest trail. In flat contradiction to this is the statement by the brothers Penard ("De Surinamer", 31 December 1905) that the species 'occurs only on savannas, one finds it seldom if at all in forests or swampy places. If during the dry season the savannas dry out entirely, this species belongs to the few animals which then still are encountered there'. Also other remarks by the Penard brothers make it doubtful whether they actually had this species in mind or whether their sources were reliable. They even seem to doubt these sources themselves as they seem to recognise that the information that the species has a litter of 8 to 12 young, all of the same sex, is difficult to swallow. It seems best therefore to ignore the Penard record of *Dasypus kappleri* entirely.

It is most peculiar that Kappler (1887: 69-71), when dealing with the Suriname armadillos, stated that 5 species occur in the country, then dealt with three of them, and entirely ignored the species that 25 years before had been named in his honour. This is the more regrettable since Kappler usually is a very reliable source of information about interesting details of the species observed by him.

***Dasypus novemcinctus novemcinctus* Linnaeus, 1758**

Text-figs. 38a (head), 38d (hind legs), pl. 56 lower figure (animal), pl. 67 lower figures (skull)

Dasypus novemcinctus Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 51.

Type locality. — "Habitat in America meridionali". Restricted by Cabrera (1958: 225) to "Pernambuco" (= Recife, north-eastern Brazil).

Synonymies. — Cabrera, 1958: 225-226; Hamlett, 1939: 334-335.

Vernacular names. — (E) Nine-banded Armadillo; (N) Negengordelig Gordeldier, Negenbandig Gordeldier, Gewone Kapasie, Langstaart Gordeldier; (S) Kapasi.

Distribution. — "This species has an amazing distribution. It ranges south into northern Argentina, spreads over all the countries east of the Andes, reaches the Pacific slope in Ecuador, extends throughout Central America and most of Mexico, and at present is spreading north and east in the United States. It has already invaded Oklahoma and Louisiana, at least one has been killed in Kansas, and Florida has been partly colonized by the liberation of some army mascots during the World War" (Hamlett, 1939: 335; see also Moeller, 1968, fig. 2: map of distribution). The nominate subspecies *D. novemcinctus novemcinctus* occurs in the greater part of South America with the exception of western Ecuador and Mexiana Island (estuary of the Amazon River, Brazil).

Occurrence in Suriname. — The Nine-banded Armadillo is the most common

armadillo in Suriname. In the very early publications dealing with the Suriname mammals (Warren, 1667: 11; Pistorius, 1763: 57; Fermin, 1765: 2, 3; Bancroft, 1769: 146; Hartsinck, 1770: 91, and others) either one or two species of Suriname armadillos are recognized; in the case of two, one of them is the giant armadillo. The second of these two species, or the single species if only one is mentioned, might be *Dasypus novemcinctus*, but the data as a rule are insufficient for the identification on a specific level. Even Stedman's (1796: 222, pl. 24) animal, which he saw at Wane Creek (north-eastern Suriname), and of which he gave a short account and a reasonably good figure, cannot be definitely identified with *Dasypus novemcinctus*, it might also have been *D. kappleri*. In later publications several armadillos were recognized as inhabiting Suriname, but this often added to the confusion. So Lammens (1844: 105, 106) enumerated *Dasypus tricinctus*, *D. quadricinctus*, *D. sexcinctus*, *D. octocinctus*, *D. novemcinctus*, *D. duodecimcinctus* and *D. octodecimcinctus*, without providing good distinctions between these 7 species. Kappler (1887: 69-71) recognized 5 Suriname species of armadillo, but dealt with only three, treating the present species under the incorrect name of *D. sexcinctus*. Being the most common species in Suriname, *Dasypus novemcinctus* has been mentioned by many subsequent authors. The abundance of these animals is clearly shown by the fact that during the "Operation Gwamba" no less than 1051 specimens were saved in the Brokopondo region, about 11% of the total number of saved animals. The species occurs throughout Suriname, from deep in the interior to the coastal area, being mostly found on savannas and in open forests, but also in flood forests.

I have examined the following Suriname specimens:

1. Lucie River, side branch of the Corantijn River, Nickerie District, 1 male (no. 18024, skin and skull).
2. Sipaliwini savanna, near Sipaliwini airstrip, close to the Brazilian border, extreme south-eastern part of Nickerie District, 1 carapace (no. 23949).
3. Stondansi Falls, upper Nickerie River, about 5°5'N, Nickerie District, 1 juvenile female (no. 23052, skin and skull).
4. Raleigh Falls, upper Coppename River near Voltzberg, about 4°40'N, Saramacca District, 1 female (no. 20954, skin and skull).
5. Near bridge across Saramacca River near Matta, due west of Zanderij, about 5°25'N, Saramacca District, 1 skull (no. 23952).
6. Zanderij, Para District, south of Paramaribo, 1 skull (no. 20961).
7. Brownsveg, north-western shore of Brokopondo Lake, Brokopondo District, 1 skull (no. 18215).
8. Forest near Mapane Creek, upper Commewijne River, about 5°20'N, Commewijne District, 1 female (no. 20958, skin and skull).
9. Forest near Peninika Creek, upper Commewijne River, about 5°25'N, Commewijne District, 1 male (no. 20959, skin and skull).
10. Forest on shell ridge 14.9 km north of Moengotapoe, Marowijne District, 1 male (no. 20966, skin and skull).
11. Forest near Langamankondre, mouth of Marowijne River, 1 female (no. 20960, carapace and skull).
12. Between Albina and Pierrekondre, west bank of Marowijne River, 1 juvenile male (no. 23948, skin and skull).
13. Weyneweg, west of Albina, just over first hill, 1 male (no. 20969, skin and skull).
14. Nassau Mts., at 10.4 km west of the Marowijne River at about 4°45'N, Marowijne District, 1 female (no. 20968, skin and skull).

15. Suriname, without more precise locality indication, 5 females (nos. 21034, 21035, skulls; 24364, 24366, 24367, skins), 4 specimens (no. 21029, skull; no. 24342, skin and skull; nos. 24341, 24362, skins).

Description. — As pointed out on page 262 *Dasybus novemcinctus* in many respects resembles *D. kappleri*. The main external characters in which the two species differ, are the following: (1) the number of movable bands over the middle of the body in *D. novemcinctus* is usually 9 (varying from 8 to 11), being 7 or 8 in *D. kappleri*; (2) the number of toes of the forefoot in *D. novemcinctus* is always 4, in *D. kappleri* usually 5; (3) the armour of the hind leg at the knee is smooth in *D. novemcinctus*, but has projecting scutes in *D. kappleri* (see fig. 38 c, d).

The general colour of the back is blackish or dark bluish; one of the Dutch vernacular names is "Zwarte tatou" (= black tatou). This colour changes into yellowish on the sides of the body and on the tail, the extent of the yellowish area being variable. The ventral surface is yellowish; it is sparsely covered with scattered hairs. The tail is longer than or about equal to the length of head and body combined. The weight of the adult animals varies usually from 4 to 6 kilograms.

As a rule the total number of teeth is 30 or 32; the number of teeth in each half of the upper and lower jaws is usually 8. The striking difference between the skulls of *D. novemcinctus* and *D. kappleri* has been dealt with in the description of the last named species.

The external measurements of six Suriname specimens and the skull measurements of nine are given in Table 39.

TABLE 39

External and skull measurements of 11 specimens of *Dasybus novemcinctus novemcinctus* Linnaeus from Suriname in the Leiden Museum.

Reg. number	18024	20959	20966	23948	20954	20958	20960	20968	23052	20961	21029
Sex	♂	♂	♂	juv.♂	♀	♀	♀	♀	juv.♀	-	-
Head and body	465	410	-	246	366	356	-	-	183	-	-
Tail	341	450	-	255	381	385	-	-	174	-	-
Hindfoot with claw	75	106	-	66	94	94	-	-	49	-	-
Hindfoot without claw	-	93	-	-	87	80	-	-	45	-	-
Length ear	55	48	-	40	47	50	-	-	32	-	-
Weight, grams	6000	6100	-	-	4500	6250	-	-	270	-	-
Greatest length skull	110.3	108.6	109.0	-	95.3	101.6	108.5	-	-	107.3	111.2
Zygomatic breadth	47.9	46.6	47.5	-	40.2	44.0	-	-	-	-	47.3
Interorbital constriction	27.7	26.6	28.1	-	25.2	25.5	-	-	-	26.0	26.1
Alveolar length of upper tooth row	25.4	25.2	23.8	-	23.7	22.7	25.0	24.7	-	23.8	25.9
Number of teeth	8/8	8/8	7/7	-	8/8	7/7	8/8	8/8	-	7/7	7/7
Greatest length of mandible	86.8	85.6	-	-	69.6	80.5	-	-	-	-	-

Remarks. — In the Suriname Game Ordinance of 1954 as revised in 1970, *Dasybus novemcinctus*, together with *D. kappleri* as "Kapasi of lontoetere of gordeldier (*Dasybus novemcinctus* en *Dasybus kappleri*)", is placed on the list of game and may be hunted from 1 May to 31 December. According to Geijskes (1954: 76, 77) the meat of *Dasybus novemcinctus* is tender with a peculiar taste, an observation

confirmed by myself in 1963. The species is highly esteemed as food by the inhabitants of Suriname. The armadillos are hunted with dogs, or dug out or smoked out of their burrows.

According to the brothers Penard ("De Surinamer", 2 January 1906) the food of these animals consists mainly of insects, but they are also said to eat carrion.

They dig extremely well and fast, and with their burrowing can sometimes do some harm to dams. But on the whole they are very useful as destroyers of insects. They are not aggressive at all, and are known to be good swimmers.

An interesting piece of information was given by the brothers Penard ("De Surinamer", 2 January 1906) about the supposed relation between the Nine-banded Armadillo, or Makka Kapassie, and the snake *Lachesis mutus* (Linnaeus, 1766), which is called in Suriname "Kapassie Slang" or "Makka Slang" (slang standing for snake). This very poisonous snake is said to live in the burrows with the armadillo, and to protect it; many natives are said to have been killed by the snake when they tried to dig out the armadillo. Also of the snake *Elaps surinamensis* Cuvier, it is said that it lives in the burrows of armadillos. At the moment it is impossible to ascertain whether the story of the special relation of the armadillo with snakes is just a piece of Suriname folklore, or that there is more to it. It is possible that snakes are now and then found in armadillo burrows without having a special preference for them and that by some of these accidental occurrences the story has started. I have not been able to find any confirmation of the account by the Penards, which is based mainly on information that they obtained from hunters.

An extensive account on the biology and the life history of the present species, based on observations made in Texas, U.S.A., was given by Taber (1945).

Dasypus septemcinctus Linnaeus, 1758, rather closely resembles *D. novemcinctus* but is smaller in all respects, while the number of movable bands is 6 or 7, rather than 8 or 9; it is only known with certainty from Brazil south of the Amazon (see Hamlett, 1939: 329-333, fig. 1; also p. 254 of the present publication).

In the literature dealing with the mammals of Suriname I found the following names used for the present species: *Dasypus peba* Desmarest, 1819, *D. longicaudatus* Wied, 1826, and *D. urocerus* Lund, 1841; in several instances the species has been confused with others. The generic name *Tatusia* has occasionally been used for it instead of *Dasypus*.

ORDER CARNIVORA

The Suriname species of the order Carnivora can be readily distinguished from those of the other orders by the presence of six incisors in both upper and lower jaw.

So far 16 species of carnivores have been reported from Suriname, including the Mongoose, *Herpestes auro punctatus*, which was introduced there in recent times, and now is considered a pest.

Practically all Suriname species of carnivores have a native name. This means that the Amerindians as well as the Bush-Negroes are well acquainted with these animals and know their distinctive characters. For the systematic zoologist, however, there are still many problems concerning the taxonomic position of the known species, their exact range of distribution within Suriname, their variability in size and colour pattern, etc., while it is not precluded that more forms do occur in Suriname than are listed here. These problems arise because of insufficient material being available for examination. Furthermore, it would be most important that more attention be given to the biology of the Suriname carnivores, in order to correctly evaluate both their function in nature for maintaining the equilibrium between animal populations, and the other rôles that they may play.

In the Suriname Game Ordinance 1954, as revised in 1964, still five of the fifteen carnivores which belong to the indigenous Suriname fauna, plus the Mongoose, were placed on the list of "predominantly harmful animals". Fortunately, the latest revision (1970) of the Ordinance has removed four of these species from this list, only the Tayra, *Eira barbara barbara* (Linnaeus), and the introduced Mongoose, *Herpestes auro punctatus* (Hodgson), are still considered harmful and are not protected in any way. The 1970 version of the Game Ordinance has only one carnivore, viz., the Jaguar, *Panthera onca onca* (Linnaeus), listed among the game animals, so this species may be hunted throughout the year. The increased protection afforded to the Suriname carnivores is completely justified, since the rate of propagation of most carnivores is low, while every individual needs a large territory to obtain sufficient food; as a result the number of carnivores in a certain region is never large. It is true that the larger animals like the Jaguar can be dangerous to man and harmful to domesticated animals, so that control in some cases is a forced necessity.

Key to the Carnivora of Suriname based on external characters

- 1a. The colour of the body shows a pattern of dark stripes and spots 2
- b. The colour of the body does not show a pattern of stripes and spots, although dark rings or stripes may be present on the tail or on the head 5
- 2a. The head and the dorsal surface of the body show rosettes of dark colour only; no dark stripes on the head or on the body (pl. 80)

Panthera onca onca, p. 326

- b. The head shows a pattern of longitudinal stripes, which extend more or less distinctly also on the dorsal parts 3
- 3a. Hind foot more than 145 mm long (pl. 75 lower fig.)
Leopardus pardalis melanurus, p. 308
- b. Hind foot less than 145 mm long 4
- 4a. Hair on nape directed backwards¹ (pls. 76, 77); width across upper canines in four specimens varies from 18.7 to 20.4 mm
Leopardus tigrinus tigrinus, p. 312
- b. Hair on nape directed forwards¹; width across upper canines in three specimens varies from 22.5 to 23.8 mm *Leopardus wiedii vigens*, p. 316
- 5a. Hind foot distinctly webbed as an adaption to aquatic life. 6
- b. Hind foot not webbed 7
- 6a. Tail dorso-ventrally flattened (pl. 74)
Pteronura brasiliensis brasiliensis, p. 303
- b. Tail cylindrical (pl. 73) *Lutra enudris*, p. 300
- 7a. Tail distinctly ringed with black (pl. 69). 8
- b. Tail not ringed. 9
- 8a. A conspicuous black band across the face and the eyes (pl. 69 lower fig.). . .
Procyon cancrivorus cancrivorus, p. 277
- b. No conspicuous black band across the face and the eyes; the face shows a more or less distinct pattern of longitudinal stripes and spots (pl. 69 upper fig.). . .
Nasua nasua vittata, p. 281
- 9a. Dog-like animals; tail bushy (pl. 68) 10
- b. Animals not dog-like 11
- 10a. The head and at least the anterior part of the dorsal surface more or less golden yellowish; the colour of the rest of the body is dark brown. Tail very short (pl. 68 upper fig.) *Speothos venaticus venaticus*, p. 274
- b. Head not strikingly different in colour from the rest of the body. The tail is about one-third of the length of head and body together (pl. 68 lower fig.). . .
Cerdocyon thous thous, p. 272
- 11a. The coat is not uniformly coloured: the dorsal parts are much lighter than the ventral parts, or there is an irregular spot of orange-yellow colour on the throat 12
- b. The coat is rather uniformly coloured without striking colour patterns . . 13
- 12a. A whitish or light yellowish band runs over the forehead and the ears to about the shoulders (pl. 71 lower fig.). *Galictis vittata vittata*, p. 290
- b. An irregular spot of orange-yellow colour is present on the throat; the head and the neck are of a dark iron-grey colour, the rest of the body is glossy black (pl. 72) *Eira barbara barbara*, p. 295
- 13a. The hind foot is less than 100 mm long 14

¹ This character can be unreliable, see p. 315.

- b. The hind foot is more than 100 mm long 15
- 14a. The dorsal parts are yellowish brown, finely speckled with dark brown; the hairs of the ventral parts are uniformly light yellowish all over. The fur is short and coarse. The hind foot is about 60 mm long (pl. 71 upper fig.)
Herpestes auro punctatus, p. 331
- b. The dorsal parts are uniformly dark gold ochre-yellowish, the ventral parts being somewhat lighter. The fur is thick, soft and woolly. The hind foot is about 90 mm long (pl. 70 upper fig.) *Potos flavus flavus*, p. 285
- 15a. The hind foot is more than 200 mm long. Dorsally the coat colour is more or less reddish brown or ochraceous-tawny, ventrally whitish. The end of the tail is dark brown or black (pls. 78, 79) *Puma concolor discolor*, p. 319
- b. The hind foot is about 155 mm long. The coat colour varies from glossy black to glossy reddish brown. The tail is uniformly coloured from the base to the end (pl. 75 upper fig.) *Herpailurus yagouaroundi yagouaroundi*, p. 323

Key to the Carnivora of Suriname based on skull characters

In the following treatment of the species the dental formula of each is given. One should take into consideration, however, that this is the complete formula as it is usually found in the adults, but that often in otherwise fully normal specimens one or more teeth (usually premolars and molars) may be absent, either because they have been shed early or because they have not developed at all.

The present key should be used with some reserve, since of most species only relatively few skulls could be examined. The variation of many characters used here may be greater than it appears from the key.

The term "length of the tooth-row", as employed here, indicates the distance between the anterior border of the alveolus of the upper canine and the posterior border of the alveolus of the upper last molar, unless otherwise indicated. The crown length of the upper carnassial (last premolar) is measured on the outside of that tooth.

If not indicated otherwise, the length of the mandible is measured from the anteriormost border of the middle incisors to the posteriormost border of the processus condylicus.

- 1a. The orbit is completely encircled by bone; the shape of the skull is slender, especially the braincase is narrow (pl. 85 lower figs.). The length of the tooth-row varies in ten specimens from 21.7 to 24.1 mm
Herpestes auro punctatus, p. 331
- b. The orbit is not completely encircled by bone 2
- 2a. The length of the tooth-row in three specimens is 21.2, 21.7 and 23.4 mm. The braincase is more or less rectangular (pl. 82 upper figs.)
Potos flavus flavus, p. 285
- b. The length of the tooth-row is more than 25 mm 3

- 3a. The postorbital processes are placed distinctly behind the middle of the skull (pl. 81 upper figs.; pl. 83 lower figs.) 4
- b. The postorbital processes are situated in the anterior half of the skull (e.g., pls. 84, 87) 5
- 4a. The palate continues far behind the last molars (pl. 83 lower figs.). The last (fourth) premolar is about as long as wide, and only slightly narrows posteriorly; the crown is about quadrangular in shape. The teeth are placed in a straight row; the length of the upper tooth-row in ten specimens varies from 42.4 to 47.0 mm *Nasua nasua vittata*, p. 281
- b. The palate reaches hardly, if at all, beyond the last molars (pl. 81 upper figs.). The last premolar is distinctly longer than wide, narrowing posteriorly; the crown is triangular in outline; between the last premolar and the first molar a distinct triangular incision is visible on the inner side of the tooth-row. The length of the upper tooth-row in three specimens is 58.9, 59.8 and 61.4 mm *Cerdocyon thous thous*, p. 272
- 5a. The length of the postorbital constriction is practically twice the postorbital width (pl. 84 lower figs.) *Pteronura brasiliensis brasiliensis*, p. 303
- b. The length of the postorbital constriction is shorter than the postorbital width 6
- 6a. In the upper jaw behind each canine there are four teeth; the posterior of these (the true molar) is strongly reduced, far smaller than the preceding tooth (= carnassial or last premolar) (e.g., pls. 86, 87) 11
- b. The number of teeth in the upper jaw behind each canine is more than four or, if four, the last is more than half as long as the third (e.g., pls. 81, 83). 7
- 7a. The line connecting the posterior margins of the last molars is situated about in the middle of the length of the skull. The number of teeth behind the canines of the upper jaw is more than four (pl. 83 upper figs.; pl. 81 lower figs.) 8
- b. The line connecting the posterior margins of the last molars lies distinctly before the middle of the skull. The number of teeth behind the canines of the upper jaw is usually four 9
- 8a. The palate reaches hardly beyond the last molars (pl. 81 lower figs.). The last (fourth) premolar is distinctly longer than wide *Speothos venaticus venaticus*, p. 274
- b. The palate reaches distinctly beyond the last molars (pl. 83 upper figs.). The crown of the last premolar is about quadrangular in shape. *Procyon cancrivorus cancrivorus*, p. 277
- 9a. The third tooth behind the canines of the upper jaw is distinctly triangular. The infra-orbital foramen is small (less than 5 mm). 10
- b. The third tooth behind the canines of the upper jaw is more or less quadrangular (pl. 84 upper figs.). The infra-orbital foramen is large (more than 5 mm) *Lutra enudris*, p. 300

- 10a. The length of the upper tooth-row in two specimens is 24.2 and 25.0 mm; the zygomatic breadth is 47.0 and 55.1 mm (pl. 82 lower figs.)
Galictis vittata vittata, p. 290
- b. The length of the upper tooth-row varies in seven specimens from 29.0 to 32.5 mm; the zygomatic breadth varies from 58.6 to 76.8 mm (pl. 85 upper figs.)
Eira barbara barbara, p. 295
- 11a. The crown length of the upper carnassial (last premolar) is more than 19 mm 12
- b. The crown length of the upper carnassial (last premolar) is less than 19 mm 13
- 12a. The outer margin of the nasals is practically straight; the basal triangular part of the combined nasals is acutely pointed posteriorly (pl. 89 lower figs.). The upper angle of the maxillary next to the nasals is triangularly pointed. The width across the upper canines in seven specimens varies from 60.2 to 72.3 mm
Panthera onca onca, p. 326
- b. The outer margin of the nasals is distinctly concave; the basal triangular part of the combined nasals has the posteriorly directed top bluntly or rather squarely truncate. The upper angle of the maxillary next to the nasals is broadly rounded (pl. 86 lower figs.). The width across the upper canines in five specimens varies from 45.6 to 52.5 mm *Puma concolor discolor*, p. 319
- 13a. The length of the upper tooth-row is less than 30 mm 14
- b. The length of the upper tooth-row is more than 30 mm 15
- 14a. The length of the upper carnassial in four specimens is 9.5, 9.5, 9.5 and 10.0 mm; the width across the upper canines varies in the four specimens from 18.7 to 20.4 mm. The breadth of the braincase in three specimens is 37.8, 39.5 and 40.2 mm. The braincase is oval (pl. 87)
Leopardus tigrinus tigrinus, p. 312
- b. The length of the upper carnassial in three specimens is 11.9, 12.0 and 12.4 mm (see further p. 318); the width across the upper canines is 22.5, 22.6 and 23.8 mm. The breadth of the braincase is 42.9, 44.9 and 46.4 mm. The braincase is more rounded (pl. 88) *Leopardus wiedii vigens*, p. 316
- 15a. The nasals are produced so far forward in the middle that when the skull is viewed from above the foramen incisivum is not visible. The dorsal outline of the skull does not form a continuous arch, being interrupted at the front end of the nasals (pl. 89 upper figs.). In one specimen the length of the upper carnassial is 14.4 mm; the width across the upper canines is 27.3 mm.
Herpailurus yagouaroundi yagouaroundi, p. 323
- b. The nasals are deeply emarginate anteriorly, so that in dorsal view the foramen incisivum is clearly visible. The dorsal outline of the skull forms a continuous arch from the incisors to the os occipitale (pl. 86 upper figs.). In 22 skulls the length of the upper carnassial varies from 14.0 to 16.9 mm (mean: 15.4 mm), the width across the upper canines from 29.3 to 38.1 mm (mean: 33.4 mm).
Leopardus pardalis melanurus, p. 308

FAMILY CANIDAE

***Cerdocyon thous* (Linnaeus, 1766)**

Pl. 68 lower figure (animal), pl. 81 upper figures (skull)

Canis Thous Linnaeus, 1766, *Systema Naturae*, (ed. 12) 1: 60.

Type locality. — "Habitat in Surinamo".

Synonymies. — Cabrera, 1931: 59; Cabrera, 1958: 239-240; Hershkovitz, 1957: 158 (under *Dusicyon*); Langguth, 1969: 177-178; Tate, 1939: 201-203 (under *Dusicyon*).

Vernacular names. — (E) Savanna Fox, Crab-eating Dog; (N) Savannehond, Savannejakhals, Surinaamse Vos; (S) Sabanadagoe.

Distribution. — The species *Cerdocyon thous* (Linnaeus, 1766) "lives in open woodlands and in grasslands of South America as far south as southern Brazil, south-eastern Bolivia, Paraguay, northern Argentina, and Uruguay" (Walker, 1964 (2): 1162). The nominate subspecies *C. thous thous* occurs in the Guianas and in northern Brazil, including Marajó Island (Cabrera, 1958: 240).

Occurrence in Suriname. — The Savanna Fox is usually regarded to be rather common in the savannas of Suriname (e.g., Zanderij and Sipaliwini), and the surrounding wooded zones. I have examined the following Suriname material:

1. Sipaliwini savanna near the Vier-Gebroeders Mountains, close to the Brazilian border, south-eastern Nickerie District, 1 male and 1 female (nos. 21057, 20548, skins and skulls).
2. Savanna near Zanderij, about 40 km south of Paramaribo, Para District, 1 adult female (no. 16053, skull).
3. Suriname, without more precise locality indication, but probably not far from Paramaribo, 7 specimens (see Jentink, 1887: 77; 1892: 89, under *Lycalopex cancrivorus*).

Description. — According to oral information of hunters in Suriname and to the data found in the literature (e.g., Mivart, 1890: 59-60), the coat colour as well as the size of the Savanna Fox is subject to remarkable variations. The following description is based on the female specimen (no. 20548) of the Sipaliwini material, mentioned above. The dorsal parts of head and body are blackish, the head being finely grizzled with whitish, the back is more heavily lined with white or light buff. An indistinct median band of black hairs extends from the nape of the neck to the base of the tail; externally the ears are tawny in the basal half, black in the terminal half, while in the basal part whitish hairs are present. The sides of the body are grizzled with buff, they gradually pass into the ventral surface, which is whitish grey and light buff on the abdomen, greyish on the breast. The ventral surface of the lower jaw is black grizzled with white, sharply set off from the lighter brown, buffy colour of the throat. The forelegs and hind legs are blackish brown grizzled with white above, buffy beneath. The bushy, rather short tail is of the same colour as the back, and ends in a black tuft.

Dental formula: $I \frac{3}{3}, C \frac{1}{1}, P \frac{4}{4}, M \frac{3}{3}$. In the upper jaw the last premolar (carnassial) is much longer than broad; in the lower jaw the first molar is the longest tooth.

The variability of the number of molars is clearly shown by that the male (no. 21057) from Sipaliwini has three molars in each side of the upper jaw, while the female (no. 20548) from Sipaliwini has only two (see pl. 81 upper figs.). The male from Sipaliwini has only five upper incisors, the extreme right incisor being absent; the female has the normal six upper incisors. The second upper premolars of the female skull are placed in an oblique direction to the line of the arch, on the right side this is very distinct, it is less marked on the left side.

The following measurements are taken from the adult male and female from Sipaliwini: head and body, 590, 670; length of tail, without tuft, 276, 350; length of tail, including the tuft, 326, 385; hind foot, 146, 144; ear, 74, 77 mm. — Skull measurements: condylobasal length, 134.5, 139.7; palatal length, 70.4, 70.5; zygomatic breadth, 72.6, 77.6; interorbital constriction, 27.4, 25.9; postorbital constriction, 31.2, 29.6; breadth of braincase, 44.2, 45.5; length of upper tooth row (c-m²), 59.4, 60.5; length of upper carnassial, 12.9, 13.2; length of mandible, 103.3, 106.6; length of lower carnassial, 14.0, 15.1 mm.

Remarks. — The Savanna Fox is difficult to observe, on account of its mainly nocturnal mode of life. Walker (1964 (2): 1162) noted that the animal hunts singly or in pairs; its daytime retreat is usually a burrow dug by some other animal. Geijskes (1953) gave the following account of the Suriname Savanna Fox (in translation): 'The Savanna Fox lives on and near the savannas. It hunts at night in pairs or alone. The animals do not bark, but howl with a drawn out howl like the moon barking of dogs. The Amerindians fear this howling near their camps, as it is said to predict death. The food of the Savanna Fox consists of birds, frogs, insects and berries of savanna shrubs. Also carrion and dead animals are eaten. The Savanna Fox is not rare on the Suriname savannas, but because of its nocturnal habits it is rarely seen. Its tracks can often be found in the sand, these strongly resemble those of dogs'.

According to the brothers Penard ("De Surinamer", 20 July 1905) the Suriname Savanna Fox hunts, often in packs of six to ten individuals, on small mammals, birds, lizards and even deer and peccaries, while it sometimes causes damage to poultry farms. Hershkovitz (1957: 159), however, noted: "Very possibly plants, rather than animals, make up the greater bulk of the year-round diet of the zorro". Hershkovitz's remark is confirmed by observations made by Dr. D. C. Geijskes, who examined the contents of the stomach and intestines of the above mentioned specimen (no. 16053) shot near Zanderij. Dr. Geijskes (oral communication) stated that it consisted mainly of (1) a great number of small green or black fruits of *Humiria balsamifera* (Aublet) St. Hilaire, a shrub known locally as "blakaberi", (2) some unidentified leaves, and (3) a grey frog, which, as Dr. M. S. Hoogmoed informed me, most likely was *Leptodactylus fuscus* (Schneider), a species formerly better known under the name *L. sibilatrix* (Wied). The specimens taken near Sipaliwini were attracted by a refuse dump which contained both animal and vegetable matter. The formerly frequently used name *Canis cancrivorus* Desmarest, 1820, for

the Savanna Fox as well as the vernacular name "Crab-eating Dog" are misleading, because it is questionable whether this animal feeds on crabs at all.

Walker (1964 (2): 1162) remarked that: "It has definitely been established that during the dry season, in the llanos, these foxes may develop rabies". From this point of view it seems important that also in Suriname attention should be paid to the distribution and the biology of the Savanna Fox.

Suriname is the type locality of *Cerdocyon thous*. This makes it desirable to obtain a correct idea of the variability of the Suriname populations of this species as compared with the other described geographical races.

The names *Canis cancrivorus*, *Lycalopex cancrivorus* and *Duscicyon thous* have often been used in the literature on the mammals of Suriname.

***Speothos venaticus venaticus* (Lund, 1842)**

Pl. 68 upper figure (animal), pl. 81 lower figures (skull)

Cynogale venatica Lund, 1842, Kon. Danske Videnskabernes Selskabs Naturvidenskabelige Mathematiske Afhandlinger, 9: 201-203.

Type locality. — Region of Lagõa Santa, Minas Gerais State, Brazil, 19°39'S 43°44'W. In the original description no exact type locality is indicated, but Lund (1842: 201-202) stated that during his stay in Lagõa Santa, the two type specimens were obtained by him from a couple of mule drivers, who had caught them at the edge of a forest presumably near his home as one of the specimen was still alive when he got them (the other was dead). Lund, namely, had offered a reward for specimens of strange dogs about the existence of which he had received information from hunters.

Synonymies. — Cabrera, 1958: 241; Hershkovitz, 1957: 160-161; Langguth, 1969: 178.

Vernacular names. — (E) Bushdog; (N) Boshond; (S) Bus(i)dagoe.

Distribution. — The species *Speothos venaticus* (Lund, 1842) ranges from Panama southward to eastern Peru, northern Bolivia, northern Paraguay and south-eastern Brazil. The nominate subspecies *S. venaticus venaticus* is "known from eastern Colombia, the Guianas, Brazil, eastern Peru and northern Bolivia. The nominate race no doubt occurs in Venezuela, at least south of the Rio Orinoco, and possibly may be found in eastern Ecuador" (Hershkovitz, 1957: 160), while, according to Cabrera (1958: 241), it also occurs in northern Paraguay.

Occurrence in Suriname. — Sanderson (1949: 770), who obtained three specimens of the Bushdog from the Republiek-Zanderij savanna (see also Sanderson, 1939: 212-219), remarked: "In Suriname *Speothos* is confined to the open wet savannahs and the meandering tongues of grass that extend from these areas into the surrounding forests wherever the soil is sandy. It is well known to the natives and is fairly common". According to oral information, which Dr. D. C. Geijskes, around 1950, obtained from an Amerindian of the village Matta, west of Zanderij, the Bushdog is rather common there in the forest as well as in the savanna at the edge of

the forest. The Paramaribo newspaper "De West" of 9 May 1953 mentioned a Bushdog swimming across the Lawa River near Maripasoela, south-east Suriname. Kappler (1887: 62) noted: "Ein wilder Hund, *Ictycion venaticus*, soll im Innern vorkommen und in Rudeln jagen. Ich bin ihm zwar nie begegnet, doch brachte man mir einen halbgewachsenen lebend. Er war äusserst wild, frass nichts, und kläffte und knurrte, sobald man sich dem Käfige näherte, sodass ich ihn tötete". The brothers Penard ("De Surinamer", 20 July 1905) gave the following observation on this species (in translation): 'Bushdogs occur within the mangrove region. They pursue their prey in packs of sometimes two to three hundred individuals, so that at a certain moment they may occur somewhere in overwhelming numbers to disappear entirely from the area for months or years'. During my Suriname collecting trip of seven months in 1963 I did not obtain any specimens of the Bushdog, although special efforts were made to this end. Dr. D. C. Geijskes, who resided in Suriname from 1938 to 1965, and who is extremely well acquainted with the fauna of this country, never saw a Bushdog alive, while the efforts by other Dutch zoologists made in recent times likewise did not meet with success. Either the species is extremely rare in Suriname (and the other Guianas; see, e.g., Roth (1941: 55-56) who moreover stated: "it is alleged to hunt in packs, but in view of its rarity, this has not been confirmed definitely"), or it escapes the attention because of its mode of life; also the possibility exists that it occurs only very locally.

Description. — The most striking characters of *Speothos venaticus* are the elongated body, the short limbs, and the short bushy tail (see pl. 68 upper fig.). The general colour of the soft fur is very characteristic: more or less light golden brown on the head and the anterior part of the dorsal surface, while the rest is blackish brown all over. Since I have not seen specimens of the present species from Suriname, I quote here the description given by Sanderson (1949: 770) based on the material obtained by him from the Republiek-Zanderij savanna: "The pelage of head and neck was rusty, orange-brown — the hairs sparse, except on the nape of the neck, where they formed a slight crest which terminated posteriorly in an abrupt V-shaped line over the shoulders. Thence the dorsum and flanks are black, grizzled with rusty orange. This colour fades out at the base of the tail, which is jet black and bushy. The chest, fore-legs and what hairs there are on the underside were jet black. At the junction of the black, grizzled with rusty orange, of the throat, and the black of the chest, there was a pale pink, diamond-shaped patch. The pink tinge was not due to stain" (see also Sanderson, 1939: 212-230).

Dental formula: $I \frac{3}{3}, C \frac{1}{1}, P \frac{4}{4}, M \frac{1(-2)}{(1-2)}$. Usually a single upper molar, if a second is present this is always minute. In the literature therefore records of one upper molar (e.g., Colyer, 1936: 92; Ewer, 1973: 69) or two (e.g., Mivart, 1890: 193; Winge, 1895: 30, 117; Hershkovitz, 1957: 161; Hall & Kelson, 1959 (2): 842; Linares, 1968: 84, fig.) are to be found. Exceptionally also the second lower molar is absent. In all three skulls examined by me (see below) the second upper molar is absent, the second lower molar present.

Very little has been published on the external measurements of the species. Sanderson (1949: 770), basing himself on one male from Suriname, gave the following: head and body, 610; tail, 127; hind foot, 102; ear, 51 mm; weight, 5 kg. Hershkovitz (1957: 161) for an adult male from Colombia in the same order: 650; 150; 110; ear, from notch, 40 mm, while Linares (1968: 85) for a Venezuelan male noted: 730; 105; 110; 51 mm; weight, 5 kg. Walker (1964 (2): 1164) indicated that the length of head and body varies from 575 to 750 mm, and the length of the tail from 125 to 150 mm; moreover, he gave the weight of two males as 5 and 7 kg.

No skulls of specimens of *Speothos venaticus* from Suriname have been examined by me. Though Sanderson (1949: 760) noted that "the collections have gone to the British Museum (Natural History), London", the three specimens (2 males and 1 female), mentioned by him, could not be found there, as Dr. G. B. Corbet, Curator of Mammals, kindly informed me. Also no Suriname specimens have been preserved in the Leiden Museum. The following measurements are based on three skulls, present in the Leiden Museum: (1) the skull of the skeleton mentioned by Jentink (1887: 71) from Brazil, already dealt with and figured by Van der Hoeven (1856); (2) a female skull from Pará, Brazil (no. 3224, bought from Blazer Company in 1937), and (3) the male skull of a skeleton from Brazil (no. 3238, bought from Blazer Company in 1937). The measurements provided by Linares (1968: 85-86) from a Venezuelan male specimen are here added in parentheses. Condylobasal length, 114.5, 130.0, 137.8, (124); palatal length, 58.0, 61.5, 65.4, (61.5); zygomatic breadth, 66.1, 71.2, 76.8, (75.8); interorbital constriction, 26.0, 25.5, 29.0, (31.6); postorbital constriction, —, 22.6, 23.9, (26.5); breadth of braincase, 46.8, 47.3, 49.0; length of upper tooth-row (c-m¹), 39.8, 47.5, 51.2, (46.1); length of upper carnassial, 13.6, 12.3, 14.0, (13.5); length of mandible, 84.0, 94.9, 100.7, (91); length of lower carnassial, 14.1, 12.9, 13.7 mm.

Remarks. — Sanderson (1949: 770) noted on the Suriname Bushdog: "They spend the day in the abandoned burrows of armadillos and *Tamandua*. Into these they constantly retreat backwards. They appear to be unable to excavate burrows for themselves, though they scratch industriously in search of insects and other small animals". Penard's observations on the Suriname Bushdog have already been mentioned above. That the Bushdog is a good swimmer is already clear from the above cited remark that a specimen was caught crossing the Lawa River. This observation agrees quite well with those made by Bates (1944: 154) on the "beaverlike adaptation to an aquatic environment" of a captive specimen from Colombia: "The *Icticyon* seemed perfectly adapted to a semiaquatic life. She spent a good deal of time in the pool and could dive and swim under water with great facility".

Morris (1965: 263) gave the following information on the life history of the Bushdog: "During the day it sleeps in burrows, often on the banks of rivers or at the edge of the forest, emerging to hunt at dusk. It often hunts in packs of up to twelve animals, eating any small creature which the group can overcome. Rodents, in particular, form an important part of the diet, especially the large Paca (*Cuniculus paca*). Bushdogs are, in fact, normally found wherever Pacas occur. In parts of

Brazil young Bushdogs are caught and raised as pets. They are said to become tame readily, and to be intelligent". In the literature I found that the litter size varies from two to five pups.

Dr. D. C. Geijskes kindly provided me with the following information, which he obtained from the Indian Ebicilio of Matta, an Amerindian village in the Saramacca District, about 15 km west of Zanderij: The species is rather common near Zanderij where it is found in the forests and the savannas along the forests. It is diurnal and hunts in packs of 8 or more. When pursuing their prey, which they try to chase out of the forest on to the savannas, the bush dogs produce a high yelping or whining sound. They hunt mainly the konikoni, *Dasyprocta* sp. The nights are passed by them in hollow fallen trees. In the rainy season they produce a litter of 2 or 3 pups. They are very tough and bloodthirsty and only eat fresh meat. Young bushdog pups are readily raised by the Amerindians and trained to become hunting dogs, in which they are quite succesful. The meat of the bushdog is not eaten by the Amerindians.

In the older literature on the mammals of Suriname the generic name *Icticyon* was often used instead of *Speothos*.

FAMILY PROCYONIDAE

***Procyon cancrivorus cancrivorus* (G. Cuvier, 1798)**

Pl. 69 lower figure (animal), pl. 83 upper figures (skull)

Ursus cancrivorus G. Cuvier, 1798, Tableau élémentaire Hist. nat. animaux: 113 (see further under Remarks).

Type locality. — "Se trouve à Cayenne" (French Guiana).

Synonymies. — Cabrera, 1958: 243; Goldman, 1950: 80-83.

Vernacular names. — (E) Crab-eating Raccoon; (N) Wasbeer; (S) Krabdagoe.

Distribution. — The species *Procyon cancrivorus* (G. Cuvier, 1798) occurs from Costa Rica eastward into South America, where it has been reported from Colombia, Venezuela, the Guianas, Trinidad, Brazil, Paraguay, north-eastern Argentina and north-western Uruguay. The subspecies *P. cancrivorus cancrivorus* is known from Venezuela, Trinidad, the Guianas, northern and central Brazil.

Occurrence in Suriname. — Sanderson (1949: 771) gave the following information on the occurrence of the present species in Suriname: "The Crab-eating Raccoon is common in the littoral mangrove swamps, and ranges thence up the rivers and creeks to the tidal limits. It is also common on the plantations and cultivated lands that lie adjacent to the littoral zone. Many litters of young were offered for sale between February and June. All had been taken from the pits of hollow trees". The brothers Penard ("De Surinamer", 27 July 1905) already remarked that the animal could be encountered in the centre of Paramaribo (where each year several were shot) and that during the night their yapping could always be heard in close proximity of the town. These statements agree with my own observations in 1963 and with the material that I could examine:

1. Coronie beach, north of Totness, Coronie District, 1 specimen (no. 20654, skull).
2. Forest near Brasil, 50.5 km west of Paramaribo, Saramacca District, 1 male (no. 20643, skin and skull).
3. Near Uitkijk, right bank of Saramacca River, 25 km west of Paramaribo, Suriname District, 1 male (no. 21663, skull).
4. Plantation "Clevia", west bank of Suriname River north-east of Paramaribo, 1 male (no. 20645, skin and skull).
5. Agricultural Experimental Station (Cultuurtuin), Paramaribo, 1 male (no. 20646, skull), 1 female (no. 18022, skin).
6. Paramaribo, 2 males (no. 20647, skull; no. 21664, skin and skull), 1 female (no. 20992, skin), 7 skulls (nos. 20648-20652, 20655, 20656).
7. Near Domburg, west bank of Suriname River, about 16 km south-east of Paramaribo, Suriname District, 1 male (no. 17781, skin and skull).
8. Near Matapica, north of Alliance, about 35 km east of Paramaribo, Commewijne District, 1 female with 5 young, found in a hollow tree.

Description. — The following description is based on five specimens from Suriname viz., three males (nos. 17781, 20643, 20645) and two females (nos. 18022, 20992), all collected near Paramaribo. The most striking feature of the head is the presence of a black ring around each eye, the two rings being connected in the middle by a black band which in forward direction extends almost to the rhinarium. This black face mask gives the animals a "highway-robber" look. Above each eye there is a light transverse spot which even more strongly accentuates the black mask. The forehead is dark grey, grizzled with whitish. The implantation of the hairs forms a whorl on the top of the head, from which a line extends towards the bases of the ears. On the neck, like on the back, the whitish colour is replaced by brownish. The ears are relatively large; the outside is of a greyish colour in the basal part, the top and side margins becoming much lighter, while the inside fur is of a whitish colour. The back and the basal part of the outside of the legs are blackish brown, heavily grizzled with pale brown or golden yellowish, this brown colour dominates on the sides where it often has a more cinnamon tinge; on the back the black and brown colours are usually of the same intensity. The colour of the fur of the greater distal part of the legs is uniformly blackish or reddish brown; the hairs become very sparse distally. The tail is quite characteristically banded with blackish and greyish or brownish over its full length, there being five to seven, usually six black rings, which are about as wide as the greyish rings with which they alternate. The tip of the tail is bushy and black.

The ventral surface of the body is much paler than the dorsal. The throat and chin are whitish, pale greyish, pale brownish or orange brown. In the lower part of the throat there sometimes are indications of a brownish throat band, which, however, always is very widely interrupted in the middle and usually is only visible in the extreme lateral parts. The ventral part of the body between the legs is of the same colour as the throat or slightly darker; it passes gradually into the colour of the sides, no demarcation being visible. The basal part of the inside of the legs is of the same colour as the ventral part of the body. The distal part of the inside of the legs is of the same colour as the outside or slightly lighter. Ventrally the basal part

of the tail shows the same colour as the ventral part of the body or is more brownish or orange, the larger distal part is of the same colour ventrally and dorsally.

Dental formula: $I \frac{3}{3}$, $C \frac{1}{1}$, $P \frac{4}{4}$, $M \frac{2}{2}$. In both jaws the first premolar is distinctly dentiform, the second and the third are somewhat more molariform. The fourth premolar (the largest of the four) is distinctly molariform, and quadrate in outline; the upper is wider and heavier than the lower. The first upper molar is about of the same size as the last upper premolar and is distinctly larger than the second upper molar. The first lower molar is distinctly larger than the last lower premolar, it is also larger than the second lower molar, which is slightly larger than the last lower premolar.

The external measurements of one female (no. 18022) and three males (nos. 17781, 20645, 20643) are, respectively: head and body, 562, 545, 588 and 650; tail, with tuft, 327, 275, 353 and 320; hind foot, with claw, 136, 137, 145 and 150; ear, 52, 55, 52 and 50 mm; weight, 6270, —, 7750, and 7500 grams. Sanderson (1949: 770) gave as external measurements of an adult female from Suriname: head and body, 645; tail, 330; hind foot, 142; ear, 52 mm, while he noted that the weight of "an average specimen" was 4082 grams.

In Table 40 the skull measurements of ten specimens, mentioned under Occurrence in Suriname, are given; the greatest length of the skull, as given here, is the distance between the anteriormost border of the premaxilla and the posteriormost border of the lambdoidal crest.

TABLE 40
Skull measurements of ten specimens of *Procyon cancrivorus cancrivorus* (G. Cuvier) from Suriname in the Leiden Museum.

Reg. number	21664	21663	20647	20643	20645	20648	20656	20652	20655	20651
Sex	♂	♂	♂	♂	♂	-	-	-	-	-
Greatest length	129.8	135.9	137.8	135.5	133.5	130.9	133.3	134.1	137.0	142.7
Condylbasal length	123.2	131.9	132.3	132.0	128.2	126.4	126.7	130.1	130.5	137.4
Palatal length	74.3	75.4	76.6	76.3	76.0	73.1	72.6	76.1	76.8	78.0
Zygomatic breadth	86.5	90.4	86.1	89.0	85.8	87.5	88.2	87.8	90.5	96.0
Interorbital constriction	27.4	27.2	31.2	27.9	29.2	27.9	29.0	28.8	30.6	29.2
Postorbital constriction	25.3	24.7	31.5	25.6	28.2	25.7	27.1	26.9	28.7	26.9
Breadth of braincase	55.7	56.4	57.6	58.2	56.0	55.2	55.2	56.6	59.7	57.5
Upper tooth-row $c-m^2$	47.7	50.5	50.3	51.5	49.1	48.9	49.3	50.3	50.6	53.6
Length first upper molar	10.5	11.1	11.0	10.8	11.2	10.7	10.7	10.7	11.1	11.3
Breadth first upper molar	11.6	12.2	12.9	12.2	12.6	12.4	11.9	11.3	11.8	12.5
Width across canines	29.8	32.4	33.0	31.6	30.5	31.5	31.0	30.7	32.0	35.3
Length of mandible	94.0	101.3	99.4	101.2	96.3	96.2	97.2	98.0	99.2	103.0
Length first lower molar	12.5	12.8	13.3	12.9	13.5	13.5	12.7	12.7	12.7	13.9
Breadth first lower molar	8.9	9.1	9.6	9.3	9.3	9.2	9.2	9.2	9.1	9.4

Remarks. — The mainly nocturnal *Procyon cancrivorus* is omnivorous; it feeds not only on small aquatic animals (crabs, prawns, frogs, water snails), but likewise on small birds, rodents, large insects, etc., while also vegetable matter (fruits, nuts and corn) is eaten. The animals may cause some damage to native gardens, and especially to melon plantations.

In Suriname, according to the brothers Penard ("De Surinamer", 27 July 1905), the Crab-eating Raccoons, because of their omnivorous habits and the fact that they live close to human habitations, can cause considerable damage to the fruit trees and to the chicken farms. Furthermore the Penards remarked that during the time that the land crabs (probably *Ucides cordatus* (Linnaeus, 1763) is meant) migrate from the interior to the sea, they are intensively hunted by Raccoons, which kills very large numbers of them. A good account on how Raccoons kill and eat crabs is given by Durrell (1958: 157), who made his observations in British Guiana: "When we were moored for the night, I caught some river crabs and put them in with the raccoon to show Bob the reason for the animal's strange performance. When he [the raccoon] saw the crabs he surveyed them with a slightly worried expression, and then, choosing a large one, he squatted down in front of it and began to pat and stroke it swiftly and gently, occasionally stopping and shaking his paws. The crab made wild lunges with its pincers, but the raccoon's paws were too swift to be caught; then it retreated, but the raccoon followed it, still patting. After ten minutes of this the crab, though quite undamaged, was exhausted and had given up trying to defend itself with its pincers. This was the moment the raccoon had been waiting for: he leant forward suddenly and bit the unfortunate crab in half. Then he sat back and mournfully watched its death throes; when it had stopped twitching he picked it up daintily between the tips of his toes and popped it into his mouth, scrunching and swallowing with a look of acute melancholy on his face". Sanderson (1949: 771) gave a very similar account.

The Penards mentioned that the Crab-eating Raccoon first grabs the crabs and bites off the chelae. After that the shell is broken and the animal is eaten. This account may be based on that given by Schomburgk (1848: 443) who stated: "So wie er [the Raccoon] eine Krabbe gefangen, beisst er ihr zuvörderst die Scheeren ab, um die Beute ruhig verzehren zu können". The story that the Crab-eating Raccoon catches the crabs by inserting its tail in the crab burrow and then pulling out the crabs that have grabbed hold of the tail, is an old and fantastic story, dating back to Buffon (see Holthuis, 1959: 45).

Most authors consider 1798 the date of publication of Cuvier's *Tableau*, because it (according to the title page) was published in "An 6" (de la République), i.e., between 22 September 1797 and 21 September 1798. The "*Tableau*" has been reviewed in the "Bulletin des sciences, par la Société philomathique de Paris", 2(10): 79, 80. This issue of the Bulletin was dated "Nivôse an 6 de la République, Janvier 1798" and therefore was published between 1 and 19 January 1798, since the month Nivôse of An VI extends from 21 December 1797 to 19 January 1798. It seems more likely, therefore, that the "*Tableau*" was published in 1797 than just in the beginning of January 1798, but for the time being it should be dated 1798, as 19 January 1798 is the earliest date of which we know with certainty that the book was out.

***Nasua nasua vittata* Tschudi, 1844**

Pl. 69 upper figure (animal), pl. 83 lower figures (skull)

Nasua vittata Tschudi, 1844, Untersuchungen über die Fauna Peruana, 1: 101-102.

Type locality. — "Aus dem Innern von Guyana" (= British Guiana).

Synonymies. — Cabrera, 1958: 248-249; Tate, 1939: 199-201.

Vernacular names. — (E) Coati; (N) Neusbeer; (S) Kwaskwasi.

Distribution. — The species *Nasua nasua* (Linnaeus, 1766) occurs in South America as far south as northern Uruguay. According to Cabrera (1958: 247, 248) the nominate subspecies *N. nasua nasua*, of which the restricted type locality is Pernambuco (north-eastern Brazil), occurs in north-eastern Brazil and French Guiana, while *N. nasua vittata* is known from Venezuela east of the Orinoco, British Guiana and Suriname.

Occurrence in Suriname. — The brothers Penard ("De Surinamer", 27 July 1905) noted that the Coati occurs throughout the country, especially, however, in the lower regions. The material examined by me indicates that the Coati seems to be rather common in all Suriname forests from the coastal plain to the Brazilian border. Specimens of the following localities have been studied by me, all collected in forests:

1. Near Cupido on the Maratakka River about 12 km south of Wageningen, northern Nickerie District, 1 male (no. 22858, skin and skull).
2. Upper Nickerie River, 1 female (no. 17970, skin and skull).
3. Lucie River, eastern tributary of Corantijn River, 2 males (nos. 18263, 18264, skins).
4. Neighbourhood of Sipaliwini airstrip, near Brazilian border, extreme south-eastern Nickerie District, 1 male (no. 22859, skin and skull).
5. Neighbourhood of Lelydorp, about 15 km south of Paramaribo, Suriname District, 1 semi-adult female (no. 18257, skin and skull).
6. Morico Creek on Oost-Westverbinding, 20 km east of Paramaribo, Commewijne District, 1 male (no. 18265, skin and skull).
7. Near Peninika boarding school, near confluence of upper Commewijne River and Peninica Creek, Commewijne District, 2 males (nos. 18266, 18267, skins and skulls).
8. Coastal region between Moengotapoe and Wiawia bank, northern Marowijne District, 1 female and 5 males (nos. 18268, 18269, 18271-18274, skins and skulls).
9. Area between Marowijne River and Nassau Mts., 4°45'N, Marowijne District, 1 female and 1 juvenile (nos. 18270, 12545, skins and skulls).

Description. — The present description is mainly based on three Suriname specimens (nos. 18263, 18267, 22859). The ground colour of the dorsal surface is dark brown or blackish brown, the fur consists of two types of hairs, those of one type are dark brown all over, those of the other type are yellowish with a dark brown tip. The snout is uniformly dark, the front shows more yellow hairs, becoming thereby more grizzled. On each half of the face there are three distinct whitish spots: one over the eye, one below it and one halfway between the eye and the ear on a lower level than the eye. Dark longitudinal lines seem to extend over the snout, but this is mainly due to the lighting under which the snout is seen. The outside of the ears is uniformly dark. On the neck and the anterior part of the back, the yellowish hairs are most distinct, giving the area a golden tinge heavily lined with black. The

posterior part of the back, especially on the sides, is uniformly blackish. The outside of the forelegs and hind legs is blackish, in some specimens heavily lined with white resulting in a silvery shine; these white hairs sometimes are very distinct and sometimes less so or even absent, in some specimens even the forelegs are silvery and the hind legs not. The basal part of the inside of the legs shows the same colour as the ventral surface; in the distal part, however, the colour is more like that of the outside of the legs. Both surfaces of the tail show the same colour as the posterior half of the back; a number (six or seven) of light cinnamon rings is present in the proximal two-thirds or three-fourths of the tail. The black rings separating the cinnamon ones are about three times as wide as the latter. Sometimes the pale rings are very indistinct.

The ventral surface of the body is of a light brown colour, in some specimens being more orange tan, in others more pale yellowish grey or brown mixed with grey; the throat (not including the upper lip) is more brownish.

Sanderson (1949: 771-772) gave an extensive description of an adult female from Suriname, which he named also *Nasua vittata*; his description agrees very well with our specimens. Sanderson, however, when comparing his Suriname female with specimens of *Nasua vittata* from British Guiana, noted that the latter have "dark heads and almost black legs and feet in direct contradistinction to the present specimen [from Suriname]".

The species is readily distinguished by its long attenuate and flexible snout, by its long ringed tail, which is not prehensile but functions as a balancing organ, and by its general colouration.

Dental formula: $I \frac{3}{3}, C \frac{1}{1}, P \frac{4}{4}, M \frac{2}{2}$. The most striking characters of the skull of the Coati, in which it differs from all other Suriname carnivores, are: (1) the greatly elongated and laterally compressed rostrum, (2) the palate ending far behind the last molars, and (3) the laterally compressed canines (see pl. 83 lower figs.). The auditory bullae are remarkably small. In both jaws the first three premolars are dentiform, the fourth is molariform. The last (fourth) upper premolar is quadrangular with the inner anterior angle somewhat produced; it is about as large as the first molar. The second upper molar is about as wide as the first, but is slightly shorter. The first lower molar is somewhat larger than both the last (fourth) premolar and the last molar.

In Table 41 the external measurements of six specimens of *Nasua nasua vittata* from Suriname are noted; in parentheses are added the measurements of an adult female from Suriname mentioned by Sanderson (1949: 771). In Table 42 the skull measurements of ten Suriname specimens are given; the register numbers provided with an asterisk are those of specimens with a well developed sagittal crest. The greatest length of the skull as given here is the distance between the anteriormost border of the premaxilla and the posteriormost border of the lambdoidal crest.

Remarks. — Kappler (1881: 157; 1887: 61) remarked that the Amerindians eat the meat of the Coati, notwithstanding the peculiar scent of the animals; this is

TABLE 41

External measurements of six specimens of *Nasua nasua vittata* Tschudi from Suriname in the Leiden Museum.

Reg. number	18263	18264	18267	22859	22858	-
Sex	♂	♂	♂	♂	♂	♀
Head and body	483	565	508	565	539	(525)
Tail, without tuft	-	445	458	460	415	(430)
Tail, with tuft	460	465	474	475	428	-
Hind foot, with claw	92	92	94	95	95	-
Hind foot, without claw	-	-	-	88	86	(83)
Ear	42	40	41	39	38	(40)
Weight, grams	3000	4500	3750	-	4200	(3000)

TABLE 42

Skull measurements of ten specimens of *Nasua nasua vittata* Tschudi from Suriname in the Leiden Museum.

Reg. number	18257	17970	18274	18267*	22859*	22858*	18268*	18266*	18271*	18273*
Sex	♀	♀	♀	♂	♂	♂	-	-	-	-
Greatest length	108.8	112.6	116.0	124.5	-	118.8	125.2	116.6	122.3	122.3
Condylbasal length	102.4	106.1	110.7	118.2	-	113.3	118.6	111.4	115.8	115.7
Palatal length	67.4	69.3	71.8	76.6	72.4	74.1	76.4	70.6	73.4	72.1
Zygomatic breadth	51.6	57.4	56.4	67.3	-	64.4	69.4	63.6	68.0	67.7
Interorbital constriction	21.7	23.4	23.0	23.0	25.5	23.2	25.0	23.0	25.0	25.5
Postorbital constriction	27.1	24.6	23.5	22.8	25.5	24.7	23.7	23.6	27.9	25.9
Breadth of braincase	42.3	42.1	41.4	42.5	-	40.3	43.8	40.8	43.7	41.7
Upper tooth-row $c-m^2$	42.4	42.8	45.4	45.5	47.0	45.1	46.4	43.9	44.9	46.1
Length first upper molar	7.7	7.7	7.3	7.3	7.7	7.3	7.0	7.5	7.7	7.6
Breadth first upper molar	7.1	6.7	7.4	6.8	7.4	6.8	6.8	6.6	7.4	6.5
Width across canines	17.0	17.3	18.5	22.3	22.5	21.3	22.5	20.0	22.0	22.7
Length of mandible	75.0	78.6	82.7	87.5	83.2	84.2	88.2	81.8	85.4	86.0
Length first lower molar	8.4	7.9	8.1	7.8	8.2	8.5	6.6	7.6	7.7	8.0
Breadth first lower molar	5.3	5.2	5.6	5.0	5.5	5.5	5.2	4.9	5.0	5.0

rather surprising since they do not eat the Crab-eating Raccoon, because of its unpleasant scent.

Kappler (1881: 157) gave the following account of his observations on the Suriname Coati: "Auch das Coati, *Nasua socialis*, hier Kwassikwassi genannt, lebt gesellig, ich habe mehrere Male Rudel von 20 oder mehr Stücken begegnet, ohne dass sie mich bemerkten. Sie durchstöbern mit ihrer langen Nase den Boden und das verfaulte Holz nach Insekten, klettern auch auf Bäume, bleiben aber nicht lange oben, sondern beeilen sich, dem andern Haufen nachzukommen. Während ihres Marsches knurren und winseln sie beständig und man hört sie schon von weitem kommen. Jung gefangen werden sie sehr zahm und bald durch ihre Zutraulichkeit lästig. Sie haben einen eigenthümlichen Geruch an sich, werden aber von Indianern gerne gegessen und sind oft sehr fett. In der Gefangenschaft fressen Sie alles, stellen aber, wenn man sie frei herumlaufen lässt, dem Federvieh nach. Gelehrig sind sie nicht und scheinen wenig Intelligenz zu haben".

In his 1887 book (on page 61) Kappler noted: "Während dieser [= *Procyon*

cancrivorus] einsam und nur bei Nacht herumstreicht, findet man seinen Verwandten, das Kwassi oder Nasenbär, *Nasua socialis*, bei Tag und in Rudeln von einigen Dutzenden in den Waldungen, indem es unter immerwährenden Winseln und Pfeifen die auf dem Boden liegenden Holzstücke und das Laub umdreht, um nach Larven und Insekten zu suchen, während andere auf den Bäumen nach Vogeleiern suchen. Sie sind in immerwährender Bewegung und scheinen einem Führer zu folgen. Überrascht man sie auf ihren Zügen, so springen oder purzeln sie von den Bäumen herunter, und der ganze Haufen macht sich unter immerwährendem Pfeifen aus dem Staube. . . . Jung gefangen werden sie sehr zahm, ja durch ihre grosse Zudringlichkeit lästig, indem sie beständig bei dem Menschen bleiben und mit ihm spielen wollen. Sie lecken Gesicht, Nase und Ohren und lassen sich nicht vertreiben".

Dr. D. C. Geijskes gave the following information about this species, obtained from Amerindians. The Kwaskwasi lives in groups and is more a terrestrial than an arboreal animal, although it does climb trees. When a group is disturbed, the animals that are in the trees will come down immediately and run away on the ground. The animals sleep in fallen hollow logs. Their food consists of fruit and of worms and insect larvae which are obtained by grubbing around in the ground and rotten wood. The sense of smell of the Kwaskwasi is well developed. The animals can run quite fast, but are usually overtaken by dogs, which seem to be one of their worst enemies. In a fight with a dog, the kwaskwasi will go for the throat of its opponent, and it usually comes out of the fight as the winner. The litter of the species consists of two or three young. The informant did not know when the young are born, but he had seen some in July.

According to the brothers Penard ("De Surinamer", 27 July 1905) the Coati feeds on insects, birds, eggs and fruits; the animal causes damage to the native gardens and poultry. An interesting account of the behaviour of a Suriname Coati, which was held as a pet, was given by Meyer-Thierens (1959).

Walker (1964 (2): 1183), summarizing data found in the literature, stated: "Males or females, particularly old animals, often are solitary, but coatis usually live in bands of 5 or 6 to 40 individuals. . . . Coatis are active day and night, perhaps most active during the day, and they rest during the heat of the day in ground shelters or in trees. . . . Coatis are omnivorous, feeding on available plant and animal matter and overlooking little. The highly mobile snout is well adapted to investigate crevices and holes. Coatis forage in trees as well as on the ground, using the tail as a balancing and semiprehensile organ. . . . From two to six young are born in spring or early summer after a gestation period of about 77 days".

The systematic position of the subspecies *vittata* is not quite clear; the variation in the coat colour of my Suriname material at hand makes it necessary to compare it with the nominate form *N. nasua nasua*. For the time being, however, I follow Cabrera's opinion, who considered the Suriname Coati to belong to the present subspecies *N. nasua vittata*.

In the literature on Suriname mammals the names *Nasua socialis* Wied, 1826,

Nasua phaeocephala J. A. Allen, 1904, *Nasua rufa* Desmarest, 1820, and *Nasua narica* (F. Cuvier, 1817) have been commonly used for the present species.

Potos flavus flavus (Schreber, 1774)

Text-figs. 39a (animal), 39b (head), 39c (front leg), 39d (hind leg), pl. 70 upper figure (animal), pl. 82 upper figures (skull)

Lemur flavus Schreber, 1774, Die Säugthiere, 1 (9): 187, index (see further under Remarks).

Type locality. — “Er ist, der Sage nach, auf den Gebirgen in Jamaica einheimisch” (Schreber, 1774, 1(9): 145). This type locality indication by Schreber is clearly based upon that by Pennant (1771, A synopsis of Quadrupeds: 138), who stated that his “Yellow Maucauco” was “shewn about three years ago in London: its keeper said it came from the mountains of Jamaica”. As Thomas (1902: 267) pointed out, this locality is certainly erroneous. Thomas’s corrected type locality “Surinam” may therefore be accepted. Some authors, e.g., Tate (1939: 199) and Cabrera (1958: 251) both interpreted Thomas’s remark incorrectly and gave British Guiana as the corrected type locality.

Synonymies. — Cabrera, 1958: 251; Tate, 1939: 198-199.

Vernacular names. — (E) Kinkajou, Night Ape; (N) Rolbeer, Rolstaartbeer, Nachtaap; (S) Kinkajoe, Neti-keskesi.

Distribution. — The species *Potos flavus* (Schreber, 1774) occurs from south-eastern Mexico south-eastward into South America, where it has been reported from Colombia, Ecuador, north-western Peru, Venezuela, the Guianas, and the greater part of Brazil. The nominate subspecies *P. flavus flavus* ranges probably from eastern Venezuela through the Guianas into the Amazon region (Brazil Amazonico).

Occurrence in Suriname. — According to Sanderson (1949: 771) the Kinkajou is “fairly common in tall virgin forests in foothill country but only south of the savannahs”. During the “Operation Gwamba” 67 specimens were saved in the Brokopondo region (Walsh & Gannon, 1967: 218). The few known Suriname localities certainly do not give a correct idea of the distribution of the species in Suriname. I have examined the following material:

1. Dijkveld, about 5 km south of Paramaribo, Suriname District, 1 female (no. 17773, skin and skull).
2. Ridge 8 between Moengotapoe and the Wiawia Bank, coastal region of Marowijne District, 1 female (no. 18293, skin and skull).
3. Nassau Mountains, west of the Marowijne River at about 4°45'N, Marowijne District, 1 female (no. 18294, skin and skull).
4. Suriname, without more precise locality indication, from Rotterdam Zoo, 1 male (no. 1161, skin and skull), 1 male and 1 female (see Jentink, 1887: 106; 1892: 132, under *Cercoleptes caudivolvulus*).

Description. — The following description is based on the three female specimens nos. 17773, 18293 and 18294. The head is rounded with a short face and large eyes. The fur is thick, soft and woolly. The tail is long, thickly furred up to tip and prehensile, the latter character being unique among carnivores. The dorsal surface of

the body (including the outside of the legs, and the entire dorsal plus the greater ventral part of the tail) is of a rather uniform brownish colour, which comes closest to buckthorn brown, but is very difficult to define as it changes considerably under different lighting. This is caused by that there are two types of hairs, the one being light yellowish all over, the other being dark brown distally; the light hairs reflect

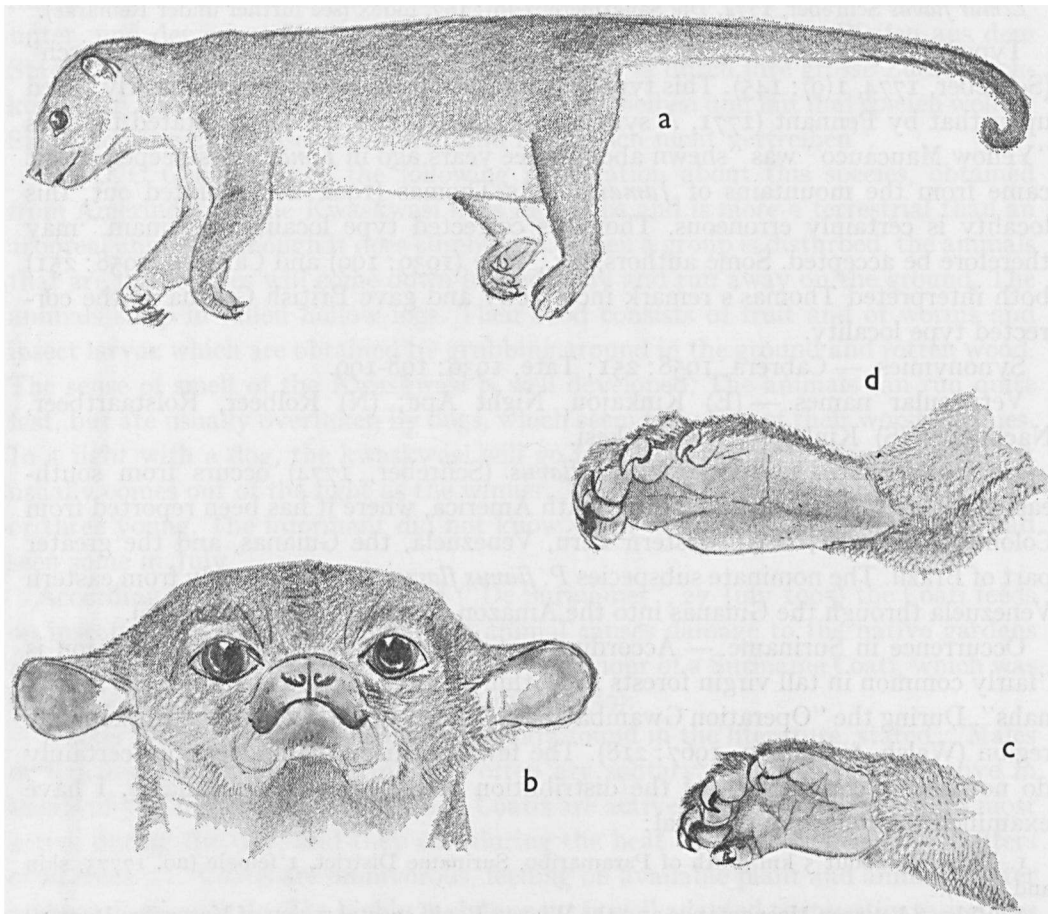


Fig. 39. *Potos flavus* (Schreber), female (no. 18293) from between Moengotapoe and Wiawia Bank. a, animal in lateral view; b, head in frontal view; c, right front leg; d, right hind leg. D. C. Geijskes del.

the light much stronger than the brown. This peculiarity of the fur often causes the impression that dark lines or light spots are present, where, at a closer inspection, they prove to lack. Many photographs found in the literature made after living specimens show a dark median line on the face and light spots over the eyes, which are totally absent in the preserved material examined by me. The only actual dark line that I can find in my material is a median line extending over the back. This

line is quite faint or absent in the anterior part, but in all specimens it is distinct in or behind the middle of the distance between front and hind legs. The ventral surface, including the throat, the inner sides of the legs and the basal ventral part of the tail, is much lighter and more yellowish than the dorsal surface, being slightly orange on the throat.

Dental formula: $I \frac{3}{3}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{2}{2}$. In dorsal or ventral view the skull has a quite characteristic quadrangular outline, because the left and right zygomatic arches are more parallel and less strongly converging anteriorly than in the other Suriname Carnivora. In the upper jaw the first premolar is dentiform, the second is somewhat more molariform, while the third is quadrangular with the inner margin slightly narrower than the outer; the first upper molar is broadly quadrangular, of the same width as the last premolar or slightly wider, while the second upper molar is somewhat smaller than the last premolar. In the lower jaw the first and the second premolars are dentiform, the last premolar being more molariform; the first lower molar is elongate quadrangular with the upper face remarkably flat or concave, without tubercles, while the second lower molar is slightly more triangular and slightly shorter than the first, but otherwise quite similar.

The external measurements of the adult female from Dijkveld (no. 17773) are: head and body, 405; tail, 450; hind foot, 89; ear, 38 mm; weight, 1650 grams. Sanderson (1949: 771) gave as average measurements of two males from Suriname (an accurate locality was not given): head and body, 441; tail, 408; hind foot, 83; ear, 42 mm; weight, 1624 grams, while he noted that the "largest [was] weighing 2 kilos".

In Table 43 some skull measurements of three specimens are noted.

Remarks. — The meat of the Kinkajou has an excellent taste and is eaten by the Amerindians (oral information).

The Kinkajou is a nocturnal, arboreal animal, sleeping by day in hollow trees,

TABLE 43
Skull measurements of three specimens of *Potos flavus flavus* (Schreber) from Suriname in the Leiden Museum.

Reg. number	18294	18293	17773
Sex	♀	♀	♀
Condylbasal length	76.3	76.0	74.7
Palatal length	31.7	35.9	29.6
Zygomatic breadth	55.2	52.0	52.4
Interorbital constriction	18.7	17.9	18.0
Postorbital constriction	19.3	21.7	20.4
Breadth of braincase	36.2	36.5	36.4
Length of upper tooth-row c-m ²	21.7	23.4	21.1
Third upper premolar, l x br	4.0x4.5	4.8x5.5	3.7x4.9
First upper molar, l x br	4.0x5.0	5.3x5.9	4.0x5.0
Width across canines	19.6	19.6	19.7
Length of mandible	55.3	53.0	51.5
Third lower premolar, l x br	4.2x2.9	4.7x3.4	4.6x3.0
First lower molar, l x br	5.0x3.4	5.7x4.4	5.0x3.7

and leaving these after nightfall in its search for food. The food consists mainly of fruit and honey, also small mammals, birds and insects are eaten. The preference of the animal for honey was also mentioned by the brothers Penard ("De Surinamer", 27 July 1905), while Walsh & Gannon (1967: 169) used the name "Honey Bear" for this animal. The nocturnal habit probably is the reason why the present species was so seldom captured by scientific collectors. The brothers Penard remarked that the Kinkajou is not very rare in Suriname, but that the animal by its nocturnal mode of life is rarely observed. This statement is illustrated by the fact that during the "Operation Gwamba" 67 specimens were saved in the Brokopondo region. In the introduction to the order Primates (see page 206) it has been mentioned that the Kinkajou at night is attracted by light.

The vernacular names "Night-ape" and "Neti-keskesi" point to the belief of many people that the Kinkajou is a monkey and not a carnivore. "Surinaamers, like the natives of most other countries where the kinkajou is found, cannot be shaken in their belief that this animal is a monkey" (Sanderson, 1949: 771).

Kappler (1887: 62) obtained a Kinkajou as a juvenile from Amerindians; he held it for more than a year as a pet, the animal becoming very tame: "Niemand wusste, wo er über Tag sich aufhielt. Sobald wir uns abends zu Tische setzten, kam Wawa, wie wir ihn hiessen, und ergötzte uns durch seine possierlichen Liebkosungen, worunter auch gehörte, dass er mir sein langes Züngchen in Mund, Ohren und Nase zu strecken suchte. Er frass reife Bananen und andere Früchte. Wenn man das Haus schloss, wurde Wawa vor die Thüre gesetzt und bestieg dann die Brotfrucht-, Kokos- oder Avigato Bäume, denn auf dem Boden hielt er sich nicht gerne auf. Ich hatte ihn über ein Jahr, als er plötzlich starb".

Dr. D. C. Geijskes (personal communication) mentioned that the species is mostly found in the rain forests, but also in forests of the savanna region. The animals sleep in the daytime in hollow trees and hollow branches, and at night climb around among the branches of the high trees. They hunt solitary or in pairs, but even then are never close together. They are said to attack small monkeys, like Tamarins (*Saguinus midas*) and birds, and also steal bird eggs. Fruit is likewise eaten, e.g., that of the bolletrie (*Manilkara bidentata* (A.DC) Chev., Sapotaceae). They are attracted by light (campfires, lanterns, etc.), and their eyes shine in the dark like two little lights. They make a sneezing sound. The young are said to be born in April and May. Females are seen with only a single young.

The systematics of the genus *Potos* and its described forms is not quite clear. Since Suriname is the type locality of *Potos flavus* it would be important to obtain a correct idea about the variability in size and colour of the typical form in order to compare it with populations from other regions. As of so many other Suriname mammals, much more material must become available before such a study can be undertaken with some success. The nomenclature of this species is rather complicated. After it had been known for a very long time as *Cercoleptes caudivolvulus* (Schreber, 1777), Thomas (1902: 266) used the name *Potos flavus* (Schreber) for the

species, stating that "Mr. Palmer has shown its name to be" such. Unfortunately Thomas did not say to which publication of Palmer he was referring, possibly to Palmer's (1897) paper in which on p. 174 it is shown that *Potos* Cuvier & Geoffroy, 1795, is the correct name of the genus. However, in the cited paper nothing was mentioned by Palmer concerning the specific name *flavus*.

This specific name was first used by Schreber (1774, Die Säugthiere, 1: 187) in the index to the first volume of his work. In this index under the name "*Lemur flavus* Penn." Schreber referred (1) to plate 42 of his own work, (2) to p. 145 of his own work, and (3) to "Pennant *syn. tab.* 16. f. 2". On p. 145 of his text Schreber dealt with the "Yellow Maucauco. Penn. *syn.* p. 138 n. 108 *tab.* 16 *fig.* 2" and also referred to his own pl. 42. Schreber's description is an abbreviated translation of that by Pennant (1771) of his Yellow Maucauco. Pennant's (1771: 138, pl. 16 *fig.* II) description and figure unmistakably show his animal to belong to the present species. Schreber's plate 42, however, depicts an entirely different species, the animal shown there clearly belonging to *Lemur mongoz* Linnaeus, 1766, from Madagascar. This plate bears the legend "Lemur Simia-Sciurus Petiv.", which is correct in so far that the species described and figured by Petiver (1704, *Gazophylacii Naturae et Artis*, (2): 26, pl. 17 *fig.* 5) under the name *Simia sciurus* indeed belongs to *Lemur mongoz* Linnaeus.

Lemur flavus thus is a composite species, based (1) on Pennant's specimen of the present species, and (2) on the specimen of *Lemur mongoz* figured on Schreber's plate 42. Since, so far as known to me, no lectotype has ever been selected for *Lemur flavus*, I now select Pennant's specimen as such, so that the name *flavus* can continue to be used for the present species.

Cabrera (1958: 250) pointed out that the name *Lemur simiasciurus* used by Schreber (1774, Die Säugthiere, 1 (6): pl. 42) on his plate 42 probably is older than *Lemur flavus* Schreber (1774, Die Säugthiere, 1 (9): 187), as the plate was published in an earlier part of Schreber's work (Lieferung 6) than the text (Lieferung 9). Both parts were published in 1774 and there is no definite proof that they were not issued at the same time, although it is likely that they were not. Cabrera thought that if the plate was published before the text the specific name *simiasciurus* should take precedence over *flavus*. The fact that the name *Lemur simiasciurus* Schreber, 1774, falls as a junior synonym of *Lemur mongoz* Linnaeus, 1766, shows that it never can become a threat to the name *Lemur flavus* Schreber, 1774, being based on an altogether different species. Cabrera (1958: 251), who cited Schreber's pl. 42 and the name *Lemur simiasciurus* Schreber, 1774, in the synonymy of *Potos flavus* thus is incorrect, as the name *simiasciurus* Schreber, 1774, does not enter into competition with *flavus* Schreber, 1774, as Cabrera thought (see also Kortlucke, 1973: 3-4).

In the literature on Suriname mammals the names *Cercoleptes caudivolvulus* (Schreber, 1777) and *Potos caudivolvulus* (Schreber, 1777) have often been used for the present species.

FAMILY MUSTELIDAE

Galictis vittata vittata (Schreber, 1776)

Pl. 71 lower figure (animal), pl. 82 lower figures (skull)

Viverra vittata Schreber, 1776, Die Säugthiere, 3 (18): pl. 124 (animal); Schreber, 1778, Die Säugthiere, 3 (26): 447-450 (description).

Type locality. — “Es ist aus Surinam nach Holland gesandt worden” (Schreber, 1778: 447). The name *Viverra vittata* was first published by Schreber (1776) as the legend of his plate 124. The animal figured on that plate thus is the holotype of the species. The plate was copied from Allamand (1771), who stated that the animal was “reçu de Surinam”. There cannot be any doubt therefore that Suriname is the type locality of the species. Tate (1939: 205) was in error when assigning two type localities to the present species, viz., “Surinam” and “Patagonia”. Even in his text Schreber (1778: 447) only assigned the specimen mentioned by Allamand (1771) with certainty to the present species. The Patagonian specimens dealt with by Feuillée and Falkner were cited by Schreber in the synonymy of *Viverra vittata* with a question-mark.

Synonymies. — Cabrera, 1958: 259-260; Krumbiegel, 1942: 104-105, fig. 7, map (under *Grison allamandi*).

Vernacular names. — (E) Grison, Guiana Marten; (N) Grison; (S) Weti-aira. The well known name Grison was first used by Allamand (1771: 65), who, not knowing the actual vernacular name, invented the name Grison, evidently to suit De Buffon, and stated that he chose this name as on the list that accompanied the animal, when sent from Suriname, it was indicated as grey weasel (“belette grise”; “graauwe Wezel” in the Dutch edition).

Distribution. — The systematics of the genus *Galictis* are not yet quite clear. I accept here Cabrera's (1958: 258-260) view that the species *Galictis vittata* (Schreber, 1776) occurs from south-eastern Mexico through Central America southward to central Peru and south-eastern Brazil. The nominate subspecies *G. vittata vittata* is known from Venezuela, the Guianas and northern Brazil.

Occurrence in Suriname. — Although Sanderson (1949: 773) stated that the Grison is “fairly common in the virgin forest” of Suriname, it is certain that museum specimens are rare. The Leiden Museum possesses a skull (no. 17745) of a male specimen taken at Meursweg near Onverwacht, about 25 km south of Paramaribo, on 22 February 1963. The specimen was collected by Dr. D. C. Geijskes during my stay in Suriname; I examined it in the flesh and took its measurements. The condition of this specimen was so poor, however, that the skin could not be preserved. The Leiden Museum furthermore holds a female specimen (no. 1910, skin and skull) from Suriname, without exact data, obtained in 1930 from the Rotterdam Zoo. In the Amsterdam Museum there are two specimens of unknown sex labelled Paramaribo, which died in the Amsterdam Zoo in 1932 and 1934 (ZMA nos. 10081 and 10082, skins and skulls).

The holotype of the present species, described and figured by Allamand (1771) and Schreber (1776: pl. 124; 1778: 447-450), was the first to be reported from Suriname.

Kappler (1887: 62) when dealing with the Suriname Martens mentioned both the Tayra (which he named *Gallictys barbata*) and *Gallictys vittata*. Of the last mentioned species he only noted: "Der andere, *Gallictys vittata*, ist fahlgelb, mit dunklerer Schnauze und stärker behaarten Schwanz". These data are not sufficient for a definite identification of the species, though the description more or less agrees with the coat colour of the two "Guyane" specimens dealt with under the heading Remarks (see p. 294). Next to the two Martens mentioned above, Kappler (1887: 63) erroneously listed the European Mink, *Mustela lutreola* (Linnaeus, 1761), under the names "der Nörz, *Lutreola Putorius*, Sumpftotter" as occurring in Suriname. Kappler's description of this animal, however, contains all the essential characters of *Gallictys vittata*: "Er ist etwas grösser wie ein Iltis, etwa zwanzig Zoll lang, mit sieben Zoll langem Schwanz; Unterleib, Füsse, Schwanz und ein Teil des Kopfes sind schwarz, der Rücken und die Oberseite des Kopfes hellgrau, an der Stirne ein weisser Streifen, so dass es aussieht, als wäre das Tierchen mit einer Schabracke bedeckt, die Haare sind aber, wie bei allen Marderarten, steif und grob".

The brothers Penard ("De Surinamer", 3 August 1905) stated that "Een andere soort (?) van Aira, de z.g. "Grieson" *G. allamandi* bewoont meer de kust dan het binnenland" (another species (?) of Aira, the so-called "Grieson", *G. allamandi*, is an inhabitant of the coast rather than of the interior).

Sanderson (1949: 773) also reported the present species from Suriname, but no accurate localities are given by him. During the "Operation Gwamba" no specimens of the Grison were saved in the Brokopondo area.

Description. — The following description is based on three skins from Suriname, viz., the one from the Rotterdam Zoo (no. 1910) and the two from Paramaribo (ZMA nos. 10081 and 10082).

The ground colour of the fur of the animal, dorsally as well as ventrally, is dark, blackish brown. On each half of the head there is a longitudinal rather broad whitish or slightly yellowish stripe, which extends from the base of the muzzle to about the shoulders, passing just above the eyes and below the ears, over the sides of the neck, where it becomes narrower, to stop just before the shoulders. Below this white line the fur is uniformly blackish brown; above the line many hairs have a large whitish tip giving the fur a heavily grizzled appearance. As a result the head becomes characteristically tricoloured, blackish brown below, grizzled grey above, the two colours being sharply separated by a whitish stripe. The small rounded ears are whitish inside and out. The grizzled colour of the dorsal part of the head extends posteriorly over the neck and the full length of the back as far as the base of the tail. The ventral surface of the body is also grizzled from slightly behind the forelegs backward; this grizzled area is only slightly darker than the dorsal part, and there is no sharp line of demarcation between the two. The fur between the two forelegs,

and also that between the two hind legs, is uniformly dark brown. The legs themselves are also uniformly dark brown, except for a small grizzled area in the extreme basal part of the outside of the legs. The rather short bushy tail is blackish brown, heavily grizzled with white at the base; the whitish colour becomes more and more pronounced distally, the tip being almost entirely whitish. The specimen from Meursweg (no. 17745), of which I examined the skin, but could not preserve it because of its poor condition, as far as I remember closely agreed with the above description.

Dental formula: $I \frac{3}{3}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{1}{2}$. The first two upper and all lower premolars are dentiform. The upper last premolar (carnassial) could be considered dentiform, were it not that its inner margin shows a strong blunt inward directed lobe, which gives the tooth a trefoil outline in ventral view. This lobe is low and blunt (much lower than the sharply pointed outer part of the tooth) and shows a distinct cingulum which at its posterior margin bears a very small cusp-like denticle. The upper molar is short and very wide, the inner margin being wider than the outer; a small but distinct metaconid is present on the inner part of this tooth. The lower first molar (carnassial) is much longer than the last lower premolar and is the largest tooth in the lower jaw; apart from the normal three cusps it bears a small metaconid on the inner side. The second lower molar is quite small, rounded in outline and very much lower than the first. The presence of metaconids, which are clearly shown in all four Suriname skulls examined by me, is considered by Krumbiegel (1942: 105) and Cabrera (1958: 260) an important character to distinguish the present species from the other species of the genus.

The external measurements of the adult male from Meursweg are: head and body, 580; tail, with tuft, 175; hind foot, 85 mm. Sanderson (1949: 773) gave the following

TABLE 44

Skull measurements of four specimens of *Galictis vittata vittata* (Schreber) from Suriname (first four columns) and those of a *Galictis* specimen of unknown identity from "Guyane" (last column).

Museum	RMNH	RMNH	ZMA	ZMA	RMNH
Reg. number	17745	1910	10081	10082	19672
Sex	♂	♂	-	-	-
Condylbasal length	92.2	81.5	80.3	85.7	72.2
Basal length	85.5	74.5	74.7	79.9	68.8
Palatal length	45.5	39.9	38.0	40.4	34.4
Zygomatic breadth	55.1	47.0	45.3	45.5	42.2
Interorbital constriction	21.0	19.5	16.5	18.1	15.6
Postorbital constriction	20.2	20.8	17.8	17.8	17.4
Breadth of braincase	41.8	42.6	40.3	39.0	35.0
Length upper tooth-row c - m ¹	25.0	24.2	25.1	25.6	20.1
Length upper carnassial	10.1	9.7	9.2	9.5	8.0
Width across canines	21.1	18.4	18.3	19.0	16.9
Length of mandible	56.3	50.3	47.5	50.9	42.9
Length lower carnassial	11.1	10.4	10.6	10.4	8.7

measurements of an adult female (the accurate locality of which is not known): head and body, 485; tail, 162; hind foot, 72; ear, 27; weight, 1475 grams.

In Table 44 some skull measurements are noted of the male from Meursweg (no. 17745), of a female from the Rotterdam Zoo (no. 1910) and of two specimens from Paramaribo in the Zoological Museum at Amsterdam (ZMA nos. 10081, 10082), while in the last column the skull measurements of a specimen from "Guyane" (no. 19672) are added.

Remarks. — Kappler (1887: 63) remarked that the Grison usually lives on land, but is supposed to be a good swimmer and diver, catching and eating fishes; it lives near the water in burrows which it digs itself. This agrees partly with the statement by Hall & Kelson (1959 (2): 921) that the species is a good swimmer and burrower. These authors furthermore stated that it is a good climber, and in contradistinction to Kappler stated that it prefers warm-blooded animals to other food, although it does accept fruit, invertebrates and cold-blooded animals. It is stated by several authors that the young of the Grison are easily tamed, but it is not advisable to let them roam around freely, because they prey upon poultry.

Krumbiegel (1942: 105; see also Nehring, 1886) gave the following characters for the distinction of the two species that he recognized in the present genus (in order to avoid the confusing nomenclature I indicate these species here as A and B):

(1) In species A the upper last premolar and the first lower molar both show a distinct metaconid, which lacks in species B.

(2) The basal length of the skull in species A is up to 90 mm in the males, up to 85 mm in the females; in species B this length is 84 mm at the most.

(3) In species A the length of head and body is between 630 and 800 mm; in species B it is 620 mm at the most.

(4) In species A the tail is shorter (up to about 110 mm), being up to 20 per cent of the length of head and body; in species B the tail is longer (up to 200 mm) measuring at least 25 per cent of the length of head and body.

(5) In species A there are 17 or 18 caudal vertebrae; in species B 20 or 21.

(6) In species A the ventral surface of the body is clearly grizzled with white and thereby indistinctly set off from the dorsal surface; in species B the ventral surface is uniformly dark coloured or has at the most a few white spots, thereby being sharply demarcated from the light dorsal surface.

My Suriname animals evidently belong to species A, agreeing with Krumbiegel's account in points 1, 2, and 6. The combined length of the head and the body of the only Suriname specimen measured in the flesh (the one collected at Meursweg) is 580 mm; the tail (with tuft), 175 mm, therefore agreeing better with species B in points 3 and 4. The number of caudal vertebrae is not known of any of my specimens.

It is not fully certain whether or not the characters enumerated by Krumbiegel are valid for the distinction of the species. Cabrera (1958: 260) indicated that the two species differ in the presence or absence of the metaconids but "son casi idénticos

en todos los demás caracteres". Also other authors (e.g., Osgood, 1943: 92) commented on the variability of size and colour in material of this genus.

My material is too scarce to enable me to arrive at a definite conclusion, but it is interesting to note that two specimens in the collection of the Leiden Museum labelled "Guyane" (see Jentink, 1887: 110, no. c (skull) and 1892: 137, no. e (mounted specimen), new reg. no. 19672; Jentink, 1892: 137, no. f (mounted specimen, skull inside), new reg. no. 19673) in several respects closely agree with species B as defined by Krumbiegel. The only available skull of these specimens (no. 19672) does not show a trace of any metaconids either in the upper or in the lower teeth; the basal length of this skull (sex of the specimen not indicated, but probably a female) is 68.8 mm. The colour of the fur of the two "Guyane" specimens is very similar and differs strongly from that of the Suriname specimens described above in that the stripe over the forehead is more yellowish than whitish and that the dorsal surface of the body from this stripe backward is much paler. On the head the line of demarcation between this pale dorsal area and the white yellowish stripe is hardly noticeable. All over the back, and especially on the tail, the light yellowish or cream-buff colour dominates entirely; the hairs here, namely, are brownish in about their proximal half and pale yellowish in the distal half. The part of the head below and before the yellowish line is as dark blackish brown as in the Suriname specimen, but instead of tricoloured the head is only bicoloured (whitish above, black below). The black colour extends over the entire throat and includes the four legs (with the exception of their outer basal part). On the ventral surface of the body the blackish colour is quite distinct, although in places it is lightly grizzled with whitish. This ventral dark area extends backward to about the anus, the ventral part of the tail being as light as the dorsal. The colouration of these two specimens is very similar to that shown by the animal of which Bell (1841: pl. 35) gave a coloured plate under the name *Galictis vittata*. The Suriname specimens (no. 1910; ZMA nos. 10081, 10082) are showing a closer resemblance to Bell's (1841: pl. 37) coloured figure of his *Galictis allamandi*, be it that in the latter figure the dorsal surface is not shown grizzled and that neither the tail is shown paler than the back. It would be interesting to ascertain on a much larger material whether these two forms actually do belong to two different species (or subspecies) or that they are just extremes of a variation within a single species. My material, at any rate, is not sufficient for a definite solution, and for the time being I follow Cabrera in recognizing a single species in Suriname and the other Guianas. It is possible that Kappler's (1887: 62) description of his *Gallictys vittata* ("fahlgelb, mit dunklerer Schnauze und stärker behaarten Schwanz") pointed to specimens which more or less agree with the description of the two "Guyane" specimens.

As to the nomenclatural confusion in the present genus, this is clearly shown by the fact that species A and B, as mentioned before, are named by Krumbiegel (1942: 104) *Grison (Grisonella) allamandi* Bell and *Grison (Grison) vittata* (Schreber) respectively, while Cabrera (1958: 258, 260) indicated them as *Galictis (Galictis) vittata*

(Schreber) and *Galictis (Grisonella) cuja* (Molina) respectively. In all respects the nomenclature used by Cabrera seems to be correct. The generic name *Grison* Oken, 1816, is invalid as Oken's (1815-1816) "Lehrbuch der Naturgeschichte" vol. 3, in which this name was published, is suppressed under the plenary powers of the International Commission on Zoological Nomenclature in their Opinion 417 (1956, Opinions and declarations rendered by the International Commission on Zoological Nomenclature, 14(1): 1-42). *Galictis* Bell, 1826, is the first available name for the genus. As *Grisonella* Thomas, 1912, has *Grison furax* Thomas as the type, and since Krumbiegel (1942: 97) considered *Grison furax* Thomas to be a subspecies of *Grison vittata*, he clearly assigned the subgeneric name *Grisonella* to the wrong taxon. Not only on the generic and subgeneric level Krumbiegel was wrong, also his species names were incorrect. Bell (1841: 201, 204), when describing *Galictis allamandi*, commented on its close resemblance to the form depicted by Allamand (1771) and evidently for that reason chose the name "*allamandi*" for his new species. Indeed, judging by the colour, Bell's specimen and Allamand's both belong to species A. As Allamand's specimen is the type of *Galictis vittata* (Schreber, 1776), it seems most logical to synonymize *G. allamandi* and *G. vittata*, as Cabrera did, and the name *G. vittata*, being the oldest of the two, has to be used for species A. Krumbiegel, when using that name for species B, probably was led astray by Bell (1841) who used the names *G. vittata* and *G. allamandi* in the same sense as Krumbiegel did later.

The result of Krumbiegel's error on the specific level was that he reported both species A and B from Suriname, species A (his *G. allamandi*) evidently because Allamand reported his specimen from there, and species B (his *G. vittata*) because Schreber gave Suriname as the type locality; evidently Krumbiegel did not realize that Allamand's and Schreber's specimens were one and the same individual.

Summarizing we can state that species A, which should correctly be known as *Galictis (Galictis) vittata vittata* (Schreber, 1776), is the only species of the genus known with certainty from Suriname. If the two specimens from "Guyane" discussed above, are correctly labelled as to the locality, and if the presence or absence of metaconids and the differences in colour pattern as used by Krumbiegel are characters of specific value, then the possibility exists that a second species of *Galictis*, which following Cabrera should be known as *Galictis (Grisonella) cuja* (Molina, 1787), also occurs in the Guianas. According to Cabrera, however, the range of the latter species extends from east and central Brazil, Bolivia and Peru southward, and does not include the Guianas.

***Eira barbara barbara* (Linnaeus, 1758)**

Pl. 72 (animal), pl. 85 upper figures (skull)

Mustela barbara Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 46.

Type locality. — "Habitat in Brasilia". Restricted by Lönnberg (1913: 19) to "Pernambuco" (= Recife), north-eastern Brazil. J. A. Allen (1904a: 38) was mistaken when he restricted the type locality to "Guiana". Allen namely remarked:

"Various names have been applied to the South America Tayras, but, as Mr. Thomas has noted (Ann. and Mag. Nat. Hist. (7), VII, Febr. 1901, p. 180), most of them are strict synonyms of *Mustela barbara* Linn. (1758), from "Brasilia". Apparently Linnaeus described the animal from an actual specimen. He cites 'Ac. Holmens.', and Brown's 'History of Jamaica', the last with a query. The former I am unable to consult. Brown's "Galera The Guinea Fox", is based on an animal "often brought to Jamaica from the coasts of Guinea, where it is a native". In the 12th edition of the 'Syst. Nat.' only Brown is cited. As "Brasilia" is probably used in a general sense, it seems proper to consider the type region of *Tayra barbara* as Guiana".

It is not clear whether or not Allen here confused Guinea and Guiana. However this may be, since Linnaeus in the original description (as well as in the 12th edition of *Systema Naturae*) only doubtfully referred to Browne, Browne's (1756: 485) specimen, whether from Guinea or from Guiana, is not a type and its locality is not a part of the type locality. That Linnaeus used "Brasilia" in such a general sense that it includes all the Guianas is most unlikely: in the eighteenth century the Guianas and Brazil were clearly distinguished and I know of no instance where British, French or Dutch Guiana were considered part of Brazil. As a side line it is interesting to point out that in Allen's remark on page 39 stating that *Eira ilya* H. Smith "was based on a crude drawing, by Prince John of Nassau, in the Berlin Library, of an animal from Guiana", a similar error is made: Johan Maurits of Nassau was governor of the Dutch possession in north-eastern Brazil near Pernambuco, and never visited the Guianas, "his" drawing (presumably by an artist in his service) therefore also must be of an animal from the Pernambuco area.

Synonymies. — Cabrera, 1958: 263-264; Krumbiegel, 1942: 81-96, figs. 1-6 (under *Tayra*); Lönnberg, 1913: 9-21 (under *Tayra*).

Vernacular names. — (E) *Tayra*, Grey-headed Weasel; (N) Aira, Zwartbruine Veelvraat; (S) Aira.

Distribution. — The species *Eira barbara* (Linnaeus, 1758) ranges from southern Mexico through Central America into South America as far south as northern Argentina and Paraguay. According to Tate (1939: 205) the nominate form *E. barbara barbara* is known from eastern Venezuela, the Guianas, northern and north-eastern Brazil, southwards to northern Argentina (see further under Remarks).

Occurrence in Suriname. — The material examined by me and the data from the literature show that the *Tayra* occurs in forests all over Suriname. The brothers Penard ("De Surinamer", 27 July 1905) remarked that the *Tayra* rather frequently occurs in the coastal plain as well as in the interior.

Krumbiegel (1942: 87) gave some skull measurements of a specimen from Albina, left bank of the mouth of the Marowijne River. Sanderson (1949: 772) mentioned two males and three females from Suriname, giving the average external measurements. During the "Operation Gwamba" two individuals were saved in the Brokponde area (Walsh & Gannon, 1967: 219).

I have examined specimens from the following localities:

1. Stondansi Falls in upper Nickerie River at 5°5'N, Nickerie District, 1 male (no. 21965, skin and skull).
2. Paris Jacob Creek, tributary of upper Nickerie River at about 4°52'N, 1 female (no. 22730, skin and skull).
3. Lucie River, eastern tributary of Corantijn River, Nickerie District, 1 male (no. 18016, skin and skull).
4. Near Brokopondo, west bank of Suriname River north of Brokopondo Lake, Brokopondo District, 1 skull (no. 20640).
5. Oost-Westverbinding, highway east of Paramaribo, Commewijne District, 1 male (no. 18220, skin and skull).
6. Near Peninika boarding school, at confluence of upper Commewijne River and Peninika Creek, Commewijne District, 1 female (no. 20639, skin and skull).
7. Near Galibi, mouth of Marowijne River, Marowijne District, 1 juvenile female (no. 20638, skin and skull).
8. Near the Nassau Mts., west of Marowijne River at about 4°45'N, Marowijne District, 1 skull (no. 20642).
9. Suriname, without precise locality indication, 4 skulls.

Description. — The following description is based on six recently collected specimens mentioned above. The most striking feature of the colouration of the dorsal surface is the sharp separation between the colour of the head and neck against that of the rest of the body. The head namely is iron greyish to brownish grey by the presence of whitish hairs with a dark brown tip and pale or darker greyish base. The snout in all our specimens has the hairs very short and dark, passing gradually into the grey of the neck. There is a considerable variation in the colour of the head; in some specimens it is very light, whitish grey, in others it is only a shade lighter than the colour of the back, but always the distinction is clear and the line of separation sharp. The hairs of the short and rounded ears are of the same colour as the dorsal surface of the head, only the tips of the ears are dark on the outer surface. The glossy blackish brown colour of the dorsal surface is entirely uniform and extends over the full length of the back, over the outside of the legs and over the full length of the long and bushy tail, which ends in a tuft; here the hairs are unicoloured without a trace of banding. On the ventral surface of the body the most striking feature is the presence of a large, more or less triangular whitish or orange spot on the throat, consisting of unicoloured pale hairs. The base of this pale triangle lies a short distance before the implantation of the forelegs and occupies almost the entire width of the throat; sometimes this base forms an almost straight line, sometimes it is convex posteriorly. The tip of the triangle points forward to about the level of the ears. Before the triangle the fur of the ventral surface of the head is either uniformly blackish brown or mixed (especially laterally and proximally) with grey, like that of the upper surface of the head. The ventral surface of the body, including the inside of the legs and the tail, is uniformly blackish brown like the dorsal surface, or a shade lighter.

Dental formula: $I \frac{3}{3}, C \frac{1}{1}, P \frac{3}{3}, M \frac{1}{2}$. In the dental formula as well as in the general shape of the teeth, *Eira barbara* is very similar to the previous species *Galictis vittata*,

except for the greater size. The two full-grown male skulls (nos. 21965, 18220) have a low but distinct sagittal crest over the full length of the braincase; the two other examined skulls, being females, are unfortunately semi-adult, showing only two separated temporal ridges. The skulls from the Nassau Mountains (no. 20641) and from the Brokopondo region (no. 20640) have also a low but distinct sagittal crest. Because the two females are not full-grown, I cannot decide whether or not the presence of a sagittal crest is a character to distinguish adult males from adult females. Krumbiegel (1942: 83) dealt extensively with the variation of the number of premolars and molars.

The external and skull measurements of seven specimens from Suriname are given in Table 45. Sanderson (1949: 772) noted that the largest specimen seen by him, a male, had a weight of 6 kilograms.

TABLE 45
External and skull measurements of seven specimens of *Eira barbara barbara*
(Linnaeus) from Suriname in the Leiden Museum.

Reg. number	21965	18220	18016	22730	20639	20642	20640
Sex	♂	♂	♂	♀	♀	?	?
Head and body	650	604	575	-	560	-	-
Tail, without tuft	425	355	382	-	464	-	-
Tail, with tuft	465	395	423	-	494	-	-
Hind foot, without nail (dried skin)	92	87	85	-	45	-	-
Ear	37	40	40	-	36	-	-
Weight, grams	5200	4000	3750	-	3500	-	-
Condylbasal length skull	114.6	112.5	107.8	107.9	106.3	117.3	116.0
Palatal length	58.5	55.1	55.3	54.5	53.4	57.7	59.8
Zygomatic breadth	71.6	68.6	58.6	60.2	-	71.3	76.8
Interorbital constriction	25.4	26.6	21.3	21.8	25.6	26.4	27.0
Postorbital constriction	21.9	24.1	22.8	24.0	25.5	22.1	26.4
Breadth of braincase	45.2	44.8	49.0	47.0	50.1	47.5	48.3
Length of upper tooth-row cm^1	31.5	30.6	29.4	29.0	28.6	31.0	32.5
Length of upper carnassial	10.0	9.7	9.8	9.7	9.3	10.2	9.4
Width across upper canines	31.0	29.1	26.6	26.1	26.7	30.1	28.9
Length of mandible	74.8	72.0	66.6	67.9	68.1	74.0	76.1
Length of lower carnassial	9.7	9.7	9.8	9.9	9.8	10.2	9.8

Remarks. — In the 1970 revision of the Suriname Game Ordinance of 1954 the Tayra is the only carnivore of the indigenous fauna left in the category of the “pre-dominantly harmful animals”. This was probably done because the Tayra often is a pest to poultry farms. It normally feeds on small rodents, birds and eggs.

According to Kappler (1887: 62) and the brothers Penard (“De Surinamer”, 27 July 1905) the Tayra lives solitary or in pairs, and hardly ever in small groups. Sanderson (1949: 772), however, stated that “troops of 5 or 10 are seen at the Donderberg” (= Donderbari Berg, or Dondrobari-bergi, north-east of Brownsberg, about 75 km south of Paramaribo).

Kappler (1887: 62) stated that the animals are arboreal and eat fruit, birds and eggs and honey. The Penard brothers (“De Surinamer”, 27 July 1905) mentioned

their diet to include birds, but add that they eat also small mammals and insects, while fruit is only taken in exceptional cases; the Penards also comment on the preference of the animals for honey, which they know to obtain in a very adroit way without paying any attention to the attacks of the bees. Kappler commented on the slow and rather awkward way in which they flee when detected. They can be tamed, but even then can be quite harmful to poultry. Sanderson also confirmed the predelection of the Tayra for honey.

Krumbiegel (1942: 82-83, fig. 2) dealt with the variation of the coat colour of the Tayra ("Albinismus und Flavismus finden sich fast noch häufiger als bei anderen Mardern") and paid special attention to the size and colour of the spot on the throat. Sanderson (1949: 772-773) discussed the variability of the coat colour of the Suriname *Eira barbara*. It seems of interest to compare Sanderson's conclusions with the specimens examined by me. Sanderson found that animals from the coastal area have the colour of the dorsal surface of the head the least different from that of the back, while the farther one comes into the interior the more distinct this difference becomes. Furthermore, specimens from the coastal area have the pale spot on the throat small, white, and diamond-shaped, while in animals from the interior the spot becomes larger and more orange or pink. In checking over our six skins with exact localities, we could find no confirmation for these statements. The specimen from Peninika (no. 20639) belongs to Sanderson's first category, having the dorsal surface of the head only slightly lighter than the back, and the light spot on the throat small, practically white and diamond-shaped. The three specimens from Oost-Westverbinding (no. 18220), Paris Jacob Creek (no. 22730) and Stondansi Falls (no. 21965) come closest to Sanderson's second category, in having the dorsal surface of the head lighter and more distinctly different from the back than in the first category, while the spot on the throat is larger, more triangular and more orange (varying here from almost white (no. 22730), through pale orange (no. 21965), to distinctly orange (no. 18220)). The not fully adult specimen from Galibi, near the mouth of the Marowijne River (no. 20638) has the dorsal surface of the head lighter than any of the other specimens, the triangular spot largest of all and about as clear orange as that of specimen no. 18220. Finally the last examined specimen, a fully grown male from the Lucie River (no. 18016) resembles the one from Galibi in the very large light orange-coloured triangular spot on the throat, but has the colour of the dorsal surface of the head much darker than in that specimen, this colour being about as dark as that of the specimens of Sanderson's second category or even slightly darker. This last mentioned specimen was found much farther into the interior than any of the other five specimens mentioned here. The specimen from Galibi, on the other hand, was collected closest near the coast, while the other four, here assigned to Sanderson's first and second categories, were found in a more or less intermediate area. The difference in colour is not due to age, as the orange throat-spot is found both in the smallest and in one of the largest animals, and neither does the dorsal colour of the head seem to be related to age. No clear correlation of the colour and

other characters can be found in our material, which admittedly is insufficient for any definite conclusion. This seems to agree with Krumbiegel's (1942: 83) statement that the spot on the throat has no systematic value at all, so that it is not advisable to distinguish subspecies solely on the colour pattern of the present species.

For the present I follow Thomas (1900: 147-148), Tate (1939: 205) and Krumbiegel (1942: 96), who are of the opinion that the typical form of *Eira barbara* occurs in Suriname. On the other hand some authors, e.g., Lönnberg (1913: 16-19) and Cabrera (1958: 264) stated that the Tayra, described by Traill (1821: 440-441, pl. 23 fig. 2) under the name *Vivera* (sic!) *poliocephalus* and "which was brought to England from Demerara", is subspecifically different from *Eira barbara*. This taxonomic question can be definitely solved only if more material from Suriname and the other Guianas becomes available for examination.

Walsh & Gannon (1967: 217) used the name *Tayra barbara senilis* for the Suriname Tayra. However, the name *senilis*, which is a junior synonym of *sinuensis* (see Cabrera, 1958: 264), is that of one of the western South American forms of *Eira barbara*.

The generic names *Galera*, *Galictis* and *Tayra* instead of *Eira* have been used by many authors for the present form.

Lutra enudris F. Cuvier, 1823¹

Pl. 73 (animal), pl. 84 upper figures (skull)

Lutra enudris F. Cuvier, 1823, Dictionnaire Sciences naturelles, 27: 242.

Type locality. — "La Guiane". Although F. Cuvier (1823) did not specifically mention the locality of this species, he gave it the vernacular name "Loutre de la Guiane". It is therefore generally accepted that French Guiana is the type locality of this species. Cabrera (1958: 272) restricted this type locality to "río Maroni" (= Marowijne River); the boundary-river between Suriname and French Guiana.

Synonymies. — Cabrera, 1958: 271-272; Tate, 1939: 204; Harris, 1968: 214-216.

Vernacular names. — (E) Guiana Otter, Water Dog; (N) Zwampotter, Kleine Surinaamse Otter; (S) Watradagoe.

Distribution. — Trinidad, eastern Venezuela, the Guianas and eastern Brazil (see further under Remarks).

Occurrence in Suriname. — *Lutra enudris* is reported to occur rather commonly in and near small streams and creeks; it is not an animal of the open and large

¹ Recently, Van Zyll de Jong (1972) suggested that most Lutrinae of the western hemisphere, hitherto included in the genus *Lutra*, deserved generic distinction, and suggested their relegation to the genus *Lontra* Gray, 1843; if accepted, this would mean that the genus *Lutra* Brännich, 1772, becomes restricted to old-world species. Moreover, the same author suggests that the present species, *L. enudris*, probably is only subspecifically distinct from *L. longicaudis* Olfers, 1818. As a consequence, the correct name for this species should be *Lontra longicaudis enudris* (F. Cuvier), but as the above author states that "confirmation . . . by evidence from other sources is highly desirable," and therefore, his conclusions being only tentative, I retain here the current nomenclature.

rivers as is *Pteronura*. Though in many publications on Suriname "otters" have been mentioned, not only accurate localities are rare, but it is not always clear which species is meant. In my opinion it is certain that Stedman (1796 (1):168) dealt with the present species, when he gave a description of "otters" observed by him in the Coermotibo Creek, a right branch of the Upper Cottica River, north-eastern Suriname. Sanderson (1949: 773) remarked: "Common in all rivers and creeks both tidal (Marowijne and Commewijne Rivers) and sluggish freshwater (Para, etc.)". I have examined only five specimens (skins with skulls) from the following localities:

1. Wageningen, northern Nickerie District, 1 male (no. 18002).
2. Corantijn River, 1 male (no. 19251).
3. Creek of Oost River, upper Lucie River basin, about 3.5°N 56.5°W, Nickerie District, 1 male (no. 18008).
4. Forest creek entering the Coppename River from the east, Saramacca District, 1 female (no. 20723).
5. Suriname, without more precise locality indication, 1 male (SMN no. 1093).

Description. — The coat colour of the dorsal parts (including the tail and the outer surface of the legs) in the first four Suriname specimens of *Lutra enudris* mentioned is uniform and varies from auburn to chestnut brown. The coat colour of the ventral surface is subject to rather wide variation. In the Wageningen specimen the ventral surface, including the chin and the sides of the head, is only a shade lighter than the dorsal surface. In the Oost River and Coppename specimens the ventral surface, including the chin and the sides of the head, is whitish to light yellowish, the line of demarcation between the dorsal and the ventral parts not being distinctly defined. The coat colour of the Corantijn specimen is more or less intermediate between that of the two previous forms: the ventral surface of the body and the inside of the forelegs is light chestnut brownish mixed with yellow. The haired ears are small. In the four specimens the hind legs and the hairy tail are concolorous with the back, only the extreme basal part of the ventral surface of the tail is coloured like the ventral surface of the rest of the body. Externally *Lutra enudris* differs from *Pteronura* (1) by its conical tail, (2) by the extent of the webs of the feet, which do not reach the nails, (3) by its smaller size, and (4) by its paler overall colour.

Dental formula: $I \frac{3}{3}, C \frac{1}{1}, P \frac{4}{4}, M \frac{1}{2}$. The skull (pl. 84 upper figs.) of this species is characterized by being strongly dorsoventrally flattened, and by the exceedingly strong development of the upper last premolar and upper molar. The species differs from *Galictis* and *Aira* by having four upper premolars, the first of these are very small and crowded in between the canine and the second upper premolar, they are not visible at all from the outside. The second upper premolar touches the canine, is much larger than the first upper premolar but distinctly smaller than the third. The second and third upper premolars although rather robust are still dentiform, the fourth, however, is extremely heavy and molariform. This fourth upper premolar (carnassial) is about quadrangular but somewhat narrower behind than in front, it shows a deep and wide groove over its full length; lingually of the groove the tooth is low and rounded, labially it is much higher with one high median apex and two

low laterals. The upper molar is quadrangular, wider than long and also shows a broad and shallow longitudinal groove, it is shorter than the last upper premolar but equally wide. The lower premolars are all robust and dentiform, becoming gradually larger posteriorly. Of the two lower molars the first (carnassial) is by far the strongest and largest tooth of the lower jaw, it is almost twice as long as the last premolar and is elongate oval in outline. The last lower molar is broadly oval in outline, about half as wide as the first and about one third of its length.

The external measurements of the male specimen from the Oost River (no. 18008) are: head and body, 660; tail, 427; hind foot, 77; ear, 21 mm; weight, about 7 kilograms. The measurements of an adult male and female from Suriname mentioned by Sanderson (1949: 773) are, respectively: head and body, 740, 575; tail, 570, 453; hind foot, 123, 104; ear, 35, 27 mm; weight, 11.5 kg and 3856 grams.

In Table 46 some skull measurements are noted of the five Suriname specimens at my disposal; for comparison the measurements given by Thomas (1908) in the original description of *Lutra mitis* are added in parentheses. Pohle (1920: 79) noted some skull measurements of an adult male of *Lutra enudris* from Suriname as well as of a young specimen of *L. mitis* from that country.

TABLE 46

Skull measurements of five specimens of *Lutra enudris* F. Cuvier from Suriname (first five columns) and those of the type of *Lutra mitis* Thomas (last column).

Museum	RMNH	RMNH	RMNH	RMNH	SMN	BMNH
Reg. number	18002	20723	18008	19521	1093	86.5.12.1
Sex	♂	♀	♂	♂	♂	♂
Condylbasal length	118.1	105.6	111.2	118.0	124.2	103.5
Palatal length	51.9	47.5	49.0	55.0	56.0	47
Zygomatic breadth	74.1	68.5	71.0	76.8	82.0	68
Interorbital constriction	23.1	19.2	21.5	21.7	25.8	20
Postorbital constriction	19.0	15.8	18.3	14.4	15.3	-
Mastoid breadth	70.5	67.4	64.7	69.9	73.9	65
Length of upper tooth-row c-m ¹	35.9	32.7	35.4	36.2	37.9	-
Length of upper carnassial	13.5	12.1	12.8	12.7	14.3	10.6
Greatest diameter of upper molar	12.8	10.9	12.5	12.5	13.3	12.7
Width across upper canines	26.7	24.5	26.2	27.1	30.0	-
Length of mandible	74.0	65.7	66.1	75.4	79.6	-
Length of lower carnassial	14.8	14.1	14.4	15.2	15.7	-

Remarks. — Dr. D. C. Geijskes, who knows the species well, informed me that *Lutra enudris*, the smaller of the two Suriname otters, was only observed by him in small forest creeks, where it was seen single or in groups of very few individuals. It is a rather shy animal, that, in contrast to the Giant Otter, never approaches boats, and is also never found together with the Giant Otter. The hunting activities of *Lutra enudris* are restricted mainly to the evening. Its fur is very soft, much softer than that of the Giant Otter, and for that reason is sometimes used for making house shoes.

In the popular literature on the Suriname otters, the present species and the next

have often been confused, while sometimes a third species is believed to exist in Suriname. As pointed out under the next species (*Pteronura brasiliensis*), it is likely that both Kappler's (1887: 63) "Fischottern" are based on the Giant Otter and that he did not see *Lutra enudris*. The brothers Penard ("De Surinamer", 3 August 1905) mentioned three Suriname otters, viz., "*Lutra brasiliensis*, *L. enydris*, *Pteronura sandbachii*". Of "*Lutra enydris*" a short description is given, and it is said to be the smaller of the two *Lutra* species; clearly the present species is meant with this name. In the description of the habits no distinction is made by the Penards between the two *Lutra* species, which are indicated with the native name Watradagoe. The habits described by them, however, are largely or exclusively based on those of the Giant Otter, their *Lutra brasiliensis*. The Penards's account of "*Pteronura sandbachii*", as far as the morphology is concerned, clearly refers to the Giant Otter; when describing its habits, however, the Penards stated that it is rarely observed in Suriname, that it is very shy and never approaches boats. Evidently some kind of mix-up has occurred here

The earliest name for these small otters from the Guianas is *Lutra enudris*, proposed in 1823 by F. Cuvier. Thomas (1908: 393-394), described a second species from the Guianas, namely from Suriname, under the name *Lutra mitis*, which should differ from *Lutra enudris* mainly by the smaller dimensions of its skull. Tate (1939: 204) and Cabrera (1958: 271-272) recognized only one form for the Guianas, while Pohle (1920: 79, skull measurements: 100), Sanderson (1949: 773) and Harris (1968: 215-216) preferred to distinguish a larger (*L. enudris*) and a smaller (*L. mitis*) Guiana otter. The few specimens at my disposal do not allow me to give a definite opinion on this problem.

***Pteronura brasiliensis brasiliensis* (Zimmermann, 1780)**

Pls. 74 and 74a (animal), pl. 84 lower figures (skull)

Lutra brasiliensis Zimmermann, 1780, Geographische Geschichte des Menschen, und der vierfüssigen Thiere, 2: 316.

Type locality. — "Das Thier . . . bewohnt Brasilien; ferner Gujana, . . . , und in den Arauca, den Apure, den Buja, den Cravo und mehreren Flüssen, die sich in den Orenoko ergiessen. Daher glaube ich, dass dieser Otter die meisten grossen Flüsse von Südamerika bewohnt". Restricted to French Guiana by the lectotype selection made here (see further under Remarks).

Synonymies. — Cabrera, 1958: 274; Tate, 1939: 204; Harris, 1968: 220-223.

Vernacular names. — (E) Giant Otter, Guiana Flat-tailed Otter, Winged-tailed Otter, Margin-tailed Otter; (N) Grote Waterhond, Grote Visotter, Platstaart Otter; (S) Watradagoe.

Distribution. — According to Harris (1968: 221, map) the Giant Otter occurs in "South America, from the Guianas to Uruguay, on the major river systems". The nominate subspecies occupies the northern part of this range.

Occurrence in Suriname. — The Giant Otter is reported to be rather common in the open Suriname rivers and larger creeks. I have examined specimens from the

following localities, which all are situated in the western part of Suriname, so that it is important to investigate also the rivers and creeks of the eastern part of the country in order to obtain a more correct idea of the actual distribution of the present species in Suriname:

1. Kaboeri Creek, eastern tributary of Corantijn River at about 5°14'N, Nickerie District, 1 adult male (no. 22248, skin and skull).
2. Maratakka River about 3 km south of Wageningen, 1 semi-adult male (no. 23294, skin and skull).
3. Koffiemaka Creek, tributary of lower Nickerie River, east of Wageningen, 1 adult male (no. 18003, skin and skull).
4. Arawarra, confluence of Wayombo and Nickerie Rivers, at about 5°18'N 56°23'W, 1 specimen (no. 19674, skin).
5. Cremer Falls in Fallawatra River, upper Nickerie basin, Nickerie District, 1 adult female (no. 20724, skin and skull).
6. Confluence of Wayombo and Coppename Rivers at about 5°23'N, Saramacca District, 2 juveniles (nos. 20727, 20728, skulls).
7. Suriname, without more precise locality indication, 1 adult male (SMN nos. 1300, 1371, skin and skull), 1 skull (no. 20726).

Sanderson (1949: 774) mentioned a large adult male from Suriname, but he did not specify the locality further.

Description. — The following description is based on the five skins from western Suriname, mentioned above. The entire dorsal surface of the body from the eyes to the tip of the tail is uniformly dark greyish brown or chestnut brown; the hairs are of a uniform colour, they are short and rather velvety on the back, still shorter, glossy and appressed on the flattened part of the tail. The snout is lighter in colour than the top of the head. The ventral surface, except for the chin and throat, is practically of the same uniform colour as the dorsal surface; this also holds for the in- and outside of the legs. The only colour pattern shown by the animals is a large irregular whitish or pale yellow spot on the chin and throat. This spot surrounds the mouth and is especially distinct on the chin. From the corners of the mouth at both sides the whitish colour extends backward as a narrower or broader irregular stripe, which reaches about halfway the distance between the mouth and the base of the forelegs, or extends even slightly farther. This stripe may broaden in places, and then the left and right stripes may come in contact with one another; posteriorly they also converge somewhat. In the specimens from Koffiemaka and from the Kaboeri Creek the two white stripes are broad and irregular, giving the impression that the medio-distal part of the throat is entirely whitish with a large irregular central brown spot. In the specimens from the mouth of the Maratakka River and from the Cremer Falls the white stripe on the left side is narrow and clear, while on the right side the stripe is broken off, so that the irregular central dark brown spot is largely in contact with the dark colour of the sides of the head. The ears are relatively small. The webs of both fore and hind feet reach as far as the nails. The larger distal part of the tail is strongly flattened and rather broadly lanceolate. The last two characters distinguish the Giant Otter immediately from *Lutra enudris*, in which the webs reach less far, while the tail is cylindrical. The Giant Otter also is distinctly larger than *Lutra enudris*.

Dental formula: $I \frac{3}{3}$, $C \frac{1}{1}$, $P \frac{4}{3}$, $M \frac{1}{2}$. Apart from their greater size, the teeth of the present species show the same general shape and arrangement as those of *Lutra enudris*; also the upper last premolar and the upper molar are exceedingly strong. However, the first upper premolar, although small, is larger than in *Lutra enudris* and, although crowded in by the canine and the second upper premolar, is still visible in lateral view. A low but distinct sagittal crest runs from the anterior part of the postorbital constriction to the lambdoidal crest in both adult females and males. Its peculiar long postorbital constriction sets the skull of the Giant Otter immediately apart from those of all other Suriname Carnivora.

The external measurements of the adult male from the Kaboeri Creek (no. 22248) and of the semi-adult male from the mouth of the Maratakka River (no. 23294) are given here in this order; in parentheses the measurements of the adult male mentioned by Sanderson (1949: 774) are added: head and body, 1000, 815, (1050); tail, 579, 443, (573); hind foot, 176, (with nail) 207, (175) mm; weight, —, 26, (24) kilograms. Kappler (1887: 63) stated that he had seen many specimens with a total length ("von der Schnauze bis zur Schwanzspitze") of about 1800 mm; he noted as the estimated weight of his specimens "60 Pfd." (= 30 kilograms). — In Table 47 some measurements of six skulls of the Giant Otter are given; it must be noted that skull no. 23294 is a semi-adult male, in which the sagittal crest is still absent, while the suture between the basioccipital and the basisphenoid is not closed.

TABLE 47
Skull measurements of six specimens of *Pteronura brasiliensis*
brasiliensis (Zimmermann) from Suriname.

Museum	RMNH	RMNH	RMNH	RMNH	RMNH	SMN
Reg. number	20724	23294	18003	22248	20726	1371
Sex	♀	♂	♂	♂		♂
Condylbasal length	153.6	143.1	145.8	155.8	149.4	154.9
Palatal length	76.3	71.5	75.0	77.8	74.0	76.0
Zygomatic breadth	92.0	85.0	94.3	94.9	91.7	97.2
Interorbital constriction	17.1	17.5	15.8	16.7	15.8	17.4
Postorbital constriction	17.6	18.1	16.1	16.7	17.0	17.3
Length of postorbital constriction	35	27	32	41	34.5	35
Mastoid breadth	82.4	76.0	79.4	87.4	81.7	81.1
Length of upper tooth-row $c-m^1$	48.0	45.8	47.6	50.0	47.5	49.6
Length of upper carnassial	18.3	16.8	17.3	17.8	16.4	17.4
Greatest diameter of upper molar	16.7	15.5	15.5	15.4	15.6	16.1
Width across canines	35.0	31.8	31.8	31.8	31.9	34.0
Length of mandible	99.5	95.9	100.1	104.1	98.6	103.9
Length of lower carnassial	19.6	19.0	18.0	18.7	18.8	19.5

Remarks. — Harris (1968: 220-234, 336-337) gave a survey of the systematics, life history and measurements of the present species based on data in the literature, while Roth (1941: 92-96) dealt with specimens from British Guiana.

Dr. Geijskes (personal communication) informed me that in Suriname the Giant Otter is found in the larger rivers and creeks, where it often lives in groups of numerous individuals. In areas where they have little contact with people they are not

shy at all, advance to close near the boats and seem to be very curious about what is going on; cases are known in which the animals even bit the paddles of the boats. They fish in the daytime and eat their fish on rocks out of the water. They produce a gurgling to yapping sound.

As pointed out under the previous species, there is quite a confusion about the number and the identity of the Suriname species of otters. Stedman (1796 (1):168-169) gave the following account: "As I am speaking of the animals found in this part of the country, I must not omit the otters here, called *tavons*, which in the Cormoetibo Creek frequently attracted our attention by their disagreeable noise: as they are amphibious, they live mostly on fishes; they are about three feet in length, grey-coloured, and all over spotted with white; their legs are short, they are web-footed, and armed with five claws; the head is round, the nose beset with whiskers like a cat; the eyes are small, and placed above the ears; the tail is very short. This animal moves awkwardly upon land, but in the rivers proceeds with great velocity". This description might be based on the Giant Otter, but neither the spotted colour nor the "very short" tail is correct, so that the identity of Stedman's animal must remain an enigma.

Kappler (1887: 63) distinguished two species of otters: *Lutra brasiliensis* and *Pteronura Sandbachii*. The former which, according to Kappler, "in Rudeln von oft 20 Stücken lebt, sehr neugierig ist und die Boote umschwimmt" clearly is the present species. But also Kappler's *Pteronura Sandbachii* belongs here, judging by Kappler's description and his mention of the size: "volle sechs Fuss lang . . . und wohl 60 Pfd., schwer". His remark, however, that this species lives solitary, evidently is erroneous.

The brothers Penard ("De Surinamer", 3 and 10 August 1905) distinguished three species of otters as occurring in Suriname. As pointed out under *Lutra enudris* (p. 303 above), both their *Lutra brasiliensis* and *Pteronura sandbachii* must be assigned to the present species. They indicated "*Lutra brasiliensis*" as 'the largest species or common Watradagoe' and *L. enudris* as the smaller Watradagoe. Then they continue and give an account of the habits of the Watradagoes, which clearly is intended cover both species. Actually, however, these observations seem to be based largely or exclusively on the Giant Otter. These observations were obtained from hunters, and thus have to be treated with some reserve; they are too interesting, however, not to be cited here, the more so as several support observations obtained from other sources. The Watradagoe is described as spending most of its life in the water. When they swim, about half the body shows above the water surface; experts at diving, the otters can stay under water (often walking over the river bed) for about 10 minutes. The females can be seen sometimes floating on their backs holding the young between the front legs, others were observed in this position playing with pieces of wood or other objects. They are supposed to sleep in the water. Fishing is done by groups of these animals, and they are said to gather the caught fishes on the shore in a pile which is guarded by one of them; only after the fishing is done the group starts eating the caught fishes. Even large fish are caught that way and

in this connection the Penards mention specimens of up to 15 pounds of the anjoemara (*Hoplias macrophthalmus* (Pellegrin)). Species of *Serrasalmus* (relatives of the piranha, indicated in Suriname with the native names perais or pireng), however, are avoided. The Watradagoe is said to be an inquisitive animal which will approach boats so closely that one can almost touch it. Sometimes a group will surround a boat. Then they emerge from the water with their head and the forepart of the body, making a kind of dancing movement. They chatter with their teeth and make a hissing sound like cats. If a paddle is pointed at them they will bite in it and sometimes they manage to break off parts of it. Sucking sounds made on the palm of the hand are said to attract them. When an otter is killed, its body will sink immediately and is difficult to retrieve. According to the natives the dead otters are being buried by their companions. The female otters are said to make a nest of grass, leaves, etc., alongside the water, and to produce a litter of 2 to 5 young. At first the young are quite helpless and only after six weeks they can follow the adults.

The Penard brothers remark that the meat of the otters is frequently eaten in Suriname, that it has a good taste, but is rather fat. Kappler, on the other hand, stated that the Indians do not eat the otter.

From Demerara (British Guiana) Gray (1837: 580) described a Giant Otter under the name *Pteronura Sambachii*, which by most authors has been regarded as identical with *P. brasiliensis*. Gray's name, however, has been used in several publications on Suriname mammals.

The authorship of the name of the present species has been the subject of much confusion. So Pohle (1920: 118), in his revision of the Lutrinae, named the species *Pteronura brasiliensis* (Blumenbach, 1810), Cabrera (1958: 274) and Harris (1968: 221) used the name *Pteronura brasiliensis* (Gmelin, 1788). This confusion arose because most older descriptions are mainly based on Marcgraf's (1648: 234) description and figure of "Iiya quae & Carigueibeiu", which as Pohle (1920: 118-120) clearly showed is a composite species, being based on both the present species and the Tayra, *Eira barbara* (Linnaeus, 1758). Pohle (1920: 120) and most other authors therefore rejected the name *Lutra brasiliensis* of Zimmermann (1780) as based on "ein Fabelwesen" and considered "der Name *brasiliensis* als nomen nudum" which "aus der Literatur zu streichen ist". This of course is clearly incorrect. Marcgraf's description is not based on a "Fabelwesen", but on a mixture of two species. If the name *Lutra brasiliensis* Zimmermann, 1780, is rejected for taxonomic purposes, it is still a nomenclaturally available name and would invalidate both *Lutra brasiliensis* Gmelin, 1788, and *L. brasiliensis* Blumenbach, 1810. Therefore, there is no good reason to reject Zimmermann's *Lutra brasiliensis*, if a proper lectotype for it is selected. Zimmermann's original description is based in the first place on Marcgraf's Iiya, the description of which is extensively cited by him. Furthermore Zimmermann referred to the following authors:

(1) Brisson (1756: 278-279), who also based his description mainly on Marcgraf and referred to several older authors.

(2) Barrère (1741: 155), who gave the following account: "Lutra nigricans, caudâ depressâ & glabrâ. Ilya quae & Carigueibeiu Marcg. Loutre".

(3) Fermin (1765: 10-11), who gave very little information: "Chien-aquatique, en Latin *Canis-Aquaticus*, en Hollandais *Water-Hond*, en Nègre Anglois *Watra-Dago*. Celui-ci est assez rare; & ne fait pas autant de dégât que le précédent [= Chien-sauvage]. Il est tout noir, & il a la queue fort courte".

(4) Gumilla (1758, vol. 3: 239), which I have not seen.

In order to definitely settle the identity of *Lutra brasiliensis* Zimmermann, 1780, I now select as its lectotype the animal described by Barrère (or if he had more than one, I select the largest of his specimens), as this without any doubt belongs to the present species as shown by his description of the smooth and flat tail, which distinguishes the present species from all other South American Carnivora. The only unfortunate consequence of this type selection is that the type locality of *Lutra brasiliensis* becomes ipso facto not Brazil, but French Guiana (Barrère's France Equinoxiale includes "l'Isle de Cayenne, les Isles de Remire, . . . , & . . . le Continent de la Guyane").

Harris (1968: 221), when discussing the nomenclatural problem, referred to "the claims of Zimmermann (1777)", and ignored Zimmermann (1780). However, Zimmermann's 1777 work was rejected for nomenclatorial purposes by the International Commission on Zoological Nomenclature in their Opinion 257 (1954, Opinions and Declarations International Commission Zoological Nomenclature, 5(18): 231-244) and was placed on the Official Index of Rejected and Invalid Works in Zoological Nomenclature, as Work no. 7. At the same time the Commission placed Zimmermann's (1780) book on the Official List of Works Approved as Available in Zoological Nomenclature, as Work no. 5.

FAMILY FELIDAE

Leopardus pardalis melanurus (Ball, 1844)

Text-fig. 2b (teeth), pl. 75 lower figure (animal), pl. 86 upper figures (skull)

Felis melanura Ball, 1844, Proc. Zool. Soc. London, 12: 128-129.

Type locality. — Not given in the original description. Pocock (1941: 328) remarked that the type locality of the species is "perhaps more likely than not British Guiana", which of course is not a type locality restriction. Cabrera (1958: 283) did not use the name *melanura* for this form, since "no me parece permisible es adoptar para esta subespecie el nombre *melanura* sin otro fundamento que suponer que el tipo del mismo, cuya localidad se ignora por completo, pudo tal vez ser cazado en la Guayana Inglesa". Of course we will never know with certainty the place of origin of Ball's type specimen, but the fact that Pocock, who actually examined this specimen and had the possibility to know more about its history, recognized it as the present form seems to be quite significant. Therefore it seems fully warranted to settle this question by definitely restricting the type locality to British Guiana.

Synonymies. — Cabrera, 1958: 282-283 (under *Felis pardalis maripensis* J. A. Allen); Pocock, 1941: 328-333; Weigel, 1961: 38-40 (under *Leopardus pardalis maripensis*).

Vernacular names. — (E) Ocelot, Tiger-Cat; (N) Ocelot, Tijgerkat; (S) Heitigrikati.

Distribution. — The species *Leopardus pardalis* (Linnaeus, 1758) has a wide range, extending from the southern part of North America (Arkansas and Arizona) through Central America into South America as far as Peru, central Bolivia, northern Argentina and south-eastern Brazil. The subspecies *L. pardalis melanurus* occurs in "Venezuela and British Guiana; also Dutch Guiana (Surinam) and possibly Trinidad" (Pocock, 1941: 328).

Occurrence in Suriname. — The Ocelot seems to be still rather common throughout Suriname, at least in the northern part of the country; also a few localities farther into the interior are known to me. Kappler (1887: 65) noted that in Suriname the Ocelot is common everywhere, while the brothers Penard ("De Surinamer", 13 July 1905) remarked that the Ocelot belongs to the most common small spotted cats of the country, and that the animal is especially abundant in the mangrove area. Sanderson (1949: 769) remarked: "The ocelot is, in Suriname at least, a purely arboreal animal and prefers the high forests or old coffee plantations where the shade trees have grown tall, coalesced and formed a forest-like growth". During the "Operation Gwamba" 13 specimens were saved in the Brokopondo region (Walsh & Gannon, 1967: 218, under *Felis pardalis*).

I have examined material of the Ocelot from the following localities:

1. Forest near Stondansi Falls, upper Nickerie River, about 5°5'N, Nickerie District, 1 adult female (no. 21964, skin and skull).
2. Forest near Bitagron, east bank of Coppename River at about 5°8'N, Saramacca District, 1 skull (no. 20679).
3. Forest between Raleigh Falls and Voltzberg, upper Coppename River, 1 adult male (no. 20661, skin and skull).
4. Calcutta, south bank of lower Saramacca River, on highway about 55 km west of Paramaribo, 1 male (no. 18010, skin and skull).
5. Saramacca District, 1 skull (no. 20676).
6. Agricultural Experimental Station (Cultuurtuin), Paramaribo, Suriname District, 1 male (no. 18066, skin and skull).
7. Near Paramaribo, 1 skull (no. 20677).
8. Upper Suriname River, Suriname District, 2 skulls (nos. 20673, 20678).
9. Plantation "Marienburg", east of Nieuw Amsterdam, south bank of lower Commewijne River, Commewijne District, 1 female (no. 20535, skull).
10. South of Alkmaar, south bank of lower Commewijne River, 1 female (no. 20660, skin and skull).
11. Plantation "Kroonenburg", north bank of lower Commewijne River, 1 skull (no. 20675).
12. Oost-Westverbinding, highway east of Paramaribo, Commewijne District, 2 males (no. 18023, skin and skull; no. 20717, skin).
13. Virgin forest along upper Tapanahony River, southern Marowijne District, 1 skull (no. 23105).
14. Suriname, without more precise locality indication, 8 skulls; probably from near Paramaribo, and listed by Jentink (1892: 99-101) under the names *Felis pardalis* and *Felis armillata*.

Description. — The following colour description is based on three adult specimens from Suriname (nos. 20660, 20717, 21964). The ground colour of the median part of the body, extending from the tip of the snout to the distal part of the tail is tawny ochraceous. The sides are pale ochraceous buff, the ventral surface is white. The stripes and spots on the back are very dark brown or black. The face shows six longitudinal dark lines, two of which extend from the outer corner of the eye backward, across the cheek, a second line being placed just below the first. The remaining pair of lines runs from the white spot at the inner corner of the eye backward over the occiput between the ears. Between the two lines of the latter pair many small dark spots are visible on the front. The ears, like in *Leopardus tigrinus* and *L. wiedii*, are rounded, with the outside black with a large white spot near the middle of the posterior margin. From between the ears five dark longitudinal lines extend backward over the full length of the neck, the middle of these being very narrow, the four others broad; the outer pair more or less forms a continuation of the median pair of lines of the face. From the shoulders backward the longitudinal lines break up and form more or less distinct longitudinal rows of elongate or rounded spots and lines. Many of these spots, especially those on the sides are ocellate, i.e., they consist of a brown spot surrounded by a black line. The basic pattern on the dorsal and lateral parts of the body between the shoulders and the base of the tail is that of longitudinal lines of a brown colour (very similar to the ground colour of the back), each of which is flanked at either side by a dark line. These bicoloured stripes are broken up at irregular intervals by the ground colour and the black lines then often enclose, entirely or partly, the brown central area. In this way ocellate spots, often very elongate, are formed; the brown centre, encircled by black, is placed in the groundcolour, which, on the sides (but not on the dorsal surface) differs conspicuously from the central colour of the spot. Over the middle of the back, from the occiput to the base of the tail, a dark line is visible, as already mentioned above: on the neck this line is very narrow, in some specimens it may be partly double. On the back itself the line becomes wider but, especially anteriorly, it may be interrupted at various places, or become double, thereby becoming less conspicuous. In the posterior part of the dorsal surface, however, this median line usually is very distinct and uninterrupted.

The ground colour of the ventral surface is white. Two broad dark transverse bands extend over the throat, the anterior at about the level of the ears, the posterior at some distance above the shoulders. Laterally these two bands at each side are connected by a dark longitudinal stripe. The chin is white with two dark spots placed before the first of the transverse dark throat bands. Two similar spots, sometimes laterally extended and then almost forming a continuous transverse band, are placed between the two transverse throat bands. Between the posterior throat band and the base of the forelegs several transverse rows of small dark spots, sometimes forming transverse lines, are present. The ventral surface of the body between the forelegs and the hind legs is covered by many large dark simple (= non-ocellate)

spots. The outer surface of the forelegs is slightly lighter than the dorsal ground colour of the body. Over the full length of the outer surface of the legs many round simple dark spots are present, those near the foot being smallest. The hairs of the soles are uniformly dark. The inner surface of the legs is mostly white with a few dark spots, which are very small distally, and more distinct, broader and transverse proximally. The colour of the hind legs is similar to that of the forelegs, especially the colour of the outer surface. On its inner surface the dark colour of the sole extends over the entire lower hind foot. The rest of the inner surface shows medium-sized simple rounded spots rather than bands, although the spots are sometimes arranged in transverse rows.

In its basal part the tail is spotted, distally more or less distinctly ringed with broad dark rings; the tip is dark brown or blackish.

Dental formula: $I \frac{3}{3}$, $C \frac{1}{1}$, $P \frac{3}{2}$, $M \frac{1}{1}$. In the upper jaw the last premolar (carnassial) is the largest tooth. The first (and only) upper molar is very small when compared with the last premolar. In the lower jaw the three teeth behind the canine become gradually larger posteriorly, the molar, which is a real carnassial, being the largest of the three. The number, shape and arrangement of the teeth is the same in all Suriname Felidae. The length of the upper carnassial (third premolar) and the width across the upper canines in most cases are useful characters to distinguish the species.

The external measurements of the female (no. 21964), the male (no. 20661) and the female (no. 20660), mentioned under Occurrence in Suriname, are, respectively: head and body, 750, 862, and 800; tail, without tuft, 305, 330, and 305; hind foot, with claw, 163, 162 and 160; ear, 60, 56, and 58 mm; weight, 11, about 13, and 10.5 kilograms. — In Table 48 some skull measurements of ten specimens are given. In 22 skulls the length of the upper carnassial varies from 14.0 to 16.9 mm (mean: 15.4 mm); the width across the upper canines from 29.3 to 38.1 mm (mean: 33.4 mm). Mearns (1902: 249, table) noted the measurements of a Suriname specimen under the name *Felis chibigouazou* Griffith, 1827.

TABLE 48

Skull measurements of ten specimens of *Leopardus pardalis melanurus* (Ball) from Suriname in the Leiden Museum.

Reg. number	20661	18066	18023	18010	20535	21964	20660	23105	20679	20675
Sex	♂	♂	♂	♂	♀	♀	♀	?	?	?
Condylbasal length	136.1	131.6	125.4	128.5	118.1	125.7	127.2	134.3	141.7	127.1
Palatal length (median line)	54.9	52.3	49.9	53.3	48.3	54.7	53.4	52.4	59.2	47.5
Zygomatic breadth	97.3	83.4	93.0	87.4	84.2	85.5	83.5	97.9	100.9	86.1
Interorbital constriction	29.1	22.3	27.2	25.2	24.0	25.0	25.7	29.6	30.6	26.9
Postorbital constriction	37.4	26.1	32.0	29.6	32.4	30.3	27.0	29.8	34.1	27.4
Breadth of braincase	55.4	52.1	53.3	52.1	51.5	54.3	52.4	51.9	53.8	51.8
Length of upper tooth-row c-m ¹	45.2	44.2	42.2	41.0	38.4	41.4	40.6	44.1	46.7	41.2
Length of upper carnassial	16.9	15.9	15.1	14.9	14.0	16.3	14.8	16.5	16.6	14.0
Width across upper canines	36.0	35.0	34.7	33.2	30.8	31.8	33.2	36.4	38.1	32.6
Length of mandible	97.2	89.6	89.3	89.4	83.1	87.7	88.6	93.1	100.3	88.8
Length of lower carnassial	13.0	11.7	11.4	10.5	10.8	12.7	11.5	11.8	11.7	10.8

Remarks. — The brothers Penard ("De Surinamer", 13 July 1905) remarked that the food of the Ocelot consists mainly of small mammals and birds, which it captures on the ground as well as in the trees. In Suriname the name Hei-tigrikati is given to the Ocelot as it is supposed to have a preference for the "Hei" (= Aguti) as food. Usually the Ocelot does not hunt its prey but waits until it comes close and then jumps it. They are especially harmful to dogs, cats and poultry, but the species hardly ever attacks cattle, and neither does it attack man. Fights between the Ocelot and the Cayman are known, while like the Puma it catches birds by jumping in a group of such animals. It usually feeds on the blood of its victims. The litter, according to the brothers Penard, consists of two or three kittens.

According to Morris (1965: 314) the Ocelot is diurnal "where it is left undisturbed, but it is a shy animal and becomes nocturnal in areas where it is hunted. Although it can climb, and often conceals itself in the branches of a tree, it normally hunts on the forest floor", where its "prey consists of agoutis, pacas, spiny rats, peccaries, brocket deer, birds and some reptiles".

In the 1964 Decree of the Game Ordinance 1954 the vernacular name "Pakira-tigri" has been used for the Ocelot; this name is misleading because it is mostly used for the Jaguar (see p. 326).

In the literature on Suriname mammals the scientific names *Felis pardalis* Linnaeus, *Felis armillata* F. Cuvier, *Felis maripensis* J. A. Allen and *Felis chibigouazou* Griffith have also been used for the Suriname Ocelot.

***Leopardus tigrinus tigrinus* (Schreber, 1775)**

Pl. 76, 77 (animal), pl. 87 (skull)

Felis tigrina Schreber, 1775, Die Säugthiere, 3 (15): pl. 106 (animal); Schreber, 1777, Die Säugthiere, 3 (23): 396-397 (description).

Type locality. — "Ist in dem ganzen südlichen America gemein" (Schreber, 1777: 397). The name *Felis tigrina* was first published by Schreber (1775) in the legend to his plate 106. The animal figured on that plate thus is the holotype of the species. The plate was copied from Buffon (1765a: 252, pl. 37; see also Buffon, 1776: 226-227), who stated that: "Le Margay (pl. XXXVII) qui a servi de sujet pour cette description, ayant été tué à Cayenne...". Therefore "Cayenne" (French Guiana) must be considered the actual type locality of the present species.

Synonymies. — Cabrera, 1958: 288.

Vernacular names. — (E) Ocelot-Cat; (N) Ocelot Kat; (S) Tigrikati.

Distribution. — The species *Leopardus tigrinus* (Schreber, 1775) occurs in Central and South America from Costa Rica to Paraguay and northern Argentina. The nominate subspecies *L. tigrinus tigrinus* is found in north-eastern Brazil, the Guianas and eastern Venezuela, but its exact range is not known.

Occurrence in Suriname. — I have examined material from the following localities:

1. Saramacca District, 1 skull (no. 17764).
2. Santo Boma, about 12 km south-west of Paramaribo, Suriname District, 1 specimen (no. 18292, skin and skull).

3. Onoribo on Para River, 5 km west of Paranam, about 25 km south of Paramaribo, Para District, 1 adult male (no. 18221, skin and skull).

4. About 10 km south of Zanderij, and about 50 km south of Paramaribo, Para District, 1 male (no. 23583, skull; the skin of this specimen, shown on pl. 76, could not be obtained for the museum collection).

As discussed under *Leopardus wiedii vigens* (see p. 316), some of the published records of that species from Suriname may actually pertain to the present species, but as in so many cases usually too little information is given on the animals, while as a rule no material has been collected, making it impossible to obtain a correct identification.

The brothers Penard ("De Surinamer", 13 July 1905) did mention "de Margai of Kleine tijgerkat *F. tigrina*" from Suriname, giving as length of body and head 560 mm, and as length of tail 340 mm, which checks sufficiently well with the measurements found by us for the species. However, in view of the existing confusion it is not certain that the identification by the brothers Penard is correct.

Description. — The following description is based on the male specimen from Onoribo (pl. 77). The ground colour of the median dorsal part, extending from the snout to almost the tip of the tail, is ochraceous tawny, on the sides passing into pale ochraceous buff to become pure white ventrally. The pattern of the spots and stripes of this specimen is shown in plate 77. The stripes are very dark brown, practically black. The dorsal spots are usually ocellate, consisting of a dark, almost black ring, which partly encloses a spot of the ground colour, while as a rule the rings are open anteriorly. The ventral spots are simple and black, they are lacking between the bases of each pair of legs. The face shows six longitudinal dark lines, the median pair of which extends from the eyes backward between the ears. The four remaining lines are placed on the cheeks: each cheek bearing one pair of parallel lines, the upper of which is the darkest and most distinct, and extends from the eye sideways to below the ear; the lower line is lighter and less conspicuous, especially anteriorly. At the level between the ears two more longitudinal lines appear, being placed more medially. These four lines extend backward and at the level of the shoulders the outer pair breaks up and disappears in the general pattern of stripes and spots. The inner pair of stripes here also becomes interrupted, but converges and from about the middle of the body continues as a median longitudinal row of V-shaped spots, reaching as far as the base of the tail. The ears are rounded, externally they are black, except for a large distinct whitish spot placed near the middle of the posterior margin of the ear. The chin is entirely white, the throat has the same colour but shows two dark transverse bands, between which two dark spots are present. Laterally the dark bands are connected by two longitudinal bands. The forelegs on their outer surfaces show a colour similar to the dorsal ground colour of the body, or are slightly more greyish, the inner surface of these legs is whitish. The spots on the outer surface are small and rather numerous, on the inner surface large and few. The hind legs show a similar colour and colour pattern. The tail shows

large dark spots, which in places seem to have a tendency to form rings, which distally are the most conspicuous. The tip of the tail is greyish.

The skin from Santo Boma (no. 18292) has been prepared in the field and its colour may have slightly changed, the ground colour being slightly more rufous than in the previous specimen. There are no ocellate spots in this specimen, the pattern of the back consisting of longer and shorter longitudinal stripes and rows of spots (the latter especially posteriorly). On the face small spots are present between the two dark lines that extend from the eyes backward; posteriorly these spots form the two submedian lines also found in the previous specimen, but which in the present specimen remain separated up to the base of the tail, each becoming interrupted posteriorly. In all other respects this specimen strongly resembles the one from Onoribo.

In April 1972 Mr. P. Staffeleu was shown a specimen of *L. tigrinus* shot near Zanderij; he obtained the skull for the Leiden Museum (no. 23583), but the owner of the specimen did not want to part with the skin. A photograph of the skin, of which the tail is missing, is published here as plate 76. The colour pattern of this specimen resembles that of the Santo Boma specimen discussed above, except for the fact that a row of V-shaped spots in the median line of the posterior part of the back is quite distinct.

As shown by the three specimens dealt with above, and as confirmed by records in the literature, the colour pattern of this species is strongly variable.

Dental formula: $I \frac{3}{3}$, $C \frac{1}{1}$, $P \frac{3}{2}$, $M \frac{1}{1}$. The number, shape and arrangement of the teeth of this species, like that of the other Suriname Felidae is practically identical with those of *Leopardus pardalis melanurus* (see p. 311).

The external measurements of the male specimen from Onoribo (no. 18221), the only specimen of the present species of which these are available, are: head and body, 556; tail, 345; hind foot, about 105; ear, 43 mm; weight, 2450 grams. Of the four skulls from Suriname listed above some measurements are given in Table 49. Winge

TABLE 49
Skull measurements of four specimens of *Leopardus tigrinus tigrinus* (Schreber) from Suriname in the Leiden Museum.

Reg. number	18221	18292	17764	23583
Sex	♂	♂	-	♂
Condylobasal length	87.8	-	86.7	85.3
Palatal length	33.0	36.5	33.3	32.7
Zygomatic breadth	56.5	-	57.1	54.5
Interorbital constriction	15.3	15.5	16.9	15.0
Postorbital constriction	28.4	27.4	29.1	28.7
Breadth of braincase	40.2	-	39.5	37.8
Length of upper tooth-row c-m ¹	25.7	28.0	27.0	25.8
Length of upper carnassial	9.5	10.0	9.5	9.5
Width across upper canines	19.2	20.4	20.0	18.7
Length of mandible	56.8	-	57.6	55.7
Length of lower carnassial	7.5	7.5	7.8	7.5

(1895: 8) noted that in seven specimens of *Felis tigrina* from Brazil the length of the upper carnassial varied from 9 to 10.5 mm (mean: 9.96 mm) and that of the lower carnassial from 7.5 to 8 $\frac{2}{3}$ mm (mean: 7.84 mm). In eight specimens from several localities of northern South America and Brazil, preserved in the British Museum (Natural History), I noted that the length of the upper carnassial varies from 8.9 to 11.0 mm (mean: 9.8 mm) and that of the lower carnassial from 6.7 to 8.0 mm (mean: 7.6 mm). The average lengths of both the upper and the lower carnassials agree rather closely with the values found in my Suriname material. As a rule the length of the upper carnassial in *Leopardus tigrinus* is less than 10.0 mm and that of the lower carnassial less than 8.0 mm; in *L. wiedii*, however (see p. 318), these lengths are, respectively, more than 10.0 mm and more than 8.0 mm. I am aware that in itself these characters are not sufficient to identify a single individual with certainty; in some specimens a combination with other skull characters (size and shape) is necessary to arrive at a definite identification.

Remarks. — The colour pattern of the species is quite variable and does not seem to show good characters by which it can be distinguished from that of *Leopardus wiedii vigens*, which also occurs in Suriname. Pocock (1917: 350) as well as Hall & Kelson (1959 (2):952) remarked that *L. tigrinus* may be distinguished from *L. wiedii* by that in the former species the hair on the nape is directed backward, while it points forward in the latter; this character, however, in my material is not at all distinct.

Also the skull characters differentiating *L. tigrinus* from *L. wiedii* are of such a nature that they have not been correctly understood by several authors, so that in the literature there exists considerable confusion concerning the systematics and the nomenclature of these and other small South American spotted cats. Several authors synonymise *L. tigrinus* and *L. wiedii*, others consider them specifically distinct. This problem has been amply discussed by J. A. Allen (1919: 353-358), Cabrera (1961a: 175-182), Pocock (1917: 344-350; 1941: 352-369), Weigel (1961: 37-38), and Winge (1895: 7-10, 82, 106-107, pl. 1 figs. 1-4), who gave arguments both for and against considering the two forms distinct species. Recently Leyhausen (1963) pointed to anatomical and behavioural differences of the two species, while Geisler et al. (1968) discussed the differences in the structure of the chromosomes. A study of my own Suriname material convinced me that *L. tigrinus* and *L. wiedii* are distinct species and that we have to be extremely careful to use the published records of these two because of their confusion by older authors. There also exists considerable confusion in the use of the vernacular names Margay, Tiger-Cat and Longtailed Cat used for the two species; I have used the names as proposed by Leyhausen (1963: 640).

My Suriname specimens of *L. tigrinus* and *L. wiedii* agree excellently with Winge's 1895 descriptions and figures of these species. The shape of the skull of *L. tigrinus* (see pl. 87) and its dimensions, as given above, in all respects conform to the figure and measurements given by Winge (1895: 7-10, pl. 1) for *Felis tigrina* (= *Leopardus tigrinus*). The braincase of *L. tigrinus* is distinctly narrower than that of *L. wiedii*

(see pl. 88), the former being more oval. In the Suriname material examined by me also the length of the upper carnassial is a good character to distinguish the two forms; in the four skulls of *L. tigrinus tigrinus* this length varies from 9.5 to 10.0 mm, while in *L. wiedii vigens* this length in two specimens is 12.0 and 12.4 mm.

***Leopardus wiedii vigens* (Thomas, 1904)**

Pl. 88 (skull)

Felis Wiedii vigens Thomas, 1904, Annals Magazine Nat. Hist., (7) 14: 192-193.

Type locality. — "Igarapé-Assu, near Pará. Alt. 50 m.", northern Brazil.

Synonymies. — Cabrera, 1958: 289.

Vernacular names. — (E) Tree-Ocelot, Margay; (N) Boomkat.

Distribution. — The species *Leopardus wiedii* (Schinz, 1821) is known from southern Texas and Mexico south to Peru, Bolivia, northern Argentina and northern Uruguay. The subspecies *L. wiedii vigens* is found in north-eastern South America from the Orinoco basin in Venezuela to the lower Amazon region in Brazil, including the three Guianas.

Occurrence in Suriname. — The Suriname material of the present species examined by me consists of three specimens: (a) A complete skeleton provided with the indication "Suriname" but without further data; this specimen was received from the Amsterdam Zoo sometime before 1887, since Jentink (1887: 84) listed it under "*Felis pardalis*" (no. a; new no. 19670). (b) A semi adult female skull collected by A. Kappler in 1880 in "Surinam" and preserved in the Stuttgart Museum (SMN no. 1880), in which all permanent teeth are present and in function; most sutures, however, are still distinctly visible. (c) An almost complete skull (only the canines and two of the upper incisors are missing) of a semi-adult specimen from near the Avanavero Falls, Kabalebo River, Nickerie District, western Suriname, found by D. G. Reeder on 5 April 1971 in a deep pit in the virgin forest, together with some skeleton fragments of other animals (no. 19671).

In the literature on Suriname mammals, the names *Felis wiedii* Schinz, 1821, and *Felis macroura* Wied, 1823, have been used, the latter name being a junior synonym of the former. Kappler (1887: 70) mentioned a small spotted cat under the name *Felis macroura*. The brothers Penard ("De Surinamer", 13 July 1905) stated that *Felis tigrina*, *F. macroura* and *F. colocolo* occur, though rarely, in Suriname, but they expressed as their opinion that these three forms might only be variations of the Ocelot, *Felis pardalis*. Of their three species the Penards gave the following measurements (a = head and body; b = length of tail): *Felis macroura*, a = 680 mm and b = 350 mm; *F. tigrina*, a = 560 mm and b = 340 mm; *F. colocolo*: a = 650 mm and b = 350 mm. What they meant with *F. colocolo* is not clear as this species (*Felis colocola* Molina, 1782) so far is only known from Chile, Argentina, Bolivia, Peru, Ecuador and southern Brazil. The Penards also do not provide any characters to distinguish this species from *F. macroura*. Judging by the measurements given, their identifications of *F. macroura* (= *F. wiedii*) and *F. tigrina* might be correct,

but there exists too much uncertainty regarding the actual differences between these species to prove their statements.

Sanderson (1949: 769) used the name *Leopardus wiedii* for the small spotted cats seen by him in Suriname, and remarked: "It is alleged by the Amerindians not to be a forest animal. The same sources also confirmed our own observations that it is purely terrestrial". Leyhausen (1963: 639) stated that *Leopardus tigrinus*, "the ocelot-cat, although in a more limited way also capable of climbing trees, is in the main ground-dwelling", contrary to *Leopardus wiedii*, of which he noted: "The tree-ocelot has acquired special anatomical and behavioral adaptations to a predominantly arboreal way of life". On the basis of Leyhausen's statement it seems more likely that Sanderson's animals were *Leopardus tigrinus* rather than *L. wiedii*.

Finally, Walsh & Gannon (1967: 90, 91, 219) listed a specimen of the "margay (*Felis wiedii*)" as being caught during the "Operation Gwamba". As the specimen has not been preserved, and as their notes on the specimens read: "a small cat, less than two feet long with an eighteen-inch tail, only a little larger than a tomcat, with black, distorted spots like a miniature ocelot" and thus are insufficient to make its identity with *L. wiedii* fully certain, it is not entirely precluded that the specimen actually was a *Leopardus tigrinus*.

Description. — No skins of Suriname specimens are available to me, therefore it seems best to cite here Thomas's (1904: 192) original description of the skin of *Felis wiedii vogens*: "Fur of medium length; hairs of back about 13 mm. long. Fur of nape from withers to crown smoothly and completely reversed forwards. Ground-colour comparatively dark, near "clay-colour" on the head, top of neck, and dorsal area, buffy white on sides, and scarcely lighter on belly, not pure white anywhere. Longitudinal lines of nape strongly defined, five in number—a median rather irregular one, split into two in places, and two outer pairs of strong clear ones, the inner of which is continuous with the supraorbital black line. Median dorsal line commencing about a decimetre behind withers, single and well-defined posteriorly, partially split in two anteriorly. Spots of back and flanks oblong, elongate, but rarely lengthened into lines, a slight lighter centre present in some. Throat with three transverse dark lines, the two anterior broken mesially. Chest and inguinal region dull whitish, with few or no spots; belly profusely spotted. Ears with their edges and inner surfaces strong clay-colour; their backs black, with their posterior halves dull buffy whitish, not white, and not succeeded behind by a second black mark, as is usually the case. Limbs coloured like body; the spotting continued on to the metapodials. Palms and soles smoky brown. Tail long, its ground-colour like the body, its dark rings about twelve in number, rather broader than the light ones, mostly broken below; the extreme tip blackish". Pocock (1941: 358-360) gave an excellent account of the variability of the coat characters of the present form based on material from a number of localities. The external measurements given by Thomas (1904: 193) for the type specimen are: head and body, 560; tail, 405; hind foot (without claw), 123; ear, 55 mm.

Dental formula: $I \frac{3}{3}$, $C \frac{1}{1}$, $P \frac{3}{2}$, $M \frac{1}{1}$. The number, shape and arrangement of the teeth of the species, like that of the other Suriname Felidae, is practically identical with those of *Leopardus pardalis melanurus* (see p. 311).

In Table 50 some skull measurements of the above mentioned Suriname specimens of the present species are given together with those of the type specimen of *Felis vigens* taken by me in the British Museum (Natural History).

TABLE 50
Skull measurements of three specimens of *Leopardus wiedii vigens* (Thomas) from Suriname (first three columns) and those of the type of *Felis wiedii vigens* Thomas (last column).

Museum	RMNH	RMNH	SMN	BMNH
Reg. number	19670	19671	1880	1904.7.4.43
Sex	-	-	♀	♂
Condylobasal length	86.4	91.3	91.9	93.9
Palatal length	33.8	34.8	35.3	35.0
Zygomatic breadth	± 59	60.5	60.5	65.1
Interorbital constriction	17.3	16.8	17.8	18.7
Postorbital constriction	29.6	32.4	34.0	33.2
Breadth of braincase	42.9	46.4	44.9	42.7
Length of upper tooth-row c-m ¹	28.0	29.7	29.8	30.1
Length of upper carnassial	12.0	12.4	11.9	11.6
Width across upper canines	23.8	22.6	22.5	22.9
Length of mandible	57.9	60.4	61.1	63.5
Length of lower carnassial	9.4	8.8	8.4	8.0

Pocock (1941: 355, 357 and 360) found that in 13 skulls of the typical race, *Leopardus wiedii wiedii* (Schinz, 1821), from south-eastern Brazil, Paraguay and northern Argentina, the length of the upper carnassial varied from 10 to 12 mm (mean: 10.5 mm); that both in a male and a female skull of *L. wiedii boliviae* Pocock, 1941, from Bolivia and perhaps from Mato Grosso, this length was 11 mm; in a specimen of *L. wiedii pardictis* Pocock, 1941, from San Lourenço, Pernambuco, 11 mm; and in four skulls of *L. wiedii vigens* "a fraction over 11 mm". Winge (1895: 9, under *Felis macrura*) noted that in five specimens from Brazil this length varied from 10³/₄ to 12¹/₄ mm (mean: about 11.6 mm). In five specimens from British Guiana and Brazil, preserved in the British Museum (Natural History), which could be measured by me, the length of the upper carnassial varies from 10.3 to 11.7 mm (mean: 11.3 mm), while the lower carnassial varies from 7.7 to 8.7 mm (mean: about 8.3 mm). If we compare these data with those of the three skulls from Suriname, it becomes evident that on an average in our Suriname material both the upper and the lower carnassial are somewhat longer than in the material from British Guyana and Brazil. It would therefore be interesting to examine more skulls of *L. wiedii vigens* from Suriname in order to decide the question whether or not the longer carnassial actually is characteristic of the Suriname population of the present form.

Some differences between the skull of *L. wiedii* and that of *L. tigrinus tigrinus* are dealt with under the latter species (see pp. 315, 316).

Puma concolor discolor (Schreber, 1777)

Pls. 78, 79 (animal), pl. 86 lower figures (skull)

Felis discolor Schreber, 1777, *Die Säugthiere*, 3 (23): 393-394 (description); 3 (25): pl. 104B (plate, scientific name); Schreber, 1778, *Die Säugthiere*, 3 (26, Nachtrag): 586 (scientific name).

Type locality. — “Er wohnt in Südamerica” (Schreber, 1777: 394). Restricted by Hershkovitz (1959: 98) to “French Guiana”.

Synonymies. — Cabrera, 1958: 293 (under *Felis concolor concolor*); Goldman, 1946: 200-204, pls. 84 and 90 (under *Felis concolor concolor*); Hershkovitz, 1959; Weigel, 1961: 43-46, fig. 17 nos. 1-3.

Vernacular names. — (E) Puma, Deer Tiger, Red Tiger, Cougar; (N) Poema, Amerikaanse Leeuw, Coegoea; (S) Reditigri.

Distribution. — The species *Puma concolor* (Linnaeus, 1771) originally inhabited the area from southern Canada (British Columbia and central Alberta to southern Quebec) southward through Central America into South America as far as Patagonia (see maps by Goldman, 1946: 197, fig. 6; Hall & Kelson, 1958: map 479 on p. 957; Petzsch, 1968: 115). Since about 1900 the range of the Puma considerably decreased, not only in North America but also in South America, where it disappeared from the more densely settled parts. The subspecies *P. concolor discolor* is known from eastern Venezuela, the Guianas and northern Brazil.

Occurrence in Suriname. — According to Sanderson (1949: 769) the Puma is “common throughout the country, though particularly so in the flood forest during the dry season. It is not so commonly met with on cleared and cultivated land as is the Jaguar”.

In many old narratives and other publications on Suriname the present species has been indicated with the name “Red Tiger”, and is there said to be far less common than the Jaguar (*Panthera onca*). The first record probably was that by Warren (1667: 12-13) who remarked: “Of the *Tygers* there are three kinds, Black, Spotted, and Red . . . There are not many of the Red, and those not so fierce as either of the former”. Kappler (1887: 65) also reported the Puma from Suriname and stated that it is less common there than the Jaguar. Dr. D. C. Geijskes kindly informed me that only twice he observed a Puma: once in a forest between the Raleigh Falls and Voltzberg, upper Coppename River at about 4°40'N (1944), and once in a forest between the Lucie and Coeroeni Rivers, upper Corantijn basin, southern Nickerie District (September 1959). Sanderson (1949) did not specify the locality where his specimen was shot. Goldman (1946: 204) examined two skins and one skull from Suriname, of only one specimen the exact locality, Paramaribo, was indicated.

The following material has been examined by me:

1. Sipaliwini savanna near Sipaliwini airstrip near the Brazilian border, extreme south-eastern Nickerie District, 1 female (no. 20663, skull; the entire animal is shown in pl. 78).

2. Between Bigi Poika (on Bigi Poika Creek, western tributary of Saramacca River) and Coesewijne River, at about 5°25'N 55°30'W, Saramacca District, 1 adult male (no. 23597, skin and skull).

3. Near Tafelberg mountain on the border of the southern part of Saramacca District and Brokopondo District, about 3°52'N, 1 skull (Surinaams Museum).
4. Upper Saramacca River, Brokopondo District, 1 young male (no. 20662, skull).
5. Near Jodensavanne, east bank of Suriname River, Suriname District, 1 young specimen (no. 17825, skull).
6. Suriname, without more precise locality indication, 2 skulls (SMN no. 1757; Surinaams Museum).

Description. — The following description is based on the single skin available, viz., of the male specimen (no. 23597) collected between Biki Poika and the Coese-wijne River. The ground colour of the dorsal surface is rather uniformly reddish brown to ochraceous tawny, without a pattern of stripes and spots. On the head a small dark spot is placed over the inner half of each eye; this spot is separated from the eye by a light area. A narrow dark line extends from the outer angle of the eye backward, to below the ear. The muzzle is more greyish, the vertex more brownish. The outer surface of the ears bears a uniformly black short fur, the inner surface has long whitish hairs. A short and narrow black line extends from the inner angle of the ear in the direction of the occiput. The neck, the back and the outer surfaces of the legs are uniformly ochraceous tawny, but for a slightly darker, not clearly defined, broad median longitudinal stripe over the full length of the body. This darker colour also extends on to the tail, which distally becomes even darker and ends in a large black tip. The ventral surface is pale, almost white; the line between this whitish colour and the brownish colour of the sides is rather sharp. The throat, as well as the upper lip, chin and cheeks, is pure white. The white colour of the upper lip and that of the cheeks are separated by a blackish band, which runs from the base of the nose to the outer corner of the mouth. A broad poorly defined pale brownish band extends over the base of the throat. The pale ventral area is widest between the bases of the legs, being constricted in the middle of the body, where the brown colour of the sides reaches farthest down. Small brownish spots, which are irregularly placed and few in number, are present on the ventral surface, being most distinct and most numerous anteriorly. Of both the forelegs and the hind legs the soles have black hairs; this black area is sharply separated from an area of whitish fur, which extends from the wrist proximally. The whitish colour is especially distinct in the hind legs, where it reaches as far as the heel. The rest of the inner surface of the legs is dirty white with, in the basal part, a few large ill-defined dark spots which may have a tendency to form transverse bands. The ventral surface of the tail is dirty white, becoming darker distally towards the black tip.

Many authors, e.g., Weigel (1961: 43-44), Blonk (1965: 145) and Mohr (1967), remark that the juveniles are spotted and have a ringed tail. Findlay (1971: 96) mentioned the occasional presence in Suriname of melanistic and albinistic specimens.

The Puma is easily distinguished from other Suriname cats by its large size and rather uniform colour. The Jaguar, it is true, is of a comparable size but it is heavily striped and spotted. The Jaguarundi, which has also a uniform colour, is much

smaller and has the tail of a uniform dark colour, the tip not being different in colour from the rest.

Dental formula: $I \frac{3}{3}$, $C \frac{1}{1}$, $P \frac{3}{2}$, $M \frac{1}{1}$. The number, shape and arrangement of the teeth of this species, like that of the other Suriname Felidae is practically identical with those of *Leopardus pardalis melanurus* (see there). The upper carnassial of the present species varies in five specimens from 20.0 to 23.2 mm.

The external measurements of the adult male mentioned by Sanderson (1949: 768) are: head and body, 1520; tail, 710; hind foot, 248; ear, 75 mm. — Some skull measurements of the specimens examined by me are given in Table 51.

TABLE 51
Skull measurements of five specimens of *Puma concolor discolor*
(Schreber) from Suriname.

Museum	RMNH	RMNH	RMNH	RMNH	SMN
Reg. number	23597	17825	20662	20663	1757
Sex	♂	-	♂	♀	-
Condylbasal length	171	180	179	153	182
Palatal length	76.5	78.0	74.5	67.9	80.5
Zygomatic breadth	122.0	136.0	117.4	121.0	134.7
Interorbital constriction	34.1	40.0	32.9	33.2	37.0
Postorbital constriction	39.1	46.2	38.2	43.4	43.3
Breadth of braincase	71.6	72.1	65.0	69.0	73.5
Length of upper tooth-row $c-p^3$	59.0	58.2	58.6	55.6	57.6
Length of upper carnassial	22.1	21.7	23.2	20.0	21.5
Width across upper canines	50.0	51.4	51.0	45.6	52.5
Length of mandible	128.4	126.0	123.1	117.4	133.8
Length of lower carnassial	17.4	17.5	18.3	16.0	17.3

Remarks. — The Puma, which is mainly nocturnal, feeds practically on all middle-sized and larger mammals, even on porcupines. As a rule it is not dangerous to man, although Roth (1941: 150-153) cited some cases of Pumas attacking Amerindian children in British Guiana (see also Young, in Young & Goldman, 1946: 99-105). Many interesting and important data on the life history of the Puma were given by Young & Goldman (1946).

The Penard brothers ("De Surinamer", 13 July 1905) remarked that the Puma does not hold its prey with its forepaws when feeding, but only uses the mouth. They state that the animal never roars, not even when very hungry. The litter consists of two or three kittens, which are hidden at the base of large trees or in caves. They also remarked that during the time the Puma has kittens it will even catch monkeys. Birds are only seldom caught. According to hunters the Puma sometimes catches *Psophia crepitans* Linnaeus by jumping in a group of these birds and killing them when they take to the wing. Like the Jaguar the Puma has the habit to sharpen its nails against tree trunks. Unlike the jaguar, it never swims across rivers.

For the Puma, Hartsinck (1770: 89) used the Dutch name "Hartenbeest-Tijger" (= Deer Tiger). This name is evidently based on an Amerindian name for the species, as Kappler (1887: 65) stated about the Puma: "Die Indianen nennen ihn Kusaliwara,

weil sein Fell die Farbe eines Hirsches, Kusali, hat". Hartsinck's Dutch name is no longer in use.

The nomenclatorial status of the species and subspecies names of the present form is rather complicated. I arrive at the same conclusion concerning these names as does Hershkovitz (1959), although partly for different reasons. As Hershkovitz (1959) has shown, the name *Felis concolor* Linnaeus (1771: 522) is based on the accounts of several authors (Brisson, Marcgraf, Ray and Buffon); these accounts, however, can be traced back to only two sources, viz., Marcgraf (1648: 235 fig.) and Barrère (1741: 16). Marcgraf's animal came from Pernambuco, Barrère's from French Guiana. The choice of a lectotype from among these two specimens will finally settle the problems existing around the actual restricted type locality. Goldman (1946: 200, 202) restricted the type locality of *Felis concolor* to French Guiana, but failed to designate a lectotype. Hershkovitz (1959: 97, 99), not only restricted the type locality to "Pernambuco, Brazil", but also "restricts the type of *Felis concolor* Linnaeus to Marcgrave's *cuguacuarana*"; this may be considered a lectotype selection, and therefore I now definitely designate the animal that Marcgraf (1648) described and figured as *cuguacuarana*, to be the lectotype of Linnaeus's *Felis concolor*. As a lectotype selection overrides all previous restrictions, the type locality of Linnaeus's *F. concolor* therefore is now definitely Pernambuco, Brazil.

Felis discolor was first described by Schreber on p. 393 in Heft 23 of his "Säugethiere", which Heft according to Sherborn (1891: 589) was published in 1777. In this description no latin name was given to the species, but reference was made to pl. 104B, which, again according to Sherborn, was published in Heft 25 of Schreber's work; this Heft appeared in the same year, possibly simultaneously with Heft 23. Hershkovitz (1959: 98, 99), for reasons unknown to me, mentioned the date of publication of pl. 104B as 1775. Neither Sherborn's (1891: 589) nor Poche's (1911: 131) accounts of the dates of publication of Schreber's work, make this early date for pl. 104B likely, and therefore I consider 1777 the correct date. Schreber's pl. 104B bears the latin name *Felis discolor* for the species. As the text belonging to this plate had already been published in a previous Heft and contains a reference to the plate, the text and the plate together form the indication which makes the name available. The name *Felis discolor* was originally based by Schreber on the following sources: (1) Schreber's plate, which is a copy of Pennant's (1771, Synopsis of Quadrupeds: 180, pl. 18 fig. 2) plate of the "Black Tiger", made after a specimen of which the locality is unknown, (2) Pennant's account of the Black Tiger as referred to in Schreber's text, and (3) the "Once" of Desmarchais (1731, Voyage, 3: 300) which originated from French Guiana. In order to settle the question of the identity of *Felis discolor*, I now select, in accordance with Hershkovitz's (1959) views, Desmarchais's specimen as the lectotype of *Felis discolor* Schreber. By this action the type locality of the species is now definitely restricted to French Guiana.

In the literature on Suriname mammals the name *Felis concolor* often has been used.

Herpailurus yagouaroundi yagouaroundi (E. Geoffroy, 1803)

Pl. 75 upper figure (animal), pl. 89 upper figures (skull)

Felis yagouaroundi E. Geoffroy, 1803, Catalogue Mammifères Muséum National Hist. nat Paris: 124.

Type locality. — “L’Amérique méridionale”. Restricted by Hershkovitz (1951: 565) to “Cayenne, French Guiana”; this restriction is validated by the lectotype selection made below on p. 325 in the paragraph Remarks.

Synonymies. — Cabrera, 1958: 297 (under *Felis*); J. A. Allen, 1919: 383; Weigel, 1961: 52-53, fig. 18 nos. 8, 9.

Vernacular names. — (E) Jaguarundi, Spotless Cat, Weasel-cat; (N) Jagoearoendi, Wezelkat; (S) Boesikati, Blakatigrikati, Reditigrikati.

Distribution. — The range of the species *Herpailurus yagouaroundi* (E. Geoffroy, 1803) extends from the extreme southern part of Arizona and southern Texas southward through Central America into South America as far as northern Argentina. The nominate subspecies *H. yagouaroundi yagouaroundi* is known from eastern Venezuela, the Guianas and north-eastern Brazil.

Occurrence in Suriname. — In my opinion Hartsinck (1770: 89) was the first author who mentioned the Jaguarundi from Suriname when he stated: “Men heeft 'er ook nog de *roode* Tyger van grootte als een Dog, rosachtig van Hair zonder Vlakken” (In this country there is also the red tiger which is as large as a mastiff, with rufous fur without spots). Kappler (1887: 65) remarked that the species is rare, while the brothers Penard (“De Surinamer”, 13 July 1905) noted that “de ongevelekte tijgerkat *F. jaguarondi* ook Jaguaronti of Grijsbruine Tigrikati geheeten” (the unspotted tiger cat, *F. jaguarondi*, which is also named Jaguaronti or Greyish-brown Tigrikati) prefers the mangrove area. Sanderson (1949: 769) obtained an adult female from a “tall forest near Zanderij” (Para District, about 40 km south of Paramaribo). I myself have only seen two Suriname specimens of this species:

1. Rama near Berg en Dal, west bank of Suriname River, about 5°7'N, Brokopondo District, 1 skull (no. 20719).
2. Near Langamankondre, mouth of the Marowijne, Marowijne District, 1 specimen (no. 20659, skin).

Description. — The examined skin from Langamankondre agrees very well with the original description by Geoffroy (1803): “Tête arrondie, oreilles rondes; pelage uniformément brun ardoisé, sans taches; poils courts, annelés de noir et de grisâtre; museau brun-noirâtre; queue longue, entièrement brune”. The animal is very uniform in colour being dark brown, almost blackish, in most parts grizzled with yellowish. Most hairs are dark brown with a large pale basal part and one to three yellowish rings in the distal dark brown part, the tips of the hairs are dark. There is little variation of the colour over the body: the face is somewhat lighter than the back, which in its turn is darkest posteromedially. The outer surfaces of the forelegs are practically of the same colour as the back and are distinctly grizzled as far as the

toes. The hind legs, however, although being of the same dark brown colour as the back, are far less distinctly grizzled and thereby give the impression of being much darker. This holds true in a stronger measure for the dorsal surface of the tail, which hardly shows any grizzling at all and is uniformly dark brown except for a light tuft at the tip. On the ventral surface of the body the hairs as a rule have the pale rings wider and thereby this surface acquires a paler colour than the back. Here too the throat is again lighter than the ventral surface between the front and hind legs. The inner surface of the forelegs is similar to the outside, in the hind legs the inner surface is more grizzled than the outer. The ventral surface of the tail, especially in the basal part, is lighter than the dorsal.

In the literature the strong variation in the colour of the present species is commented upon by many authors, the main colour of the body varying from blackish brown through greyish brown to reddish brown (Weigel, 1961: 52-53), depending on the colour of the hair and the presence or absence of bands. The uniformly reddish brown coloured form, which some authors considered a different species, has the hairs red without bands; this possibly is the form mentioned by Hartsinck (see under Occurrence above), and is also the one from Demerara, British Guiana, described by Traill (1821a) under the name *Felis unicolor*.

Dental formula: $I \frac{3}{3}, C \frac{1}{1}, P \frac{3}{3}, M \frac{1}{1}$. The number and arrangement of the teeth of this species, like that of the other Suriname Felidae, is practically identical with those of *Leopardus pardalis melanurus* (see there). The upper carnassial (the last premolar) in my specimen is 14.4 mm long. The upper molars in the examined skull are only represented by an indistinct alveolus. This skull is of an adult animal and has the sagittal crest restricted to the posterior quarter of the braincase. The temporal crests are very low, but distinct and widely separated, they occupy the anterior three-fourth of the length of the braincase. The skull differs strongly from that of *Leopardus pardalis melanurus* by that the nasals reach farther forward and are triangularly produced in the inner part of their anterior margins, in such a way that when the skull is viewed from above the nasals entirely obscure the foramina incisiva.

The external measurements of the adult female from Zanderij, mentioned by Sanderson (1949: 769), are: head and body, 735; tail, 515; hind foot, 153; ear, 46 mm; weight, 7 kilograms. — Some skull measurements of the specimen from Rama (no. 20719) are: condylobasal length, 110.2; palatal length, 43.4; zygomatic breadth, 77.5; interorbital constriction, 21.4; postorbital constriction, 34.3; breadth of braincase, 50.2; length of upper tooth-row (c-p³), 35.6; length of upper carnassial, 14.4; width across upper canines, 27.3; length of mandible, 74.3; length of lower carnassial, 11.1 mm.

Remarks. — Concerning the habits of the Jaguarundi, Traill (1821a: 173) noted "that it is an inhabitant of the deep recesses of the forests, that it climbs trees to prey upon birds, monkeys, &c, but that it will boldly attack the larger quadrupeds". The brothers Penard ("De Surinamer", 13 July 1905), however, remarked that the species inhabits the mangrove area, where it is as numerous as the Ocelot, and that

it has a special preference for domestic fowl and other domestic animals. According to some authors the species, although being a carnivore, sometimes feeds on fruit (see Morris, 1965: 243). The Jaguarundi, which is active by day and night, causes damage to poultry farms and in Suriname it is therefore considered to be harmful in the inhabited areas. There are usually two or three young per litter (which according to some authors have a spotted colour pattern; see, e.g., Blonk, 1964: 123, and Petzsch, 1968: 136-138, pl. 15).

The original description of *Felis yagouarundi* by E. Geoffroy (1803: 124) was based on F. d'Azara's (1801 (1): 171-176) description of the "Yagouarundi" from Paraguay and on two specimens in the collection of the Paris Museum, one of which had been collected by the physician Leblond in Cayenne (French Guiana). As to its distribution Geoffroy remarked "Patrie. L'Amérique méridionale". The actual type localities of the species thus are (1) Paraguay and (2) Cayenne. The syntype from Cayenne is here designated as the lectotype of *Felis yagouarundi* E. Geoffroy, 1803, thereby confirming Hershkovitz's action to restrict the type locality of the species to Cayenne.

In his important treatise on the mammals of Paraguay, in which no scientific names were used, Felix d'Azara (1801(1): 171-176, and 177-178) clearly distinguished the blackish form of the present species which he named "Yagouarundi" (and which later formed the basis for Geoffroy's 1803 *Felis yagouarundi*), and the red form which he indicated with the vernacular name "Eyra" (later used by Fischer (1814: 228) as the basis for his *Felis eyra*). D'Azara remarked that the Indians in Paraguay use the two vernacular names interchangeably. In the popular literature the present species often has been indicated with either "Jaguarundi" (or its spelling variants) or "Eyra". It seems advisable to give preference to the name Jaguarundi for this species, as that of Eyra may lead to confusion with the "Aira" or "Eira", the vernacular name of *Eira barbara* (see p. 295), a Mustelid, whose range largely overlaps that of the Jaguarundi.

By casual observation the reddish colour phase of the Jaguarundi might be mistaken for a Puma. Already Traill (1821a) was aware of this possibility and for this reason he gave a rather extensive comparison between the Puma and his *Felis unicolor* or Spotless Cat. The two species, juveniles as well as adults, can immediately be distinguished by the fact that the end or tip of the tail of the Puma is always blackish brown or black, while the tail of the Jaguarundi is uniformly coloured from the base to the end.

The blackish brown colour phase of the Jaguarundi at a first glance might be mistaken for *Eira barbara* (see p. 295). The latter species, however, has always a distinct irregular ochre-yellow or orange-yellow spot on the throat; this spot is lacking in the Jaguarundi.

Panthera onca onca (Linnaeus, 1758)

Pl. 80 (animal), pl. 89 lower figures (skull)

Felis Onca Linnaeus, 1758, *Systema Naturae*, (ed. 10) 1: 42.

Type locality. — "Habitat in America meridionali". Restricted by Thomas (1911: 136) to "Pernambuco" (= Recife), north-eastern Brazil.

Synonymies. — Cabrera, 1958: 299 (under *Leo onca onca*); Nelson & Goldman, 1933: 231-233 (under *Felis onca major*); Pocock, 1939: 410-416; Weigel, 1961: 73-75, fig. 21 nos. 9-12.

Vernacular names. — (E) Suriname Jaguar; (N) Surinaamse Jaguar; (S) Penitigri, Pakira-tigri.

Distribution. — Nelson & Goldman (1933: 223) gave the following notes on the distribution of the Jaguar: "Nearly transcontinental; found at the lower altitudes from the Grand Canyon, Arizona, southern New Mexico, and central Texas south at least to the Parana Valley, central Argentina. Mainly tropical in dispersal; not usually ascending into the colder belts at high altitudes". Pocock (1939: 410) noted the occurrence of the nominate subspecies *P. onca onca* as follows: "From Pernambuco southwards to Espiritu Santo and Rio Grande do Sul and westwards along the Amazon and its tributaries, the Tocantins, Tapajos, Madeira, Ucayali and Rio Negro, thence northwards up the Rio Branco to the Guianas and Venezuela".

Occurrence in Suriname. — Since the discovery of Suriname the Jaguar has been mentioned in many publications on that country, so that the impression is given that the animal is rather common. However, accurate information about the size of the populations is lacking. The brothers Penard ("De Surinamer", 25 May, 1 June, 8 June, 18 June and 22 June 1905) stated that the Jaguar occurs throughout Suriname, depending on the amount of game present; although not too common near the coast, it has been observed there and the Penards specifically mentioned a Jaguar shot at Fort Zeelandia in Paramaribo, and told the story of a ship on the roadstead in which in the morning a Jaguar was found in the mast. Sanderson (1949: 768) gave the following information: "Jaguars are fairly common throughout the country, but little attention is paid to them by the inhabitants. The specimen obtained was shot in a private park, the remnant of an old estate at the end of one of the main streets of Paramaribo. Others were seen at camps on the Coppename River and bordering savannah at Zanderij". Stedman (1796: 49) noted that he saw "the print of that enormous tyger's foot, . . . in the sand, near Patamacca", south of Moengo, north-eastern Suriname. The Paramaribo newspaper "De West" (17 May and 25 June 1963) mentioned one or more Jaguars which had killed cattle near Paramaribo (Kwatta, Vijfde Rijweg). Appelman (1964: 109-110) mentioned the occurrence of the Jaguar on the Sipaliwini savanna, south-western Suriname. During the "Operation Gwamba" three specimens were saved in the Brokopondo region (Walsh & Gannon, 1967: 219). In 1975 Dr. M. S. Hoogmoed observed some Jaguars in the area between the Right Kabalebo River and the Lucie River, Nickerie District,

western Suriname. The Jaguar has also been observed near the Voltzberg. Dr. D. C. Geijskes (personal communication) informed me that he observed the Jaguar at several occasions: (1) in the Zuid River near Kayserberg airstrip, southern Nickerie District, (2) in the Wilhelmina Range, on the border between Nickerie and Brokopondo Districts, and (3) foot prints were seen on the bank of the Rechter Coppename River, above the Cremer Falls, southern Saramacca District. The Jaguar has also been reported from near Nickerie, from the Agricultural Experimental Station at Paramaribo, and from the sea coast of the Commewijne District near Matapica, and of the Marowijne District near Bigisanti.

I myself have examined material from the following localities in Suriname:

1. Cupido on the Maratakka River south of Wageningen, northern Nickerie District, 1 male (no. 21712, skull).
2. Stalweide, Nickerie, northern Nickerie District, 1 skull (no. 20669).
3. Tawajari Creek near Uitkijk on Saramacca River, west of Paramaribo, Suriname District, 1 male (Surinaams Museum, skin and skull).
4. Plantation "Houttuin" on Suriname River between Paramaribo and Domburg, Suriname District, 1 male (no. 20666, skull).
5. Near Berg en Dal on Suriname River, about 75 km south of Paramaribo, Brokopondo District, 1 male (no. 20671, skin and skull).
6. Plantation "Kroonenburg" on the lower Commewijne River between Nieuw-Amsterdam and Alliance, Commewijne District, 1 skull (Surinaams Museum).
7. Forest along Paloemeu River, near Paloemeu airstrip, upper Marowijne basin, southern Marowijne District, 1 male (no. 20670, skin and skull).
8. Suriname, without more precise locality indication, 3 skulls (nos. 20667, 20688, and Surinaams Museum).

Description. — The following description is based on the male specimen (no. 20671) from near Berg en Dal. The ground colour of the dorsal surface and the sides is light yellowish to golden yellow. The head shows numerous simple very distinct spots of a dark brown almost black colour; these spots only lack at the muzzle and over the inner part of the eyes. The outer surface of the ears is black with a large, rounded yellowish central spot. The neck and the back are covered over their full length with ocellated spots consisting of a rounded central area of yellowish, similar to the ground colour, and a ring of dark brown to black, which usually is interrupted at one or more places. In some of the larger ocellae small black dots are visible within the central yellowish area. The spots near the median line have the central area small or entirely lacking; this row of prominent dark spots gives the impression of an irregularly interrupted dark median dorsal stripe. The outer surface of the legs shows the ocellated spots in its basal part; distally these spots are gradually replaced by smaller simple spots. The dorsal surface of the tail has the ground colour of the basal part similar to that of the back, in the distal part it is whitish; the entire tail shows large dark spots, which distally form irregular rings. The tip of the tail is black.

The ventral surface of the body has the ground colour dirty white, it is densely spotted with dark simple (non-ocellate) spots. The upper lip has very small dark spots arranged in oblique rows, the chin shows hardly any spots at all. The corners of the mouth show a large black area. On the throat several small and a few large

spots are visible, which in the basal part of the throat form irregular and incomplete transverse bands. The spots on the ventral part of the body are very large, especially in the middle where the whitish area is narrowest, in the posterior part they may form irregular oblique stripes. The hairs of the soles of all four legs are greyish brown. In the hind legs the greyish area extends as far as the heel. The inner surface of the legs is whitish with dark spots, which are largest proximally and have a tendency there to form broad transverse bands. The ventral surface of the tail has a whitish ground colour and is spotted similar to the dorsal surface.

The melanistic form, which is entirely black, and in which the spots can only be seen under certain conditions of light, has been reported from Suriname by Kappler (1887: 64) who, however, remarked that he had never seen a living specimen: "Es kommen ganz schwarze mit noch schwärzeren Flecken und gelben Augen vor, doch habe ich nie ein lebendes Tier davon gesehen". The brothers Penard ("De Surinamer", 25 May 1905) also mentioned the melanistic form and even recorded a native name for it "Blakka pakira-tigri *Felis niger*". The Paramaribo newspaper "De West" (20 June 1963: 5) published three photographs of one of two black cubs caught in a forest near Afobaka and noted that several well-known hunters had never observed a black Jaguar in the Suriname forests. Findlay (1971: 96) also reported the presence of black Jaguars in Suriname, noted them to be rare, but still rarer, according to him, is the albinistic form of the species.

Dental formula: $I \frac{3}{3}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{1}{1}$. The number, shape and arrangement of the teeth of the species is practically identical to those of *Leopardus pardalis melanurus* (see p. 311). The length of the upper carnassial of the present species varies in seven specimens from 25.2 to 29.1 mm. The adult males show a well developed sagittal crest; unfortunately I could not verify this character in adult females.

The external measurements of the three above-mentioned adult males from Paloe-meu, Berg en Dal, and Uitkijk, are, respectively: head and body, 1190, 1200 and

TABLE 52
Skull measurements of seven specimens of *Panthera onca onca* (Linnaeus)
from Suriname in the Leiden Museum.

Reg. number	21712	20670	20666	20671	20667	20668	20669
Sex	♂	♂	♂	♂	?	?	?
Total length	270	238	243	251	-	274	231
Condylbasal length	238	220	217	230	-	240	204
Palatal length	117.5	101.2	101.2	108.4	100.1	115.7	96.8
Zygomatic breadth	180.7	168.5	163.5	167.2	162.0	180.5	158.0
Interorbital constriction	50.8	45.5	45.9	51.2	42.0	51.6	40.6
Postorbital constriction	47.0	39.4	48.1	54.9	44.2	44.9	44.8
Breadth of braincase	83.6	75.5	76.0	77.5	75.5	87.3	73.0
Length of upper tooth-row cm^1	84.5	79.9	73.0	83.7	77.6	81.9	71.8
Length of upper carnassial	29.1	27.0	25.2	28.4	27.3	26.3	25.7
Width across upper canines	72.3	68.0	64.7	65.3	66.3	70.2	60.2
Length of mandible	184.6	168.9	161.4	172.7	159.0	180.2	154.0
Length of lower carnassial	19.7	20.2	19.9	21.6	21.1	19.8	19.8

1350; tail, 520, 440 and 550; hind foot, 245, 228, —; ear, 88, 80, — mm. In Table 52 some skull measurements of seven Suriname specimens are noted.

Remarks. — In the Game Ordinance 1954, as revised in 1970, the Jaguar is placed on the list of game under the names "Jaguar (*Panthera onca*)", with the indication that it may be hunted throughout the year.

Kappler (1881: 161; 1887: 63-65) dealt with the food of the Suriname Jaguar, mentioning peccaries, deer, capybaras, agutis, etc., and even porcupines; by attacking cattle and pigs it is often quite harmful, although only in rare cases the Jaguar will actually attack man. On the sea-shore it will eat turtles, which are first turned over on their backs.

When pursued the Jaguar will take to the trees, it seems to be much more of a forest dweller than the Puma. It hunts mostly at night and then often comes very close to human habitations. It likes to sharpen its claws at the trunk of *Manilkara bidentata* (A.DC) Chev. (vernacular names: bolletrie, bortri).

The brothers Penard ("De Surinamer", 25 May, 1 June, 8 June, 18 June and 22 June 1905) report extensively on the Jaguar, embellishing their account with numerous anecdotes. Summarizing the information on the biology of the species we obtain the following picture. In contrast to the Puma, the Jaguar produces a fearsome roar and hisses like an angry cat. It lives singly or in pairs and its territory is dependent on the amount of game present in the region; the territory is smaller in the richer areas. It does not allow other Jaguars in its territory, although other Felidae are tolerated. Pairs remain together for life, the young are chased out of the territory as soon as they can take care of themselves. In the season when the coastal swamps are drying up, the Jaguars will also invade this area and a kind of seasonal migration occurs. Only rarely the Jaguar reaches the sea coast, to hunt there for turtles and turtle eggs. The brothers Penard also comment on the ability of the Jaguar to climb straight trees. In the daytime the Jaguar stays in trees with a dense foliage. The food of the Jaguar, according to the Penards, consists of deer, peccaries, pingoes, tapirs, caymans, turtles, fishes and even monkeys. The hunting is done during the night and the early morning. Cows, pigs, goats, horses, and also dogs and cats often are the prey of Jaguars, but attacks on humans are quite rare, although instances are known, and seem to be more common in the mountainous areas than in the coastal plain. The Jaguar is a good swimmer and often goes into the water to catch fishes. In an interesting paper Gudger (1946) discussed the question whether or not the Jaguar uses its tail as a lure in fishing, and came to the conclusion that this is entirely possible, but that information by scientifically trained observers, if possible supported by photographic evidence, is necessary.

The inhabitants of Suriname have a great fear for the Jaguar as well as for the Puma. Hartsinck (1770 (1): 89), however, stated that these mammals never attack human beings in the daytime, except when they are starved. He noted that the best protection at night is a good camp-fire. Still, cases are known of people being killed or fatally wounded by the Jaguar or the Puma. In this respect it is interesting to

quote the stories given by Warren and by Stedman, the former being one of the earliest authors who paid attention to the Jaguar. When dealing with the "Tigers" of Suriname, Warren (1667: 12-13; Dutch translation, 1669: 11-12) remarked about the Jaguar: "They are of so vast a strength, that one of them will make nothing to leap over a five or six foot Rail, with a *Hog* in his Mouth. There was once one came into a Plantation, kill'd a *Bull* of two years old, and dragged him above a quarter of a Mile into the Woods. Unless they be wounded, or very hungry, they will hardly assault a man in the day time. I never heard of above two or three they have killed one way or other, since the settling of the Colony: one of them (who was a Huntsman and a lusty Fellow) was often heard to wish he could meet with a *Tyger*, and made it a great Complaint in all his Searches through the Woods, it was never his good fortune; at length, one night, lying in his Hamacko, in an open House, a *Tyger* comes, takes him up, and carries him two miles into the Woods, in vain Crying for help, which was heard by an *English-woman* in a Close House hard by, who had so much Courage (more than is usual in her Sexe) to fire a Musquet from the Window; but those who have had to do with them know, it is not noise only can scare a *Tyger* from his Prey: the Man was found next day with his Head and Shoulders eaten off; they are observed to be not so numerous now as formerly, partly retireing further into the Woods, and a great many having been taken by the Hunters. There is one *John Miller*, who has killed no fewer than a dozen or fourteen, singly with his Gun and Lance, from some miraculously escaping with his Life, and having been dangerously hurt by others".

Stedman (1796 (2):49-50) noted: "they devour a sheep, or a goat, with the same facility as a cat would kill a mouse or a rat; nay, cows and horses are not protected from their attacks, for these they frequently kill on the plantations; and though they cannot carry them off into the forest on account of their weight, they tear and mangle them in a dreadful manner, only for the sake of the blood, with which this ferocious animal is never glutted. It has even happened that the *jaguar* has carried off young negro women at work in the field, and too frequently their children Still this creature is not a match for the aboma-snake [a boid snake, most probably the Anaconda, *Eunectes murinus* (Linnaeus, 1758)], which, when it comes within its reach, has the power of crushing it for a jelly in but few moments".

Recently Findlay (1971: 96; 1971a: 20, 24, 28, 29, 40) recorded examples of Amerindians, both adults and children, belonging to the Wayama, Trio and Akoeri tribes, being killed in recent times by Jaguars. These tribes inhabit the extreme southeastern part of Suriname, where according to Findlay the Jaguar is quite common. Also Dr. D. C. Geijskes (personal communication) mentioned instances in which Amerindian children were carried off by Jaguars. There are also cases in which Amerindian hunters, who returned home carrying a shot pakira (*Tayassu tajacu pativa*) on their back, were jumped from behind by a Jaguar, which evidently was attracted by the smell of blood of the killed animal.

Near Nickerie Jaguars at a time were harmful and killed cattle on the grazing

grounds. With the help of a professional hunter one of these Jaguars was shot (Leiden Museum, specimen no. 20669). In 1945 Jaguars were observed in and near the Agricultural Experimental Station at Paramaribo, where they attacked dogs and goats of a Javanese village. This pair probably had its young at the Charlesburg shell ridge north of the station.

The name "*Felis Onca Major*" was given by Fischer (1830: 336 (error pro 566)) to a Jaguar which, according to Nelson & Goldman (1933: 231, 233), came from Suriname. The latter authors considered the Suriname form different from the nominate subspecies, of which the type locality is Pernambuco, and therefore used the subspecific name *major* for it. Pocock (1939: 413), however, came to the conclusion that "on the available evidence there do not appear to be any reasons for regarding the Jaguars from Surinam and Venezuela as racially distinct from those from the Amazons". More material of Suriname Jaguars is badly needed to determine their variability in the country and to settle the question of their subspecific status. For the time being I prefer to follow Pocock.

In the literature on Suriname mammals the name *Felis onca* often has been used for the present species.

FAMILY VIVERRIDAE

Herpestes auropunctatus (Hodgson, 1836)

Pl. 71 upper figure (animal), pl. 85 lower figures (skull)

Mangusta Auropunctata Hodgson, 1836, Journ. Asiatic Soc. Bengal, 5: 235-236.

Type locality. — "Habitat, The Central Region" of Nepal.

Synonymies. — Bechthold, 1939: 149-152; Hinton & Dunn, 1967: 116.

Vernacular names. — (E) Small Indian Mongoose, Gold-spotted Mongoose, Gold-speckled Mongoose; (N) Mungo, Mongoes (in Suriname erroneously named "Fret").

Distribution. — According to Ewer (1973: 402-403) *Herpestes auropunctatus* is known from "northern Arabia eastwards through Near East to Afghanistan, Nepal, Assam, Burma, Malayan peninsula and Thailand; southwards through Pakistan into northern India; Hainan. Introduced into the West Indies, Hawaii and Mafia Island off the coast of Tanzania". In 1870 the Indian Mongoose was introduced by man into Trinidad and later was brought to other Antillean Islands (Westermann, 1953: 15-20; Husson, 1960a: 112; Hinton & Dunn, 1967: 63-75). The main reason for this introduction was to control rats that formed a pest in the sugar fields, and to destroy the venomous snake "Fer-de-lance", *Bothrops atrox* (Linnaeus).

Occurrence in Suriname. — Around 1900 the Mongoose was introduced in Suriname. The specimens, which were obtained in the West Indian island of Barbados, were liberated at the former plantation "Mariëenburg" on the left bank of the Commewijne River near its confluence with the Suriname River (see Husson, 1960). At present the Mongoose still inhabits the same area and has slightly expanded its range to about Meerzorg on the Suriname River (opposite Paramaribo) and to about Alliance on the Lower Commewijne River. I have examined a representative series

of the species from Meerzorg, Mariënborg and Nieuw-Amsterdam. So far no specimens have been reported from Suriname west of the Suriname River. The fact that the area west of this river is the most densely inhabited part of Suriname makes it unlikely that the species has been wholly overlooked there. This absence of the mongoose on the west bank of the Suriname River is the more remarkable since there is a regular ferry service (many times daily) across the Suriname River between Meerzorg on the east bank and Paramaribo on the west bank. Another possible indication that rivers form an important barrier in the distribution of the species is the fact that so far the Mongoose has not been reported from the east [Suriname] bank of the Corantijn River, while Roth (1941: 74), when dealing with the mammals of British Guiana, stated: "On the Courentyne Coast the large areas of bright green shrub called locally sanfra, harbour mongoose in large numbers".

Description. — The Mongoose is the smallest of the carnivores of Suriname. It is characterized by its uniformly coloured fur. The dorsal parts are yellowish brown, finely speckled with dark brown; the hairs, namely, are light yellowish with two or three dark brown bands, the tip being usually dark brown or blackish. The English vernacular name "Gold-spotted Mongoose" or "Gold-speckled Mongoose" is therefore well chosen. The hairs of the ventral parts are uniformly light yellowish all over. The colour of the thickly furred tail is somewhat lighter than that of the back and sides.

Dental formula: $I \frac{3}{3}$, $C \frac{1}{1}$, $P \frac{4}{4}$, $M \frac{2}{2}$. The skull is narrow and elongated (pl. 85 lower figs.); the orbit is completely enclosed by bone, a character by which the genus *Herpestes* strikingly differs from the other genera of carnivores of Suriname. In

TABLE 53

External and skull measurements of ten specimens of *Herpestes auro-punctatus* (Hodgson) from the Meerzorg—Nieuw Amsterdam—Mariënborg area, Suriname, in the Leiden Museum.

Reg. number	17787	16057	17789	8674	17784	7394	8681	16228	21923	22581
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Head and body	302	322	312	320	300	291	323	—	280	—
Tail, without tuft	261	244	285	238	255	240	246	—	243	—
Tail, with tuft	295	275	326	268	275	270	268	—	—	—
Hind foot, with claw	61	59	62	62	64	57	60	—	56	—
Ear	18	24	23	22	18	22	18	—	22	—
Weight (grams)	500	550	545	500	900	375	500	—	—	—
Condylbasal length skull	60.8	64.1	65.0	63.1	66.5	61.5	63.3	—	61.5	62.5
Palatal length	32.0	33.3	33.0	32.7	35.0	32.5	32.6	32.2	32.9	32.9
Zygomatic breadth	28.5	31.0	31.8	30.6	35.4	28.9	31.2	30.4	27.6	30.1
Interorbital constriction	10.1	10.6	11.3	11.0	11.9	10.9	11.6	10.7	10.4	11.1
Postorbital constriction	12.7	12.5	12.5	13.2	11.5	11.3	10.8	12.2	12.1	11.0
Breadth of braincase	22.4	22.2	23.2	23.4	23.8	22.2	22.2	22.8	21.9	21.8
Length of upper tooth-row cm^2	21.7	22.1	23.0	23.0	24.1	22.5	23.6	22.2	22.1	22.7
Length of upper carnassial	6.6	6.2	7.0	6.7	6.5	6.4	6.3	6.3	6.3	6.3
Width across upper canines	10.5	10.8	11.3	10.5	12.3	10.3	11.0	10.2	9.9	10.2
Length of mandible	38.7	40.9	41.3	40.8	43.0	38.6	41.1	39.2	37.7	39.5
Length of lower carnassial	6.1	5.8	5.9	6.0	5.7	6.0	5.8	6.0	5.7	5.5

ventral view the upper carnassial is triangular in shape (the top of the triangle is directed posteriorly); the narrow base of the triangle is formed by the anterior margin of the tooth.

The external and skull measurements of ten specimens from Suriname, preserved in the Leiden Museum, are given in Table 53.

Remarks. — The Mongoose belongs to the predominantly harmful animal species of Suriname, because it has become a pest to poultry farmers in the Mariënborg area. Moreover it plays a role in the transmission of canine rabies, so that a strict control of the animal is most urgent (see Hinton & Dunn, 1967: 73-74).

The Dutch name "Fret" has been used by the brothers Penard ("De Surinamer", 16 April 1905) for the present species and this name is, e.g., used in the various Decrees of the Suriname Game Ordinance. However, the Dutch name "Fret" refers in the Netherlands to the animal which in English is known as the "Ferret", and which is a semi-domesticated form (*Mustela furo* L.) of the European Polecat, *Mustela putorius* Linnaeus, 1758. The incorrect use of the vernacular name "Fret" in Suriname has already given rise to some confusion, illustrated by the following translation of a paragraph in a Suriname text-book on biology by Vermeulen (1966: 74, and previous edition): 'The Ferret, which is used in the Netherlands for ferreting, has been formerly introduced for the control of rats at Mariënborg. The offspring of these animals is our Mongoose ...'.

It is not fully certain whether or not the specific name *auropunctatus* is the correct name for the Suriname Mongoose. Recent unpublished revisionary studies seem to point to the possibility that the name should be changed, but pending the definite publication of such studies the name *Herpestes auropunctatus*, currently adopted for the Mongoose introduced into tropical America, is retained here. Bechthold (1939: 149) as well as Hall & Kelson (1959 (2): 950) considered *H. auropunctatus* to be a geographical race (subspecies) of *Herpestes javanicus* (E. Geoffroy, 1812).

ORDER SIRENIA

The distribution of the Recent Sirenians covers both sides of the Tropical Atlantic (Trichechidae), and the Indo-West Pacific region from East Africa to the Ryukyu Islands, New Guinea and the New Hebrides (Dugongidae). Of the three species of the Trichechidae, one occurs in tropical western Africa and two in the New World. The range of the American species extends from southern North America (30°N) southward to northern South America (20°S), covering the coastal areas and the Orinoco and Amazon basins far inland. In Suriname only the nominate subspecies of *Trichechus manatus* (Linnaeus) occurs.

FAMILY TRICHECHIDAE

***Trichechus manatus manatus* Linnaeus, 1758**

Pl. 90 (animal), pl. 91 (skull)

Trichechus Manatus Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 34.

Type locality. — “Habitat in Mari Americano”. Restricted by Thomas (1911: 132) to “West Indies”.

Synonymies. — Cabrera, 1961: 310; Hatt, 1934: 534-537; Mohr, 1957: 6-7; Hall & Kelson, 1959: 989-990.

Vernacular names. — (E) American Manatee, Mermaid, Seacow; (N) Zeekoe, Amerikaanse Lamantijn; (S) Sekoe.

The brothers Penard (“De Surinamer”, 5 November 1905), Vermeulen (1966: 80) and Rediman (1971: 77) gave the vernacular name “Watrakaw” for the present species, which name was also used in my 1973 paper (Husson, 1973: 11). However, I am informed by reliable sources that, at least at the present time, the name “Watrakaw” is generally used for the introduced Water Buffalo, and that “Sekoe” is the most commonly used name for the Manatee. It is not clear whether or not the name “Watrakaw” was used for the present species before the introduction of the Water Buffalo in Suriname. “Watramama”, a name sometimes used for the Suriname Manatee, is also that of a kind of aquatic spirit.

Distribution. — The species *Trichechus manatus* Linnaeus, 1758, inhabits bays, lagoons, estuaries and rivers along the Atlantic coast of America from North Carolina south to north-eastern Brazil, including the West Indies.

The nominate subspecies *T. manatus manatus* is known from the coasts of the West Indies and the adjacent mainland from Vera Cruz to north-eastern Brazil, where it lives in the “warm, turbid shallows of salt water bays and along mud-bottomed estuaries of sluggish coastal rivers” (Morris, 1965: 344).

Occurrence in Suriname. — A large and peculiar animal like the Manatee has not failed to attract the attention of the early travellers in the Guianas between the

Amazon and the Orinoco Rivers. One of the first of these, Raleigh (1596: 83, page number erroneously printed as 93) already mentioned "the great fishes, as big as a wine pipe, which they call *Manati*, and is most excellent and holsome meate". Also Harcourt (1707: 13; Dutch version) in the narrative of his 1608 voyage, reported upon the species. Warren (1667: 2) was one of the first to mention the species from Suriname proper, when remarking that: "There is another [fish], call'd the Manatee, who feeds upon Bushes by the River side, gives suck like a Cow, and eats more like Flesh than Fish".

However, rarely exact localities have been given. One of the few early authors to do so was Van Berkel (1695), who mentioned the species from the Suriname River, probably the lower part, as the river at that time was unexplored above the Labadist colony at 65 km from the coast.

Stedman (1796 (1): 220-221; (2): 175, pl. 59) observed two specimens in the Coermotibo and Wane Creeks, north-eastern Suriname.

Quandt (1807) dealt both with "Wassermenschen" (pp. 104, 107) and with the Manatee (pp. 107-109). Part of his information on the "Watermen" was hear-say and might refer to the Manatee, his own encounter with them in the Corantijn River, where he saw "zwey menschenähnliche Köpfe aus dem Wasser herauskommen, und hörte einen dem Lachen ganz ähnlichen Laut", might pertain to the Giant Otter, *Pteronura brasiliensis brasiliensis* (Zimmermann) (see also pl. 74a). Quandt (1807: 107) mentioned the occurrence of the Manatee in the Neuker (= Nickerie River), where "diese Thiere [were] nicht so scheu wie in andern Flüssen", and described the way the Amerindians hunted these animals with harpoons.

W. Vrolik (1852) reported on two full grown Manatees and one embryo taken near Paramaribo and gave details of external and internal morphology, as well as information of general interest.

Kappler (1887: 76-78), who spent a considerable part of his life in Albina, near the mouth of the Marowijne River, mentioned "40 Manatis, die ich im Laufe vieler Jahre nach Stuttgart sandte". Some of these Manatees which Kappler collected in the Marowijne River, served Krauss (1858; 1862a; 1872) for his extensive studies on the anatomy of the species.

The brothers Penard ("De Surinamer", 5 November 1905) gave only one exact locality, namely, the mouth of the Saramacca River (see under Remarks).

Now and then the Suriname newspapers reported on the species (e.g., "De West", 20 May 1963, p. 2, where the capture of a cow with a calf in the Suriname River near Domburg was reported upon), but, obviously, most of such notices have escaped the attention of zoologists.

Dekker (1971: 51) mentioned that in January 1971, in the mouth of the Commewijne River, one or more Manatees were caught in fishermen's nets; according to these fishermen, they had previously also caught Manatees in this area, especially in the months of January and February.

At present the Suriname Manatee is known from numerous localities in Suriname,

where it is found in rivers and creeks usually not farther than 60 km from the sea-coast. A more or less complete enumeration of the localities where the species has been found is given by Noelmans (1969, map between pages 9 and 10).

Summarizing we can state that the Manatee inhabits the coastal region of Suriname, where it is found in swamp-creeks between the Corantijn and the Suriname Rivers, especially in the swampy Nanni Creek and in the lower reaches of the Nickerie, Wayombo, Coppename, Tibiti, Coesewijne, Saramacca and Suriname Rivers and their creeks. Many of these creeks, because of the floating weed-mats, are un-navigable; the water is dark brown with pH 4-4.5. East of the Suriname River the species seems to be less common, although it has been reported from localities throughout the area (mouth of the Commewijne River, Alliance, Wane Creek, Marowijne). We do not know whether this supposed scarcity is due to either the presence of fewer suitable habitats there, or to the fact that the area is more densely populated than the others and that there is more traffic on the Commewijne and Cottica Rivers; also, the Manatee might be more intensively hunted here. It is possible that in the early spring (January-February) the Manatee migrates from the creeks to the lower reaches of the larger rivers. The Manatee has never been found on the open ocean coast.

I have examined only a few specimens of this species:

1. Nickerie River near Wageningen, Nickerie District, north-western Suriname; found floating dead in the river, June 1963, 2 males (nos. 16049, 16050, skeletons).
2. Mouth of Suriname River near Purmerend, opposite mouth of Commewijne River, just north of Leonsberg, Suriname District, captured by the crew of the Paramaribo pilot boat on 20 December 1957, 1 juvenile (total length 0.85 m), 1 specimen (Surinaams Museum, Paramaribo, skin).
3. Suriname River, 2 specimens (nos. 19675, skeleton; 19676, skull; these specimens have already been mentioned by Schlegel, 1841: 9-13, pl. 5 figs. 3-6, and by Jentink, 1887: 171, nos. a and b, as *Manatus latirostris* Harlan).
4. Lower Commewijne River near Alliance, Commewijne District, 15 April 1971, 1 female (no. 22392, skeleton).
5. Suriname, without more precise locality indication, 2 skins (mentioned by Jentink, 1892: 199, nos. a and b, as *Manatus latirostris*).

Description. — The Manatee is a most peculiar looking animal (plate 90). The body is cylindrical, the head is small and the snout is squarish. It has paddle-like front limbs, but no hind limbs. The large fleshy tail is flattened out horizontally with a broadly rounded hind margin. On the outer edges on the front limbs a few (2 to 4) small nails are present, at least in young animals; Schlegel (1841: 12) remarked: "Diese Organe mögen sich daher wohl mit dem Alter abstossen, und dann erklärt es sich, warum sie meist nur bei jungen Individuen gefunden wurden". The very tough and thick skin is nearly hairless, except for bristles on the snout; the upper lip is cleft, each half being capable of moving independently of the other. The nostrils are valve-like. The eyes and the external ears are small. The general colour of the Manatee is a uniform dull greyish, dark grey to blackish.

The total length of the species is usually noted as two to four metres, but also

larger specimens have been mentioned. Herlein (1718: 196) gave the over-all length of Suriname specimens as 18 "feet". Bancroft (1769: 186) remarked: "This animal is sixteen feet in length, and several feet in circumference, especially at the navel, where it is largest". Von Sack (1821 (2): 247) noted the length as about 15 feet. Kappler (1887: 77) mentioned that "von 40 Manatis, die ich im Laufe vieler Jahre nach Stuttgart sandte, keiner über 3 m Länge hatte". As an explanation of the smaller size of the Suriname Manatee Kappler suggested the following hypothesis: "Er [the Manatee] ist in den Surinam'schen Flüssen gerade nicht sehr selten; da aber diese Flüsse schon acht bis zehn Meilen oberhalb ihrer Mündung durch Bänke und Felsen beengt werden, die das schwerfällige Tier nicht zu überschreiten vermag, so mag der bezüglich kleine Bezirk, in dem sie sich aufhalten und ihre Nahrung finden müssen, vielleicht Ursache sein, dass sie hier nicht grösser werden; möglich ist es, dass der Manati der Lagunen eine andere Spezies ist. Sie kommen nicht an der Küste, sondern nur in den Flüssen selbst vor und halten sich stets im Wasser auf, das sie auch nie verlassen können".

The Manatee differs strongly from all other Suriname mammals, not only externally, but also the skull shows striking differences (plate 91). In young specimens there are two small upper and lower incisors, which are concealed under bony plates, and are lost before maturity. There are no canines and no premolars. The number of molars is 10 or 11, usually no more than 4 to 8 of these are in function at the same time. The molars are replaced horizontally, and the new ones are formed at the back of the jaw. The molars in front wear down first, and finally drop out; the alveoles are then filled with bony tissue and become entirely obliterated. It is possible that the very first of these molars actually should be considered premolars. The low crown of the molars is enamelled, has no cement, and shows two transverse tuberculate ridges with anterior and posterior cingula. For a more detailed descrip-

TABLE 54
Skull measurements of five specimens of *Trichechus manatus manatus* Linnaeus from Suriname in the Leiden Museum.

Reg. number	16050	22392	16049	19676	19675
Sex	♂	♀	♂?	-	-
Condylbasal length	252	267	284	320	325
Palatal length	117	136	140.5	170	165
Postorbital constriction	41.8	46.5	35.0	55.4	58.5
Zygomatic breadth	166	179	184	204	213
Mastoid breadth	163	160	171	175	175
Breadth across parietals	76	74	73	73	78
Diastema upper jaw	78	85	96.5	100	103
Length upper tooth-row	44	65	66	85	90
Number teeth, upper jaw	5(+1)	6(+1)	6(+1)	8(+1)	6(+1)
Length of mandible	160	181	193	221	226
Length lower tooth-row	47	64	66.5	85	77
Number of teeth, lower jaw	5(+2)	6(+1)	6(+1)	8(+1)	6(+1)

tion of the skull as a whole see Flower (1885: 223-228, fig. 224; reprint of the 1885 third edition), and Kaiser (1974).

Some external measurements (in centimetres) of three of the specimens mentioned above (nos. 16049, 16050, and 22392) are, respectively: total length, 190, 234.5 and 185; length of tail, —, 66.5 and 47; breadth of tail, 42, 45 and 44; length of front limb, 24, 33 and 30 cm. Some skull measurements of five specimens from Suriname are given in Table 54. In this table the diastema is the distance between the anterior-most border of the praemaxillae and the anteriormost border of the first molariform cheek-teeth. Number of teeth, both in the upper and the lower jaws, as given here, is that of the functional molars, followed in parentheses by the number of visible teeth that have not yet completely broken out. The length of the tooth-row is that of the row of functional teeth and the non-functional teeth in which the crown is completely visible.

Remarks. — In Suriname the Manatee is a protected animal; in the 1954 Suriname Game Ordinance as revised in 1970 it is not classed as game. Notwithstanding its legal protection the Manatee is reported to decrease constantly in numbers, possibly as a consequence of advancing civilization and drainage of swamps.

The food of the Manatee consists mainly of aquatic plants, which it gathers with its strong prehensile upper lip. According to Kappler (1887: 77) the main food of the Suriname Manatee is: "Eine mit krummen Dornen besetzte Papilionacee mit violetten Blüten [*Machaerium lunatum* (L.)], die ein undurchdringliches Gebüsch am Ufer bildet und deren Zweige und Ausläufer ins Wasser hängen, sowie die Blätter und Früchte des *Caladium arborescens*, in der Kolonie Mokko-Mokko genannt. Vermutlich frisst es noch verschiedene andere Blätter der in das Wasser hängenden Pflanzen und Tange". Also the brothers Penard ("De Surinamer", 5 November 1905) reported on the preference for the young sprouts of the "moko-moko" (= *Montrichardia arborescens* Schott); they also mentioned the grass species "*Panicum elephantipes*". In the literature many other aquatic plants are noted to form part of the diet of the animal, like *Nymphaea*, *Eichhornia*, *Nelumbo*, etc. An interesting detail provided by the brothers Penard, which I did not find confirmed anywhere else, is the following (free translation from the Dutch): 'The Manatees seem particularly fond of ripe bananas and seem to be able to smell these from far away. Gold prospectors maintain that for this reason it is dangerous to have ripe bananas in one's boat near where Manatees graze. It is stated that the animals will follow the boat under water and then will try to let it capsize. Some time ago a Manatee made itself a nuisance in the mouth of the Saramacca River, forcing the boatman to throw all their ripe bananas overboard in order to prevent accidents. This preference of the Manatee for bananas is well known to the Amerindians, who use this knowledge to catch the animals. For they place a pile of ripe bananas in a spot where the Manatees usually graze, and then wait in an ambush for the animals'. I do not know how reliable this information is, but it seems too interesting not to be repeated here.

In the daytime, and especially in the early morning, Dr. Geijskes often observed

the animals nibbling at young shoots of the moko-moko and other plants of the waterside. When disturbed or alarmed the manatees quietly let themselves sink below the water surface and then swim away to deeper parts of the river, a trail of air-bubbles indicating their direction.

Females give birth to a single calf (sometimes two) after a gestation period of about five to six months. The calves are born throughout the year; they remain with the females for more than a year, for females have been observed with young of two different ages. Newborn young are reported to weigh approximately 27 kg and to measure about 100 cm; they are born under water and they spend their entire life in the water (Jones & Johnson, 1967: 272).

The life-history of the Manatee in the Guianas was thoroughly treated by Bertram (1963), who studied the species especially in connection with the possibility to use the animals to clean inland waters from excessive growth of water plants, in the first place of the waterhyacinth, *Eichhornia crassipes*, which at that time formed a true pest in Brokopondo Lake, endangering the hydro-electrical project there. The introduction or propagation of the manatee for that purpose, however, proved to be impractical.

In an interesting historical study by De Jong (1961, 1962) many data concerning the hunting of the manatee in Suriname are given. In the early times of the Suriname plantations, the manatee provided almost the sole meat for the plantation workers, and was obtained from the Amerindians, who hunted the animals. The salted meat was even exported to the West Indies.

In 1966, the Amsterdam Zoo "Artis" organized an expedition to Suriname to procure some living specimens for attempts to breed the animal in captivity (Dekker, 1967; 1967a, b; 1971; 1974).

Manatus koellikeri, which Kükenthal (1897: 40) described as new from Suriname, is synonymous with *Trichechus manatus*. In the literature dealing with Suriname mammals the scientific names *Manatus americanus* (Link, 1795) and *Manatus latirostris* Harlan, 1824, were also used for the species.

ORDER PERISSODACTYLA

The recent distribution of the Perissodactyla, or Odd-toed Ungulates, is limited to the northern half of South America, Central America, Africa (except the northern and north-eastern part), southern and central Asia, the Malay Peninsula and Sumatra. In Suriname only one species, *Tapirus terrestris* (Linnaeus), occurs.

FAMILY TAPIRIDAE

***Tapirus terrestris terrestris* (Linnaeus, 1758)**

Pls. 92, 93 (animal), pl. 94 (skull)

Hippopotamus terrestris Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 74.

Type locality. — "Habitat in Brasilia". Restricted by Thomas (1911: 155) to "Pernambuco" (= Recife), north-eastern Brazil.

Synonymies. — Cabrera, 1961: 314; Hershkovitz, 1954: 479-486.

Vernacular names. — (E) South American Tapir, Bush-cow; (N) Zuidamerikaanse Tapir, Buffel, Boskoe; (S) Bofroe.

Distribution. — The species *Tapirus terrestris* (Linnaeus, 1758) occurs in the tropical forests of the mainland of South America east of the Andes, its range extending southward as far as south-western Brazil and north-eastern Argentina. The nominate subspecies, *T. terrestris terrestris*, has the same distribution with the exception of northern Colombia, where it is replaced by another subspecies (see Hershkovitz, 1954: fig. 61, map).

Occurrence in Suriname. — The Tapir is a rather common species in the Suriname lowland forests and swamps, but it is also found in the interior and even occurs in the mountainous areas (see also Geijskes, 1956: 20). Kappler (1887: 81) even maintained that the species is more common in the mountains than in the lowland areas: "Wiewohl er zuweilen in den Wäldern der Küste herumstreicht, so ist er doch mehr in den bergigen Gegenden des Innern zu Hause". Sanderson (1949: 781) recorded the species from the Wihelmina Mountains (central part of Suriname), three localities on the Coppename River, and one near the Donderberg (= Donderbari Berg) between the upper Saramacca and the Suriname Rivers. During the "Operation Gwamba" 36 individuals were saved in the Brokopondo region (Walsh & Gannon, 1967: 218). Appelman (1964: 109) reported the Tapir from the Sipaliwini savanna near the Brazilian border. In April 1960 Dr. D. C. Geijskes observed a young Tapir near Benzdorp on the left bank of the lower Lawa River, upper Marowijne River basin; a photograph of this specimen is reproduced here on plate 93.

I have examined skulls of this species from the following Suriname localities, all of which are situated in forested areas:

1. Wakay on the Corantijn River, north of the Kaboeri (= Kapoeri) Creek, at about 5°15'N, Nickerie District, 1 male (no. 21934).
2. Matapi on the Corantijn River, north of the mouth of the Kabalebo River, about 5°N, 1 male (no. 21935).
3. Forest near Sipaliwini airstrip, extreme south-eastern part of Nickerie District near Brazilian border, 1 skull (no. 17657).
4. Arawarra, near the confluence of the Wayombo and Nickerie Rivers, about 5°15'N, eastern Nickerie District, 1 skull (no. 21714).
5. Matta, an Indian village about 12 km due west of Zanderij, about 5°25'N, Saramacca District, 1 skull (no. 16672).
6. Plantation "La Liberté" near Meerzorg, east bank of Suriname River, opposite Paramaribo, Suriname District, 1 skull (no. 17658).
7. Forest near Afobaka, on Suriname River, near northern shore of Brokopondo Lake, Brokopondo District, 1 skull (no. 17659).
8. Forest near the southern shore of Brokopondo Lake, at the mouth of the Sara Creek, Brokopondo District, 1 male (no. 19731).
9. Forest near Mooimankondre, right upper Commewijne River, Commewijne District, 1 male (no. 16841).
10. Forest near Gododrai, left bank of upper Commewijne River, at about 5°25'N, 1 skull (no. 16669).
11. Suriname, without more precise locality indication, 2 adult female and 3 unsexed skulls (no. 1283, and the 4 specimens mentioned by Jentink, 1887: 168, 169 under *Tapirus americanus*).

Description. — The South American Tapir is a blackish-brown animal, with short bristly hairs scattered over the body, and usually with a low, narrow mane. The fore foot has four digits, the hindfoot three. A striking character is that the snout and the upper lip are projected into a short fleshy proboscis. The length of the animal is about 200 cm, the shoulder height is about 90 cm and the length of the tail varies from 5 to 10 cm. Hershkovitz (1954: 484) described the colour of an adult female from Suriname as follows: "blackish brown on back and sides, dark brown on chest, belly, and limbs; top of head blackish brown, ears blackish brown except for white edging; cheeks grizzled brown and gray, throat with more gray, neck brown, chin blackish brown; mane from front of ears to withers black". Hershkovitz (1954: 485) noted that the "Tapirs of the Guianas are extremely dark, blackish brown in general appearance, and probably distinctly darker than typical *terrestris* [from Pernambuco]". This is confirmed by the description by the brothers Penard ("De Surinamer", 17 August 1905) which runs as follows (in translation): 'The colour of the hair and the skin is generally blackish brown, with the exception of the sides of the lower lip, the band under and in the middle of the chin, the upper margins of the ears and a line below near the hoofs, all of which are white. Young animals, like young deer, show white spots on the sides of the body'. At the present time it is impossible to decide whether the Guiana animals form a separate subspecies, as too little material is available. So far I myself have not been able to examine fresh Suriname specimens. The skin of the young shows a pattern of yellowish white stripes and spots (pl. 93). Kappler (1887: 82) remarked: "Das Junge ist in der ersten Färbung hellbraun mit weissen Längsstreifen und Flecken beinahe wie das Paca und wird, so gefangen, schon nach einigen Tagen zahm. Nach etwa zehn Monaten bekommt es nach und nach die Farbe der Alten Werden sie im Alter von

einem Jahr oder wenn ihr Jugendkleid dunkel zu werden anfängt, gefangen, so sind sie schwer zu zähmen”.

Dental formula: $I \frac{3}{3}, C \frac{1}{1}, P \frac{4}{4}, M \frac{3}{3}$. The third upper incisors are very large and heavy, separated from the conical canines by a short diastema, which is of about the same length as the alveolus of the third incisors. The canines are small, being only slightly larger than the four inner incisors. There is a large diastema between the upper canines and the first premolars (pl. 94). In the lower jaw the two inner incisors are larger than the second pair, while the third incisors are still smaller and are in contact with the large conical canines; there is a large diastema between the canines and the first premolars, its length being less than that of the four premolars combined. One of the most striking characters of the skull is the high and strongly developed sagittal crest. By the place and the arched shape of the nasals the skull differs strongly from that of the other Suriname mammals; the nasals are more or less broadly triangular. Table 55 provides some skull measurements of nine specimens from Suriname. The breadth of the braincase as used here is taken just above the zygomatic processes of the temporal. Also the greatest length of the nasals and the greatest width across the nasals are given in order to obtain an idea of the variability in size and shape of the nasals.

TABLE 55

Skull measurements of nine specimens of *Tapirus terrestris terrestris* (Linnaeus) from Suriname in the Leiden Museum.

Reg. number	19731	1283	16841	21934	21935	17657	17659	16669	17658
Sex	♂	♂	♂	♂	♂	-	-	-	-
Greatest length	371	385	385	385	385	378	-	403	380
Condylobasal length	360	368	-	376	367	365	-	380	365
Palatal length	179	198	196	191	192.5	185	197	189	193
Zygomatic breadth	162	184	176	186	164	170	173	184	175
Interorbital constriction	87.5	95.5	77.5	85.0	80.0	90.5	84.0	84.5	79.3
Postorbital constriction	58	58	62.0	63.0	60.0	61.5	66.0	60.0	54.5
Breadth of braincase	98	100	97	96	94	94	97	102	91
Mastoid breadth	112	119.5	117	115	108	111	112	123	108
Greatest length of nasals	91.5	97.5	102.5	103.5	92.5	68.0	93.0	-	91.0
Greatest breadth across nasals	62.6	73.6	63.0	64.5	70.0	66.3	71.1	-	63.5
Length diastema upper jaw	52.3	53	48.2	58.8	47.6	47.5	39.5	42.5	44.0
Length of $p_1^1 - p_4^4$	52.6	75	77.5	75.5	71.5	76.5	81.2	72.0	73.3
Length of $p_1^1 - m_2^2$	107	116	120	118.5	101	116	126.5	113.0	114.8
Length of $p_1^1 - m_3^3$	-	-	-	-	130	-	-	136.0	135.7
Length of mandible	280	291	292	285	283	280	294	-	293
Length of $p_1 - p_3$	56.5	64.5	64.5	65.0	51.0	62.5	66.5	54.0	65.5
Length of $p_1 - m_2$	97.5	112	110.5	113	96	109	116.8	97.5	102.0
Length of $p_1 - m_3$	-	-	-	-	123	-	-	124.0	128.8

Remarks. — The Tapir is officially classed as game and is mentioned in the Suriname Game Ordinance of 1954, as revised in 1970, under the names: “Tapir of buffel (*Tapirus terrestris*)”. It is an esteemed game, as each animal provides a few hundreds of kilograms of meat which tastes like buffalo meat (Geijskes, 1954: 74). The brothers Penard (“De Surinamer”, 17 August 1905) remarked that the meat of

the adult Tapirs is quite tasty, but the meat of the young is much better. Notwithstanding this, the Suriname Amerindians as a rule do not eat tapir meat, but the Bush-Negroes do. However, Lenselink (1972: 40) remarked that in the Amerindian village of Alalapadoe (population: 450) in the Sipaliwini area of south-western Suriname, during one month (March 1972) 2 adults and 2 juveniles of this species were shot and eaten by the Trio-Indians.

Tapirus terrestris is the largest land mammal of South America. In Suriname the Tapir, although rather common at present, may become rare in the near future since (1) it produces only a single young after a gestation period of about 400 days, (2) the solitary animal is intensively hunted, and (3) the extent of the primeval forests in Suriname decreases progressively. It is therefore important to learn more about the actual distribution of the Tapir, its exact habitats, and the size of the populations in the country. Recently Noelmans (1969: 42-52) gave a compilation of the known data concerning the Suriname Tapir.

The habits of the Suriname Tapir were extensively described by Kappler (1887: 81-83) and by the brothers Penard ("De Surinamer", 17 August 1905). The animal is mainly nocturnal and in the daytime hides in the woods and in dense shrubbery. It leaves its lair in the evening and usually keeps following the same trails, which thereby become quite distinct, and in the mountains often lead to the extreme top. In the savannas the trails usually follow the Mauritie palms (*Mauritia flexuosa* L.), the fruit of which forms a special delicacy for the tapirs; from the air these trails show clearly in the savanna as white lines. The tapir is found both in the mountains and in the lowlands, in the savannas as well as in swampy areas. It likes water and often can be seen in the early morning to take a bath in the river; it swims and dives well, and also is fond of mud baths. It walks like a horse and jumps like a deer. Dr. Geijskes, whom I owe much of the above information, recalls instances of pairs of tapirs which, during the night or very early morning, ran with great noise through the forests, sometimes galloping straight through a campsite and creating great havoc there. The sense of smell of a tapir is well developed and is better than its eye-sight. It makes a grunting noise like a pig, but louder, and when in distress it produces a loud squealing or almost whistling sound; when troubled by insects its noise becomes puffing. According to Amerindians the tapir does not attack man, not even when cornered; but still it is safest not to get in the way of females with young or of solitary males. To defend its young the tapir will attack jaguars and dogs, and then it only uses its legs: it can kick so efficiently that jaguars and attacking dogs, even those that are trained by the natives for hunting tapir, are kept at bay.

The food of the Tapir consists of young sprouts, fruits and other vegetable matter. As mentioned above, it is especially fond of the fruit of the Mauritie palm, but also is said to show a preference for the leaves of *Spondias* (Anacardiaceae) and *Lonchocarpus* (Leguminosae) (native names: mope and nekoe, respectively). Very interesting, but probably not quite true, is the story told by the brothers Penard that the Tapir is also fond of fishes and obtains these with the help of fish poison contained in the

nekoe plants. According to the tradition among the natives the animal either eats these leaves, which, after passing through the digestive tract, poison the water in which the excrements are dropped, or the Tapir just chews the leaves and then deposits them in the water. The fishes that are affected by the poison come floating to the surface and then are eagerly eaten by the Tapir. Practically all authors dealing with the species seem to agree that the Tapir is an exclusive herbivore. However, Frädrich & Thenius (1968: 22) remarked that, although the free living Tapir is exclusively herbivorous, in captivity it does eat fishes: "So berichtet Zoodirektor H. Hediger, dass man ihnen im Züricher Zoo zur Abwechslung manchmal Fische anbot, die sie gern verzehrten". This might be an indication that notwithstanding all statements in the literature fishes do form part of the regular diet of the free living Tapirs. Whether or not they obtain these with the help of fish poison is another matter.

In the literature not only man and the Jaguar are mentioned as enemies of the Tapir, but also the alligator.

In the older literature on Suriname the name *Tapirus americanus* (Gmelin, 1788) has often been used for this species.

ORDER ARTIODACTYLA

The Artiodactyla or Even-toed Ungulates have a world-wide distribution. In the fauna of Suriname they are represented by at least five species: two peccaries (genera *Dicotyles* and *Tayassu*) and three deer (genera *Odocoileus* and *Mazama*). The imported domesticated Artiodactyla (cattle, pigs, goats and sheep) of Suriname are left out of consideration here.

The number of species of Artiodactyla occurring in Suriname has long been a point of controversy. Sanderson (1949: 781) when dealing with "The Van Emden Pig" remarked that the third species of peccary reported from Suriname probably is nothing but a domestic pig that has become feral; this third "species" is larger than the other two. In this connection it is interesting that already Quandt (1807: 202) remarked that "Oben in den Gebürgen, wo die Freyneger wohnen, soll es eine grössere Sorte wilder Schweine geben die wie die hiesigen sich gegen einen Menschen zu Wehre setzen, auch wohl gar die Mensche anfallen". According to hunters there are more than three species of deer in Suriname. However, both in the literature and in collections only the three species discussed here are represented. Even older authors like, e.g., Pistorius (1763: 56) and Quandt (1807: 204), clearly do not mention more than three species of Cervidae.

The peccaries and the deer are well known in Suriname. They are intensively hunted for their meat, which provides excellent food. Consequently, the inhabitants of the interior, as well as many hunters, have a profound knowledge of these animals. However, the mammalogical literature dealing with the Artiodactyla of Suriname and with their biology is practically non-existent. Because these large mammals are difficult to transport and because they are used as human food, they are poorly represented in museums and only a few specimens are available to scientists for study. In order to obtain a correct idea about the status of the various species and the variability of the crucial taxonomic characters, it will be extremely important to have the opportunity to study extensive series of complete, well sexed skins and skulls of adult specimens.

Key to the Artiodactyla of Suriname based on external characters

- 1a. Upper incisors present (4 in all); upper canines tusk-like and directed downwards (pl. 95). Muzzle pig-like. The general colour of the animal is blackish to dark greyish, mixed with yellowish (family Dicotylidae) 2
- b. Upper incisors absent (pls. 100, 102 and 103). Muzzle deer-like. The general colour of the upper parts is brownish, reddish brown or greyish brown. Antlers or spikes present in males (family Cervidae). 3
- 2a. A whitish or light yellowish collar extends from the mane over the shoulders to the throat (pl. 97) *Tayassu tajacu patira*, p. 353

- b. No collar present, but the muzzle, chin and cheeks are white or yellowish white (pl. 70 lower figure) *Dicotyles pecari*, p. 349
- 3a. Ears large, length in two specimens 130 and 135 mm. The colour of the dorsal parts of the body is ochraceous brown or yellowish brown, the sides being somewhat lighter. The ventral surface shows a broad pure white area between the fore and hind legs. The muzzle and the head show a pattern of whitish and black spots and stripes. The antlers of the males are branched (pls. 99 and 100); they are absent in the females *Odocoileus virginianus cariacou*, p. 356
- b. Ears shorter, length in 13 specimens up to 105 mm. The dorsal surface is of a deep reddish brown or dull greyish brown colour. The ventral surface shows a more yellowish rusty colour or is yellowish or whitish sometimes washed with buff. A more or less distinct crest is present on the forehead. The antlers of the males are unbranched simple spikes (pls. 101, 102 and 103); they are absent in the females (genus *Mazama*) 4
- 4a. The dorsal parts of the body are of a (deep) reddish brown colour; the ventral parts show a more rusty colour *Mazama americana americana*, p. 361
- b. The coat colour of the dorsal parts is dull greyish brown; the ventral parts are yellowish or whitish *Mazama gouazoubira nemorivaga*, p. 366

Key to the Artiodactyla of Suriname based on skull characters

- 1a. Four incisors in the upper jaw, upper canines large and directed downwards (family Dicotylidae, pl. 95) 2
- b. Upper incisors absent; upper canines, if present at all, very small (family Cervidae, pls. 100, 102 and 103) 3
- 2a. The maxillae are laterally expanded behind the upper canines, so that the implantation of the three upper premolars is separated from the lateral margin of the maxillary by a distinct distance (pl. 95 upper figs.). The alveolar length of the upper tooth-row (three premolars and three molars combined) varies in 21 skulls from 73.0 to 82.2 mm (mean: 78.7 mm) *Dicotyles pecari*, p. 349
- b. The maxillae are not laterally expanded but are constricted immediately behind the canines, and the implantation of the three premolars is situated next to the lateral margin of the maxillary (pl. 95 lower figs.). The alveolar length of the upper tooth-row (three premolars and three molars combined) varies in 23 skulls from 61.3 to 69.9 mm (mean: 65.7 mm) *Tayassu tajacu patira*, p. 353
- 3a. A well developed, sharply defined, deep longitudinal supra-orbital groove is present; this groove continues anteriorly to the foramen or foramina in the orbital roof which are always visible; the inner margin is sharp, especially in its posterior part, and slightly to distinctly overhangs the foramina, and in dorsal view partly or entirely obscures them (pls. 101, 102 and 103). The posterior part of the suture between the frontals is irregularly sinuous, usually slightly deviating from a straight line; the anterior part of the suture is prac-

- tically straight. The bulla is small and reaches hardly beyond the base of the processus paroccipitalis. The antlers of the male are simple unbranched spikes. 4
- b. The supraorbital groove is usually very indistinct, not continuing beyond the foramina; its inner margin only rarely overhangs and then only partly obscures the foramina from dorsal view. The posterior part of the suture between the frontals meanders or oscillates strongly, in striking contrast with the practically straight anterior part of the suture (pls. 99 and 100). The bulla is well developed, its lower margin reaches to about the middle of the processus paroccipitalis. The antlers of the male are branched. The alveolar length of the upper tooth-row (three premolars and three molars combined) varies in 6 skulls from 64.0 to 72.2 mm, the greatest alveolar breadth of the second upper molar varies from 13.5 to 16.2 mm. *Odocoileus virginianus cariacou*, p. 356
- 4a. The alveolar length of the upper tooth-row (three premolars and three molars combined) varies in 27 skulls from 60.1 to 69.6 mm (mean: 63.4 mm), the greatest alveolar breadth of the second upper molar varies from 13.4 to 16.0 mm (mean: 14.5 mm) *Mazama americana americana*, p. 361
- b. The alveolar length of the upper tooth-row (three premolars and three molars combined) varies in 5 specimens from 49.0 to 54.9 mm, the greatest alveolar breadth of the second upper molar varies from 10.5 to 11.9 mm.
Mazama gouazoubira nemorivaga, p. 366

FAMILY DICOTYLIDAE

It is to be regretted that for a well known group of mammals like the present the scientific names still form a source of misunderstanding and confusion.

Family name. — Although the family name Dicotylidae has been used by several older authors, modern handbooks mostly use the name Tayassuidae, as introduced by Palmer (1897: 174). The name Dicotylidae, however, dates from 1849, when Turner (1849: 157) first introduced it as Dicotylina. In most modern treatises the genera *Tayassu* G. Fischer, 1814, and *Dicotyles* G. Cuvier, 1816, are synonymized and the former name, being the older of the two, is used. The fact that *Dicotyles* was considered a junior synonym of *Tayassu*, probably was the reason that the name Dicotylidae was rejected in favour of Tayassuidae. This, however, is incorrect, as under Article 40 of the International Code of Zoological Nomenclature, a family name based on a generic name considered to be a junior synonym is not to be rejected for that reason. Therefore, whether or not one considers the genera *Dicotyles* and *Tayassu* to be synonymous, the family name Dicotylidae is correct, and it is therefore adopted here.

Generic names. — Until recently, in most of the fundamental publications dealing with this group of pigs, the generic name *Dicotyles* G. Cuvier, 1816, has been treated as a synonym of *Tayassu* G. Fischer, 1814. Woodburne (1968), however, basing himself on the cranial myology and osteology, very convincingly showed that the differences between the two peccary species are of such a fundamental nature that it is

wholly justified to consider the two species to represent two distinct genera. Although a definite answer to the question regarding the correct generic status of these two species requires also a thorough study of the other genera of the Suidae, judging by the data at hand Woodburne's conclusions seem very reasonable, and they are accepted here as far as their taxonomic implications are involved. As to the nomenclatorial consequences of Woodburne's findings, I regret to have to come to a conclusion principally opposite to that of Woodburne. Woodburne, namely, was of the opinion that the generic name *Dicotyles* should be used for *Sus Tajacu* Linnaeus, 1758 and the generic name *Tayassu* for *Sus pecari* Link, 1795. G. Fischer (1814: 285), however, cited in the synonymy of the species which he named *Tayassu Pecari*: "*Sus Tajassu* Linn. Gmel. syst. nat. 219. n. 3". In accordance with Article 68 (d) of the International Code of Zoological Nomenclature, *Sus Tajacu* Linnaeus, 1758 (Syst. Naturae, (ed. 10) 1: 50), of which *Sus Tajassu* is a later erroneous spelling, is the type species of the genus *Tayassu* G. Fischer, 1814, by absolute tautonymy. Hall & Kelson (1959 (2):994) had already arrived at this conclusion. The name *Tayassu* G. Fischer, 1814, thus must be employed for the genus containing the Collared Peccary: *Tayassu tajacu* (Linnaeus, 1758).

As to the genus *Dicotyles* G. Cuvier, 1816, Woodburne (1968: 33) stated: "From Cuvier's text (1817, pp. 237-238) *D. torquatus* is clearly the genotypic species of *Dicotyles* and refers to the Collared Peccary. *D. torquatus* not only has page priority over *D. labiatus* (Cuvier's name for the White-lipped Peccary), but is more thoroughly diagnosed than the latter and seems to have been central to Cuvier's concept of the genus". However, neither page priority nor the central position of a species in a genus is acceptable as a valid type designation. G. Cuvier (1816), in the original description of the genus *Dicotyles*, did not indicate a type species at all. The first authors to do so were, as far as I can ascertain, H. Milne Edwards, Laurillard & Roulin (1845, G. Cuvier, Règne Animal. (Disciples ed.), 1: pl. 80), who indicated *Dicotyles labiatus* (i.e., the White-lipped Peccary) as the type of *Dicotyles* G. Cuvier, 1816, so that the name *Dicotyles* must be given to the genus containing *Sus pecari* Link, 1795.

Specific names. — In his much consulted checklist of the mammals of South America, Cabrera (1961: 315-319) used the name *Tayassu albirostris* (Illiger, 1815) for the White-lipped Peccary, as has been done by many earlier and later authors. Hershkovitz (1963), however, showed that not *albirostris* Illiger, 1815, but *pecari* Link, 1795, is the valid specific name for this species. Hershkovitz's nomenclature for the species is followed here. As to the subspecies, far more material from the entire range of distribution of *Dicotyles pecari* is needed to ascertain whether or not subspecies can be distinguished within this range. The same problem is found with *Tayassu tajacu* (Linnaeus, 1758), the Collared Peccary, of which Hershkovitz (1963) accepted two subspecies: the nominate form or Brazilian Collared Peccary, and the subspecies occurring in the Guiana region, *Tayassu tajacu patira* (Kerr, 1792).

Occasionally a domestic pig, *Sus scrofa* Linnaeus, 1758, may escape from a farm

and run wild; although there are no definite records that this has happened in Suriname, the possibility should not be excluded. There are two distinct external characters by which the domestic pig and the peccaries can be distinguished from each other: (1) on the middle of the back the peccaries have a large scent gland, which is lacking in the true pigs, and (2) the hind feet of the peccaries have three toes (the outer toes are absent), while *Sus scrofa* had four (Mohr, 1959; 1960, figs. 121-123; Husson, 1960a: 36-37, fig. 5). The main differences between the skulls of *Sus scrofa* and the peccaries are noted under *Dicotyles pecari* (Link, 1795).

Dicotyles pecari (Link, 1795)

Pl. 70 lower figure (animal), pl. 95 upper figures (skull), pl. 96

Sus Pecari Link, 1795, Beiträge zur Naturgeschichte, 1 (2): 104.

Type locality. — Not mentioned by Link (1795), but, as his species is evidently based on the "Pécari" of Buffon (1776, Hist. nat. gén. part., suppl. 3: 92), the type locality by implication is Cayenne, French Guiana, to which it has definitely been restricted by Hershkovitz (1963: 86).

Synonymies. — Cabrera, 1961: 316-317 (under *Tayassu albirostris* (Illiger)); Hershkovitz, 1963; Mohr, 1960: 119-137, figs. 133-135 (under *Dicotyles labiatus* G. Cuvier); and the present work (p. 348).

Vernacular names. — (E) White-lipped Peccary; (N) Witlippeccarie, Pingo; (S) Pingo.

Distribution. — The species has been recorded from Central America (from eastern Mexico to Panama) and from South America, where it is known from Ecuador, Colombia, Venezuela, the Guianas, Brazil, Paraguay, and north-eastern Argentina.

Occurrence in Suriname. — The Pingo is widely distributed in Suriname. It is found in forests, but more information regarding its actual habitat is desirable, especially in view of an eventual protection of the species, which at present is intensively hunted. I have examined the following specimens:

1. Washabo, east bank of Corantijn River, at about 5°12'N, Nickerie District, 1 upper jaw (no. 21839).
2. Avanavero Falls, Kabalebo River, right branch of the Corantijn River, about 4°45'N, 7 males (nos. 21833, skin and skull; 21829, 21830, 21832, 21837, 21838, 21859, skulls), 4 females (nos. 21835, 21836, skins and skulls; 21831, 21834, skulls).
3. Lucie River, right branch of Corantijn River, 2 skulls (nos. 18006, 18009).
4. Kayserberg airstrip near Zuid River, left branch of Lucie River, about 3°N 56°30'W, 2 skulls (nos. 20533, 20534).
5. Sipaliwini, extreme south-eastern part of Nickerie District, near Brazilian border, 1 female (no. 18232, skull).
6. Afobaka on Suriname River near northern shore of Brokopondo Lake, Brokopondo District, 2 skulls (nos. 20978, 20979).
7. Between Moengotapoe and the coast near the Wiawia Bank, north-eastern Suriname, Marowijne District, 1 male (no. 17106, skull), 1 skull (no. 20976).
8. Tapanahony River, upper Marowijne basin, south-eastern Suriname, Marowijne District, 3 skulls (nos. 19678, 19679, 19680).
9. Suriname, without a more precise locality indication, 1 skull (no. 20977).

Description. — The most striking external character by which the Pingo can easily be distinguished from the next species *Tayassu tajacu patira*, is the whitish colour of the muzzle, the chin, and the cheeks. The general colour of the rest of the animal is dark blackish brown, usually washed with yellowish white or light brownish, caused by the fact that most of the stiff and coarse hairs have one or more light brownish or light yellowish rings. The long hairs of the mane, which runs from the crown of the head to the rump, are blackish. As in the next species, there is a musk gland in the midline of the back in the posterior portion of the mane, about 20 cm in front of the tail base. Walker (1964 (2):1365) remarks: "This gland is approximately 7.5 cm in diameter and 1.25 cm thick. When the animal is excited, the hairs on the neck and back bristle and the dorsal gland emits a musky secretion, the odor of which can be detected for many meters" (see further under Remarks). The ovate and erect ears are sparsely haired. The ventral surface of the body is usually sparsely haired when compared with the fur of the dorsal parts. The few skins I examined show that there is considerable variation in the coat colour, owing to the markings of the hairs, in which the light yellowish rings may vary considerably in number and width.

Dental formula: $I \frac{2}{3}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{3}{3}$. The skull of the present species (pl. 95, upper figs.) is quite characteristic and among the wild Suriname mammals can be confused only with that of the Collared Peccary, *Tayassu tajacu patira* (Kerr, 1792). The differences between the two have been enumerated in the key on page 346. The skull of the present species and that of the Collared Peccary can be easily distinguished from that of the domestic pig, *Sus scrofa* Linnaeus, 1758, by a number of characters of which the following are among the most striking: (1) in the domestic pig the upper canines are directed downward and outward, with the tip stronger outward; in the peccaries they are directed downward; (2) in the domestic pig a small third upper incisor is placed about half way between the anterior two upper incisors and the canine; in the two peccaries the third upper incisor is missing; (3) in the domestic pig there are four premolars in both the upper and lower jaws, the first of these being placed immediately behind the canines, followed in the upper jaw by the other three premolars without interruption, while in the lower jaw the first premolar is separated from the next by a distinct diastema; in the peccaries there are only three premolars in both upper and lower jaw, the first of these being separated from the canines by a large diastema that has about the length of the three premolars combined.

In Table 56 the measurements of eleven skulls are provided. The total length, as noted in the table, is the distance between the anteriormost border of the premaxillae and the posteriormost border of the occipital crest. The greatest breadth of the maxilla is situated at about the level of the first upper premolars. In the column "length of nasals" the true length of the nasalia is not given, since posteriorly these are completely fused with the frontals, but the length indicated is the distance between the anterior margin of the nasals and the foramen supraorbitalis. The length of the lower jaw is measured from the anteriormost tip of the mandible to the

TABLE 56

Skull measurements of eleven specimens of *Dicotyles pecari* (Link) from Suriname in the Leiden Museum.

Reg. number	21835	21831	21836	18232	21834	17106	21837	21830	21859	21833	19680
Sex	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂	-
Total length	297	289	277	288	294	268	270	285	290	291	284
Condylbasal length	254	255	247	248	257	-	238	-	252	255	244
Palatal length	189	185	178	181	188	171	169.5	182	184	186.5	184
Length of nasals	156.5	154.5	149.0	151.0	159.0	140.0	143.5	154.5	155.7	147.5	144
Zygomatic breadth	124.9	118.7	115.5	118.5	122.5	115.1	119.5	118.7	119.2	119.4	122.1
Greatest breadth across canines	64.3	63.4	59.6	60.6	64.2	56.6	54.9	65.0	68.1	73.8	71.5
Greatest breadth of maxillae	57.7	59.7	54.2	56.6	59.8	51.8	53.8	56.1	55.6	57.9	56.1
Breadth of braincase	70	69	69	67	68	68	65	63	69	66	64
Interorbital constriction	65.2	61.8	60.4	64.1	66.2	61.9	62.3	62.5	66.2	67.9	64.4
Upper diastema	28.9	29.1	31.9	31.8	30.9	26.4	26.3	29.2	30.3	32.1	29.1
Length of p ¹ - p ³	35.2	33.0	30.2	34.5	32.6	32.3	32.1	32.3	32.9	32.3	32.4
Length of p ¹ - m ³	86.6	81.0	73.0	76.2	80.2	77.9	77.4	77.6	76.9	76.0	78.3
Length of mandible	205.3	200.8	194.5	198.8	208.7	188.0	191.5	201.3	221.1	226.0	194.1
Length of p ¹ - m ³	93.8	87.3	78.2	83.8	89.7	86.4	80.9	82.3	82.4	83.8	86.4

posteriormost border of the processus condylicus. In some specimens there is a remarkable difference in the length of the right and left tooth-row (three premolars and three molars combined); in a female specimen from Avanavero Falls (no. 21836) this length on the upper right side is 70.6 mm and on the upper left side 74.0 mm. In all specimens, however, I measured the greatest length. In 21 skulls the length of the upper tooth-row varies from 73.0 to 82.2 mm (mean: 78.7 mm).

On 8, 9 and 10 April 1971 Mr. P. Staffeleu collected eleven specimens of the Pingo at the Avanavero Falls, Kabalebo River, right branch of the Corantijn River, and took the external measurements of all. These measurements are given in Table 57. The skulls of these specimens and the skin of three (nos. 21833, male; 21835, female; 21836, female) are now in the collections of the Leiden Museum.

Remarks. — In the Game Ordinance 1954, as revised in 1970, the Pingo is listed as game under the names: "Pingo (*Tayassu pecari*)". As stated by several authors the meat of the Pingo is a valuable food for the Amerindians and Bush-Negroes; so, Lenseink (1972: 40) remarked that in the Amerindian village of Alalapadoe (population: 450) in the Sipaliwini area of south-western Suriname, during one month

TABLE 57

External measurements of eleven specimens of *Dicotyles pecari* (Link) from the Avanavero Falls, Suriname, in the Leiden Museum.

Reg. number	21836	21831	21835	21834	21838	21859	21830	21829	21837	21833	21832
Sex	♀	♀	♀	♀	♂	♂	♂	♂	♂	♂	♂
Head and body	950	1040	1085	1100	995	1025	1035	1040	1035	1070	1080
Tail, without tuft	56	30	33	33	30	40	-	33	28	50	-
Tail, with tuft	113	80	58	60	60	91	-	53	58	80	-
Hind foot, without hoof	200	200	188	195	205	200	200	189	194	205	195
Hind foot, with hoof	215	225	207	220	225	220	220	215	215	222	215
Ear	80	80	80	80	90	80	81	84	80	80	78

(March 1972) 13 specimens of this species were shot and eaten by the Indians. It must be noted, however, that the musk gland and the surrounding flesh must be removed to prevent the meat from being spoiled; if the gland is not removed within fifteen minutes or half an hour after the death of the animal, the meat of the entire body takes the taste and odour of the glandular secretion (see Werner, Dalquest & Roberts, 1952: 72).

Since the remarks by Geijskes (1954: 74) on the Pingo present a good general account of the species in Suriname, they are cited here in a free translation from the Dutch: 'The White-lipped Peccary is more or less comparable to the European wild pig and occurs in Suriname in large herds of up to 200 individuals. The animals roam around in the forests, where they feed on fallen fruits, tubers, etc. They can also do considerable harm to the native gardens. Hunting of the Pingo is not without danger, since the fullgrown males defend the group by attacking the hunters with their large tusks. When danger threatens, they give warning by an intense rattling of their teeth. In the dry season they concentrate along the rivers and forest-creeks and not seldom can they then be seen swimming across the rivers. If they are observed at such occasions by the Bush-Negroes, a real slaughtering may take place. The swimming animals, which are defenseless, are killed with sticks, machetes, and rifles. The dead animals will float and are picked up with canoes. The meat of the Pingo is very tasty and an adult animal yields about 40 kg of meat. The hunters consider it an extraordinary windfall to meet a troop of swimming Pingos, and the occasion is fully exploited by killing the largest possible number of animals. The species seems to multiply rather quickly, even though the females produce only two young each year'.

An illustration of a herd of Pingos, swimming across the Marowijne River, and being attacked by Bush-Negroes, has been published by Kappler (1887: 80) and is reproduced here as plate 96. It seems that the number of individuals forming a herd varies considerably; according to data found in the literature it ranges from 15 to 200 or even more, on an average from 30 to 50. An Amerindian from the Marowijne River area, however, informed me that a herd of Pingos usually consists of 15 to 30 animals. According to the brothers Penard ("De Surinamer", 7 and 14 September 1905) the herds of Pingos are smallest in the higher areas, consisting there of rarely more than 20 animals, while in the virgin forests at lower altitudes, viz., in the higher alluvial areas, the herds consist of 200 to 300 animals. In the dry season the Pingos migrate down to the ridge areas near the coast. The approach of a large herd of Pingos seems to be awe-inspiring. The brothers Penard very vividly described the sound of the hundreds of hoofs in the quiet of the night, accompanied by a very loud grunting and gnashing of teeth, which gives a most frightening impression, especially to those who hear it for the first time.

The brothers Penard described the food of the Pingo as consisting of fruit, palm seeds (e.g., Awarra palms, *Astrocaryum vulgare* Martius, and Maripa palms, *Attalea regia* (Martius) W. Boer), mushrooms, insects, worms, and even snakes, toads

and fishes. The Pingos are said to be rather aggressive and may attack dogs and even human beings. Their main enemies (apart from man) are the Jaguar and the Puma; according to Kappler (1887: 81) also *Boa murina* (= *Eunectes murinus* (Linnaeus, 1758)) is one of the enemies of the species. In contrast to the Pakiras (*Tayassu tajacu patira*) the young Pingos cannot be tamed. The brothers Penard also stated that the litter of the Pingo consists of one or two young and that these are not restricted to a certain season: young animals are found throughout the year. Three of the females (nos. 21831, 21835, and 21834), collected on 9 and 10 April 1971 near the Avanavero Falls, had two, two, and three embryos respectively.

In the literature the Pingo is often indicated with its synonyms *Dicotyles labiatus* G. Cuvier, 1816, *Dicotyles albirostris* (Illiger, 1815), and *Tayassu pecari* (Link, 1795).

***Tayassu tajacu patira* (Kerr, 1792)**

Pl. 97 (animal), pl. 95 lower figures (skull)

Sus Tayassu Patira Kerr, 1792, The Animal Kingdom: 353.

Type locality. — "Inhabits Guiana" (based on the "Patira" of Buffon, 1776, Hist. nat. gén. part., suppl. 3: 94, who noted as the locality "le continent de la Guyane"). Restricted by Cabrera (1961: 318) to "Guyana Francesa"; further restricted by Hershkovitz (1963: 87) to "Cayenne, French Guiana".

Synonymies. — Cabrera, 1961: 318; Hershkovitz, 1963; Mohr, 1960: 119-137, figs. 120-132 (under *Dicotyles torquatus* G. Cuvier) and the present work (p. 348).

Vernacular names. — (E) (Guiana) Collared Peccary; (N) Halsband Peccarie, Witdas; (S) Pakira.

Distribution. — The species *Tayassu tajacu* (Linnaeus, 1758) occurs from the south-western U.S.A. (the southern part of Texas and Arizona), through Central America to north and eastern South America, where it has been reported from Colombia, Ecuador, Trinidad, Venezuela, the Guianas, and Brazil, and southward to northern Argentina. The subspecies *T. tajacu patira* is known from the Guianas and the adjacent regions of Venezuela and Brazil.

Occurrence in Suriname. — The Collared Peccary is widely distributed in the forested areas of Suriname. It was well known to the early authors. Already Warren (1667: 11) distinguished between the "Pakeera" and the "Pinko". During the "Operation Gwamba" 71 specimens of the Pakira were saved in the Brokopondo region (Walsh & Gannon, 1967: 218).

I have examined the following Suriname material:

1. Kaboeri (or Kapoeri) Creek, right branch of Corantijn River, at about 5°14'N, Nickerie District, 1 female (no. 21858, skin and skull).
2. Matapi on the Corantijn River at about 5°N, 1 male (no. 21857, skin and skull).
3. East of Kayserberg airstrip near Zuid River, left branch of Lucie River, about 3°N 56°30'W, 1 skull (no. 18019).
4. Sipaliwini, extreme south-eastern part of Nickerie District, near Brazilian border, 1 female (no. 16055, skin and skull).

5. Mouth of Takomara Creek, branch of Maratakka River, almost due south of Wageningen, about 5°16'N, Nickerie District, 1 skull (no. 21713).
6. Matta, an Amerindian village about 12 km due west of Zanderij, about 5°25'N, Saramacca District, six upper and three lower jaws (no. 20991).
7. Paramaribo area, Suriname District, 1 skull (no. 20985).
8. Zanderij, about 40 km south of Paramaribo, Para District, 1 male (no. 17822, skull).
9. Afobaka on Suriname River near northern shore of Brokopondo Lake, Brokopondo District, 3 skulls and some skull fragments (nos. 20980-20983).
10. Ganiakondre, east bank of Suriname River, opposite Gansee, at present submerged by Brokopondo Lake, Brokopondo District, 1 skull (no. 20987).
11. Commetewane Creek, left branch of Commewijne River, east of Alliance, Commewijne District, 1 skull (no. 20984).
12. Between Moengotapoe and the sea shore near Wiawia Bank, north-eastern Suriname, Marowijne District, 1 male (no. 20972, skin and skull), 2 females (nos. 20973, 20975, skulls).

Description. — As expressed by the vernacular name "Collared Peccary" the present species can at once be distinguished from the only other wild pig in Suriname, *Dicotyles pecari*, by the presence of a pale line ("collar") over the shoulders. This line extends from the throat obliquely upwards and backwards over the shoulders on to the back, where the left and right line are separated by the black mane. The hairs of this pale stripe have the base brownish followed by a large yellowish area, while the extreme tips usually are black. The general colour of the larger part of the body is blackish, sprinkled with yellowish. Here the hairs are coarse and stiff, of a black or dark brownish colour, usually with one or more yellowish rings. A mane, in which the hairs are much longer and darker (mostly entirely black), extends over the full length of the back, being most distinct anteriorly. In a few other areas the hairs are entirely black, less coarse and often more sparse, viz., on the dorsal surface of the snout, on all legs and on the ventral surface of the body, especially in the median area. As in the previous species (see p. 350), a musk gland is present on the back. Also, in most other external characters the two species are very similar, except that the present species is smaller than *Dicotyles pecari*.

Dental formula: $I \frac{2}{3}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{3}{3}$. The skull of the present species can be distinguished from that of *Dicotyles pecari* by the fact that in the Collared Peccary the maxillae narrow directly behind the canines and that their lateral margins extend closely along the premolars and molars. The ventral surface of the maxillary between the canines and the molars is much narrower than the greatest width of the skull in that area. In *Dicotyles pecari*, however, the maxillary is widened behind the canines and its outer margin runs at some distance laterally of the outer margin of the premolars; the ventral surface of the maxillary between the canines and the molars is the widest part of the skull in this region. Furthermore, the skull of *Tayassu tajacu patira* is characterized by having the diastema, between the posterior border of the alveoles of the upper canines and the anterior border of the premolars, about as long as the first two premolars combined, while in *Dicotyles pecari* the diastema is about as long as the three premolars combined.

The differences between the skull of the present and the previous species and that of the domestic pig, *Sus scrofa*, are listed under the previous species (p. 350).

TABLE 58

Skull measurements of ten specimens of *Tayassu tajacu patira* (Kerr) from Suriname in the Leiden Museum.

Reg. number	21858	16055	20975	20973	21857	17822	20972	20984	18019	20985
Sex	♀	♀	♀	♀	♂	♂	♂	-	-	-
Total length	233	243	229	236	235	227	245	238	239	235
Condylobasal length	199	205	196	199	201	191	208	209	205	210
Palatal length	139.7	144.5	137.7	139.5	138.5	136.0	146.9	147.8	145.4	146.0
Length of nasals	123.7	131.1	116.5	110.3	121.5	115.3	130.5	121.9	123.9	128.5
Zygomatic breadth	100.5	100.7	106.7	99.9	99.0	102.0	101.9	107.5	100.6	97.2
Greatest breadth across canines	49.9	55.1	53.9	53.0	49.9	54.5	58.5	54.4	52.5	44.8
Breadth maxillae, at level of p	32.1	34.8	38.0	33.2	30.4	35.9	35.0	32.3	33.3	32.1
Breadth of braincase	53	58	55	55	52.5	52	58	54	55	53
Interorbital constriction	51.0	54.8	54.1	52.2	50.1	51.3	53.5	51.1	49.8	48.3
Upper diastema	21.9	17.7	15.5	19.0	19.8	17.8	19.0	19.8	16.0	21.0
Length of p ¹ - p ³	27.1	29.3	26.8	28.7	28.7	29.8	26.6	27.0	29.5	29.0
Length of p ¹ - m ³	61.8	65.7	63.4	65.6	66.8	67.6	63.4	63.3	70.0	67.5
Length of mandible	159.5	165.0	154	157	158	153	166.5	167	161	163
Length of p ₁ - m ₃	67.6	70.5	66.7	69.0	69.6	71.6	69.5	72.3	73.9	69.6

The skull measurements in Table 58 are taken in the same way as those in Table 56. In 23 skulls the length of the upper tooth-row (three premolars and three molars) varies from 61.3 to 70.0 mm (mean: 65.7 mm).

The external measurements of three specimens (no. 21857, male from Matapi, Corantijn River; no. 21850, female from Kaboeri Creek, right branch of the Corantijn River; no. 16055, female from Sipaliwini, south-western Suriname) are, respectively: head and body, 830, 850, 880; tail, without tuft, 30, —, 20; hind foot, with hoof, 200, 200, 191; ear, 85, 85, 89 mm; weight, 20, 22, — kg. The two females collected on 29 March 1971 and 29 November 1948 each carried two embryos.

Remarks. — In the Game Ordinance 1954, as revised in 1970, the Collared Peccary is listed as game under the names: "Pakira (*Tayassu tajacu*)". The animals are highly esteemed as food. Lenselink (1972: 40) found that in the Amerindian village of Alalapadoe (population: 450) in the Sipaliwini area of south-western Suriname, during one month (March 1972) 6 specimens of this species were shot for food (about half as many as of the previous species).

Geijskes (1954: 74) gave the following information on the Pakira (free translation from the Dutch): 'Like the White-lipped Peccary, the Collared Peccary is a highly valued game species. This forest pig is smaller than the White-lipped Peccary and lives in groups of 10 individuals at most. They have not been observed swimming in rivers, but seem to live preferably in swampy places along small creeks. The meat of the Collared Peccary is considered a delicacy. However, as soon as the animal is shot, the dorsal musk gland should be removed, as otherwise the meat may acquire an unpleasant taste; the same is true for the White-lipped Peccary. The Collared Peccary occurs here and there in the woods. It disappears, however, from areas where it is frequently hunted. The animals often spend the night in the hollow trunks of fallen giant trees, where they are safe from the attack of Jaguars'.

According to data found in the literature, the number of individuals forming a herd varies greatly, ranging from 3 to 100, with an average of 10. An Amerindian from the Marowijne River area informed me that the herds usually consist of about 7 or 8 animals.

The brothers Penard ("De Surinamer", 17 September 1905) noted that the Pakira is a more nocturnal animal than the Pingo (*Dicotyles pecari*), and that in the daytime it usually hides in hollow trees. Also Kappler (1887: 81) mentioned hollow trees as hiding places for the species, the entire herd sometimes hiding within a single tree. Geijskes (personal information) considers the Pakira to be truly diurnal: it is possible that in the daytime they sometimes hide in fallen hollow trees, perhaps for a siesta, but they certainly are not nocturnal. The Pakira is less aggressive than the Pingo, and less noisy. Their meat is more tasty than that of the Pingo.

The litter of the Pakira consists of one or two young. The young animals can be easily tamed and are often seen in Amerindian villages: when a mother animal is killed the young often follow the hunter, accepting him as a replacement parent. This is in contrast to the Pingo (*Dicotyles pecari*), the young of which cannot be tamed.

In many publications on Suriname mammals the name *Dicotyles torquatus* G. Cuvier, 1816, has been used for the present species.

FAMILY CERVIDAE

Odocoileus virginianus cariacou (Boddaert, 1785)

Pl. 98 (animal, male), pl. 99 (skull, frontal view, male), pl. 100 (skull, male)

Cervus Capreolus Cariacou Boddaert, 1785, Elenchus animalium, 1: 136.

Type locality. — "Habitat in Gujania, Brasilia". Restricted by Hershkovitz (1948: 44) to "Guyane, coastal French Guiana".

Synonymies. — Cabrera, 1961: 325; Avila-Pires, 1958: 589-590; Hershkovitz, 1948: 44; Hershkovitz, 1958a: 540.

Vernacular names. — (E) White-tailed Deer, Virginia Deer; (N) Zeehert, Strandhert, Savanne-hert; (S) Awojo-dia, Wojodia.

Distribution. — The species *Odocoileus virginianus* (Zimmerman, 1780) occurs from southern Canada and most of the United States southward through Central America into northern South America, where it has been reported from Colombia, Ecuador, Peru, Venezuela, the Guianas and north-eastern Brazil. According to Cabrera the subspecies *O. virginianus cariacou* is known from French Guiana and north-eastern Brazil (see further under Remarks).

Occurrence in Suriname. — Warren (1667: 11) mentioned the occurrence of deer in Suriname, which "are much like our ordinary ones in *England*", and did not distinguish different species. Herlein (1718: 170) recognized "Harten" (deer) and "Kabritjes of Rheën" (goats or roe-deer). Although his account is rather vague it seems most likely that with the first category *Odocoileus* is meant and with the

second *Mazama*. The first author writing about Suriname, who gave a recognizable description of the present species is Pistorius (1763: 56), who distinguished three species of deer in Suriname, the first of which clearly is *Odocoileus* as it is said to consist of animals "die zig aan de Zeestranden ophouden, en het grootste zoort zyn. Deeze hebben Horens met drie a vier Takken, en zyn doorgaans zoo vet als Schapen; hun couleur is bleek-rood, trekkende na het graauwe; zy werpen dikwyls twee Jongen teffens" (which live at the sea shore and form the largest species. They have horns with three or four branches, and are usually as fat as a sheep; their colour is pale red, tending to greyish; they give birth to two young at the same time). Later authors often confused the three species or recognized more than three species as occurring in Suriname. Also recent authors like Geijskes (1954: 75) pointed to the possibility that two species of deer with forked antlers might occur in Suriname.

Judging by the (published and unpublished) accounts of various informants, the White-tailed Deer occurs throughout Suriname, from the coastal plain to the Brazilian border, preferring the sea shore, sand ridges, savannas, open woodland, forest edges, and the open land along some of the streams in the interior.

I have examined material from the following Suriname localities:

1. Plantation "Waterloo" near Nieuw Nickerie, Nickerie District, north-eastern Suriname, 1 male (no. 21959, skull).
2. Savanna near Sipaliwini airstrip, Sipaliwini River, extreme south-eastern part of Nickerie District near the Brazilian border, 1 female (no. 19683, upper jaw), skull fragments (nos. 19645, 19683).
3. North of Calcutta, lower Saramacca River, about 1.5 km from the sea coast, about 55°40'W, Saramacca District, 1 female (no. 19684, skin and skull).
4. Sea beach near Bigisanti, north-east coast of Suriname between the Suriname and Marowijne Rivers, Marowijne District, 1 male (no. 19685, skin and skull).
5. Suriname, without more precise locality indication, 3 males (nos. 19644, 19666; SMN no. 368, all skulls), 1 female (SMN no. 783, skull). The specimen no. 19644 has been listed by Jentink (1887: 152) as *Cariacus nemoralis* no. a.

Description. — The following description is based on the adult female from north of Calcutta, Saramacca District, collected on 5 November 1972 (no. 19684).

The dorsal surface, including the neck, is tawny ochraceous brown, slightly lighter over the bases of the front legs; posteriorly the colour becomes somewhat more rufous. A faint dark stripe runs backwards from between the ears, disappearing entirely on the anterior part of the back. The hairs are bicoloured, with light yellowish bases. The muzzle has very short, dense hairs. The hairs on the sides of the muzzle are dark brown, with a pale distal part giving the area a grizzled appearance. In the mid-line of the snout the hairs have very short light tips only, and form a very dark, almost blackish longitudinal band, which extends from between the eyes to the snout. Laterally the pale brownish part of the hairs of the muzzle is longer and the cheeks thereby are pale brown. The upper lip at each side of the rhinarium shows a small but very distinct white patch, which is followed by a brownish line. This, in turn, is followed by a pale greyish stripe, which extends from the corner of the mouth up to slightly behind the base of the rhinarium. On the front and the

vertex the hairs are longer than on the muzzle and more yellowish brown. Two triangular dark, almost black spots are found in the median line between and slightly before the ears. The basal part of the outer surface of the ears has hairs of the same colour as those of the vertex. The rest of the outer surface is blackish, with shorter hairs. At the base of the large ears there is a white area, extending onto the posterior basal part; furthermore, there is a small, rather sharply defined white spot present just behind the basal part of the upper margin of the ear. The inner surface of the ear shows long white hairs. Around the eyes there is a blackish ring. The lower surface of the head is whitish, rather sharply separated from the pale brown of the cheeks and that of the throat. This lower surface bears a large dark brown spot on either side just before the corner of the mouth; these two spots become narrower medially and almost touch in the median line; the tip of the lower lip is whitish. The throat is uniformly pale brown. The ventral surface of the body is pale brown like the sides, except for a rather broad white median area, which extends from somewhat behind the level of the fore legs all the way back. The inner surfaces of the fore and hind legs are white in their proximal half; the white colour of the belly is separated from that of the fore legs by a brownish area, but is fused with that of the hind legs. The remaining portion of the legs has about the same colour as the dorsal surface of the body, except that it is paler. Dorsally the short tail is more rufous than the back, and ventrally it is white; its hairs are quite long and distally form a white tuft. The white ventral hairs of the body are unicoloured.

Hershkovitz (1958a, table 1) and Quay (1971) discussed the variations of the glands on the outer surface of the metatarsus (or cannon-bone) in respect to the geographical distribution of the species.

Dental formula: $I \frac{0}{3}$, $C \frac{1}{1}$, $P \frac{3}{3}$, $M \frac{3}{3}$. The upper jaw has no incisors and usually no canines, although sometimes very small (deciduous) canines may be found. In the lower jaw there are three pairs of incisors, of which the middle one is spatulate with a broad cutting edge. In the lower jaw the canines are incisiform, placed next to the incisors; they are of about the same shape and size, or slightly smaller, so that at first sight it seems that four pairs of incisors are present. There is a very large diastema between the lower canine and the premolars. In both jaws the premolars and the molars form an uninterrupted straight row, the elements of which become progressively larger posteriorly. The zygomatic arch is short and rather weakly developed. In the males (pls. 99, 100) the skull bears antlers, these are absent from the female skull. The antlers are branched, thereby distinguishing the White-tailed Deer from the two other Suriname cervids (genus *Mazama*), in which the antlers are simple, i.e., unbranched. The antlers vary greatly in the length of the tines, the shape of the beam (more flattened or more cylindrical, with the tips blunt or more pointed, etc.), and in the extent of the warty basal area.

The measurements of six skulls from Suriname specimens of the White-tailed Deer are noted in Table 59. The diastema of the upper jaw as noted here, is the distance from the anterior tip of the jaw to the anterior margin of the first premolar.

TABLE 59

Skull measurements of six specimens of *Odocoileus virginianus cariacou* (Boddaert) from Suriname in the Leiden Museum.

Reg. number	19684	19683	19644	21959	19685	19666
Sex	♀	♀	♂	♂	♂	♂
Greatest length	243	214	241	241	239	247
Condylbasal length	227	206	230	231	228	235
Palatal length	153.6	-	150.3	154.2	151	153
Length of nasals	74	-	68.8	73.0	67.3	82.8
Interorbital constriction	52.8	53.7	59.3	55.1	55.0	57.1
Zygomatic breadth	92.3	90.8	101.8	91.6	92.2	94.4
Breadth of braincase	63.2	60.8	67.8	60.4	63.2	61.6
Diastruma	73.0	71.5	75.0	75.0	74.9	75.4
Length of upper tooth-row	72.2	64.0	64.6	71.1	68.5	70.7
Breadth of m_2^2	14.2	14.2	16.2	14.5	14.8	13.5
Length of mandible	193	-	184.5	186	186	188
Length of lower tooth-row	79.4	-	71.6	77.3	75.4	77.4
Breadth of m_2	10.6	-	10.0	9.9	9.7	10.5
Length of the beam	-	-	± 170	± 35	± 115	± 128
Width between antlers	-	-	61	61	50.8	57

The width of the male skull taken between the antlers, was measured below the bases of the coronets.

The skull of the present species can be distinguished from that of the two *Mazama* species in the following characters: (1) in the males the antlers are branched, while in *Mazama* the antlers are simple spikes; (2) the supraorbital groove is usually very indistinct, not continuing beyond the foramina, while in *Mazama* this longitudinal supraorbital groove is well developed and sharply defined; (3) the posterior part of the suture between the frontals meanders or oscillates strongly, in striking contrast to the practically straight anterior part of the suture, while in *Mazama* the posterior part of the suture between the frontals is irregularly, but not acutely, sinuous, usually only slightly deviating from a straight line, and not in striking contrast to the anterior part; (4) in *Odocoileus* the frontals are more strongly arched in the midline than those of *Mazama*; (5) the bulla is well developed, its lower margin reaches to about the middle of the processus paroccipitalis, while in *Mazama* the bulla is small and reaches hardly beyond the base of the processus paroccipitalis.

The skull measurements of *Odocoileus*, *Mazama americana*, and *Mazama gouazoubira* from Suriname, as noted in Tables 59, 60, and 61, show that the size of the interorbital constriction can also be used as a character to distinguish the Suriname *Odocoileus* from the two *Mazama* species. In the examined material, namely, the sizes of the interorbital constriction do not overlap. In the 6 skulls of *Odocoileus* this value varies from 52.8 to 59.3 mm; in the 16 skulls of the two *Mazama* species this breadth varies from 35.8 to 51.0 mm. Also, the width between the antlers in comparison with that of the spikes may be a character to separate young males of the Suriname *Odocoileus* from those of young Suriname *Mazama*, since in four adult specimens of *Odocoileus* this measurement varies from 50.8 to 61 mm and in 17 adult skulls of *Mazama* from 25.0 to 44.0 mm.

External measurements of the Suriname *Odocoileus* are unknown to me, except the length of the ears, which is known of two adult specimens, being 130 and 135 mm. In 13 adult specimens of *Mazama americana americana* from Suriname the length of the ears is up to 105 mm.

Appelman (1964: 109) estimated the weight of a large male shot at the Sipaliwini savanna as being between 50 and 60 kilograms.

Remarks. — In the Game Ordinance of 1954, as revised in 1970, the White-tailed Deer is listed as game under the names: "Zeehert of savanna-hert (*Odocoileus virginianus*)". According to the brothers Penard ("De Surinamer", 19 October 1905) the species is mainly hunted by Amerindians, and rarely by other inhabitants of the country. Geijskes (1954: 75) noted that the meat is rather dry, like that of the two *Mazama* species, but quite tasty and nourishing.

According to personal information received from Mr. G. Sanchez, who has a profound knowledge of the game of Suriname, the females of the present species, as well as those of the two other Suriname cervids, give birth to one fawn after a gestation period of about seven months. The antlers and spikes are usually shed in September, sometimes in August. Shortly after shedding the development of the new antlers and spikes starts again; until about February these new antlers and spikes are covered with living skin, the so-called velvet. When the antlers and spikes reach full size, the velvet dries and its remains are rubbed off. That the antlers sometimes still are present later than September is shown by the following observation made by Dr. D. C. Geijskes in November 1943. When camping in a forest at the Emma range, he was awakened during the night or the early morning (it was still dark) by the noise of two fighting male deer, the sound of the antlers hitting each other was very clear. In the morning traces of the fight were found in foot prints and dug up earth, but no blood or broken antlers were noted.

The brothers Penard noted that the present species is quite common in Suriname, occurring in the lowlands as well as in higher areas, being especially numerous in the savanna region. The animals are often seen in the open grassy areas, but when disturbed flee to the woods and bushes. In the wet season, when part of their usual range is flooded, they may occur closer to human settlements.

The oldest name for the South American White-tailed Deer is *Cervus Capreolus Cariacou* Boddaert. Boddaert's species is considered by most recent authors to be only subspecifically different from the North American Virginia Deer, *Odocoileus virginianus* (Zimmerman, 1780). According to Cabrera (1961: 325-326), *O. virginianus cariacou* occurs in French Guiana and north-eastern Brazil, while *O. virginianus gymnotis* (Wiegmann, 1833) occurs in the other Guianas and Venezuela. The variability of *O. virginianus cariacou* is poorly known, especially that of the shape and the size of the antlers (an important character to separate various forms and subspecies of deer), while the variation of the coat colour of both males and females has also been insufficiently studied. A comparative study of populations from different regions of northern South America is necessary to establish the relationship

between *O. virginianus cariacou* and *O. virginianus gymnotis*. Pending such an investigation, I prefer to use the subspecific name *cariacou* for the White-tailed Deer of Suriname.

In the literature dealing with the mammals of Suriname, the names *Cervus savannarum* Cabanis & Schomburgk, 1848, *Cervus campestris* F. Cuvier, 1817, *Cervus gymnotis* Wiegmann, 1833, and *Cervus nemoralis* H. Smith, 1827, have also been used for the present species, often in combination with the generic names *Cariacus*, *Mazama* and *Dama*.

***Mazama americana americana* (Erxleben, 1777)**

Pl. 101 (skull, male, dorsal view), pl. 102 (skull, male and female)

Moschus americanus Erxleben, 1777, *Systema regni animalis*, 1: 324.

Type locality. — "Habitat in Guiania et Brasilia". Restricted by J. A. Allen (1915a: 533) to "Cayenne", French Guiana.

Synonymies. — Cabrera, 1961: 334-335; Tate, 1939: 225-227.

Vernacular names. — (E) Large Red Brocket; (N) Groot Boshert, Gewoon Boshert, Plantage Hert; (S) Prasara-dia, Pranasi-dia, Redi-dia.

Distribution. — The species *Mazama americana* (Erxleben, 1777) has a wide range, occurring from southern Mexico through Central America into South America, where it is known from Colombia, Venezuela, the Guianas, Brazil, Ecuador, Peru, Bolivia, northern Argentina and Paraguay. The nominate subspecies, *M. americana americana*, occurs in Venezuela, the Guianas and north-eastern Brazil.

Occurrence in Suriname. — The first definite record of this species from Suriname is by Pistorius (1763: 56), who distinguished three species of deer in this country. His "Land- of Bosch-Harten; deeze zyn wat rooder van Hair, maar zoo vet niet als de voorgaande; de Bokken hebben maar twee Horens zonder Takken" (land- or forest-deer, these have the fur somewhat more reddish, but are less fat than the previous species (= *Odocoileus virginianus cariacou*); the bucks have but two unbranched horns), clearly is the present species. In many later papers the three species are again confused or even more than three species have been recognized.

The Large Red Brocket is common throughout Suriname. It occurs in the coastal region in cultivated land, and in the former plantations; in the interior it is found along the edges of the savannas and in the more open forests. An indication about the abundance of the species of *Mazama* in the foot hill region of Suriname is given by the fact that during "Operation Gwamba" no less than 671 specimens of the genus were saved in the Brokopondo area (no distinction was made at that time between the two species). I have examined the following material, which originates from the interior as well as from the coastal area:

1. Nieuw Nickerie, north-western Suriname, Nickerie District, 1 specimen (no. 23852, skin and skull).
2. Lucie River, right branch of Corantijn River, 1 juvenile female (no. 16056, skin).

3. Kayserberg airstrip near Zuid River, left branch of Lucie River, about 3°N 56°30'W, 1 male (no. 18018, skull), 1 female (no. 18005, skull).
4. Near Sipaliwini airstrip, Sipaliwini River, extreme south-eastern Nickerie District near Brazilian border, 1 female (no. 23858, skull).
5. Forest near Wayombo, west of Coppename River, Saramacca District, 1 male (no. 19668, skull).
6. Coppename River near the mouth of Tibiti River, northern Saramacca District, 2 males (nos. 23851, 23853, skulls).
7. Tibiti River near Sabana, 1 male (ZMA no. 16.866, skull), 1 female (no. 21666, skin and skull).
8. Tibiti River west of Bigi Poika, 3 males (nos. 23860, 23861, 23866, skins and skulls), 1 female (no. 23859, skin and skull).
9. Tibiti River, 1 female (no. 18020, skull), 1 juvenile (no. 23863, skull).
10. Between Coesewijne River and Bigi Poika, 1 male (no. 23855, skin and skull).
11. Tottiekamp (= Toti-kampoe), Saramacca River, about 5°31'N, 1 female (ZMA no. 15519, skull), 1 skull (ZMA no. 15520).
12. Pine grove, 20 km from Saramacca bridge near Matta, about due west of Zanderij, 1 juvenile female (no. 23865, skin and skull).
13. North-west of Matta, about 5°22'N 55°20'W, 1 female (no. 19657, skin and skull).
14. Matta, Saramacca District, 1 male (no. 21962, skull), skull fragments found in Amerindian dwellings (no. 19656).
15. Santigron on Saramacca River south of Uitkijk, Suriname District, 1 male (no. 23854, skin and skull).
16. Plantation "Clevia" on west bank of Suriname River north-east of Paramaribo, 1 female (no. 21963, skull).
17. Powakka, west bank of Suriname River, opposite Jodensavanne, 1 juvenile skull (no. 23864).
18. Blakkawatra, east of Suriname River, south-east of Jodensavanne, Suriname District, 1 male (no. 23862, skin and skull).
19. Coropina Creek near Zanderij, 40 km south of Paramaribo, Para District, 1 male (no. 19664, skull).
20. Bossee Creek (Saramacca Creek) south of Zanderij, Para District, 1 male (no. 23856, skin and skull).
21. Berg en Dal, west bank of Suriname River, at 5°7'N, Brokopondo District, 1 female (no. 19660, skull).
22. Afobaka, west bank of Suriname River, just north of Brokopondo Lake, 1 male (no. 19667, skull), 1 female (no. 19663, skull).
23. Kappel Savanna near Rudi Kappel airstrip, near Tafelberg, about 3°50'N 56°5'W, Brokopondo District, 1 female (no. 19662, skull).
24. Nieuw Amsterdam, east bank of Suriname River at confluence with Commewijne River, north-east of Paramaribo, Commewijne District, 1 juvenile female (no. 20957, skin and skull).
25. Forest near Tamarin, 20 km north of Moengo, northern Marowijne District, 1 male (no. 19669, skull).
26. Suriname, without a more precise locality indication, 1 male (no. 23857, skull), 1 female (no. 19661, skull), 7 skulls (Mus. Stuttgart, Kappler collection, probably from near Albina, Marowijne River).

Description. — The present description is based on five skins: three of adult animals (two females, nos. 21666, 19657; one male, no. 23854) and two female juveniles (nos. 16056, 20957).

In the adult females the colour of the dorsal surface is rather uniformly reddish brown, being slightly darker in the middle and becoming somewhat lighter towards the sides; anteriorly, towards the head, the colour becomes more grey. In the smaller specimen (no. 19657) the head is more greyish brown, in the larger it is more blackish.

An inconspicuous median dark band extends over the full length of the face and neck. The anterior part of both upper and lower lips is white. The ears are greyish brown outside with some longish white hairs on the inner surface, while on the outer surface there is a small white spot at the base at either side of the ear opening. The hairs of the head are short except for those of the front, which are conspicuously longer and form a transverse crest. The lower surface of the head is lighter than the upper, being more whitish. The middle of the ventral surface of the body is of about the same reddish brown colour as the dorsal surface, but it is interspaced with whitish hairs. At the base of the front legs the colour of the ventral surface is paler, in the larger specimen it even is whitish. Anteriorly the ventral colour rather abruptly changes into the pale brownish grey of the throat, which is only slightly darker than the lower surface of the head. At the bases of the hind legs the ventral surface of the body is white. A pale area extends from this white region forwards and includes the area around the mammae; it narrows (gradually or rather abruptly) in a forward direction; the hairs in this lighter area are very sparse. The outer surface of the front legs has the same colour as the dorsal surface of the body, the inner surface being paler, in the larger specimen somewhat whitish, in the smaller pale brown; there is a distinct demarcation between the colours of the inner and the outer surfaces. The hind legs are rather uniformly reddish brown to greyish brown in colour, only a light whitish area extends from the base on to the inner surface of the thighs. The tail is reddish brown above, pure white below; the tip is white.

In the male specimen the dorsal colour is of a deeper reddish brown, showing more blackish hairs, but the pattern is as in the females. Also the head and the neck are more reddish brown and the black median stripe is more pronounced. The white of the lips and the ears is brighter than in the females. Also the differences in colour of the pale lower surface and the dark brown upper surface of the head are more marked. On the ventral surface of the body there is a dark greyish median stripe over the brownish belly. The greyish brown colour of the throat is rather clearly set off from the whitish colour of the under surface of the head and the reddish to blackish brown of the ventral surface of the body. Pale areas are present near the bases of the front legs and a white area near those of the hind legs. In the posterior ventral part the hairs are few and light brown. The outer surfaces of the front legs are dark reddish brown with a conspicuous sharply defined black area reaching from near the shoulder to halfway the length of the foot, becoming narrow distally. The inner surface of the front legs shows a conspicuous and sharply defined white band extending over the full length of the proximal half of the leg, narrowing distally. The outer surface of the hind legs is very dark, being almost black from about the heel down, while the white on the upper part of the inner surface is very bright and sharply set off from the brown around it. The tail is as in the two females but the colour differences are more conspicuous. All in all, the male specimen is more colourful and has the colour more pronounced and more sharply defined than in the females.

The two examined female juveniles (nos. 20957 and 16056) show, on the whole, the same colour pattern, but are slightly darker than the adult females. The most striking difference is the presence of six to eight longitudinal rows of distinct white spots, extending over the full length of the back. The hairs, especially those of the ventral surface, are relatively longer and denser than in the adults. The ventral surface of no. 16056 has in the median part a distinct greyish colour, while in no. 20957 this part is more brown.

The five skins examined very probably do not give a complete picture of the variability in colour and colour pattern of the Suriname populations of the species. It seems likely, however, that the dark reddish brown colour of the dorsal surface is characteristic of the species, as it is distinguished with the vernacular name "Redidia" (= red deer) by the inhabitants of Suriname.

Dental formula: $I \frac{0}{3}, C \frac{0}{1}, P \frac{3}{3}, M \frac{3}{3}$. The dental formula is the same as in the other Suriname deer, and the remarks made under *Odocoileus virginianus cariacou* (see p. 358) are also pertinent here. The upper canines are present in only three of the 28 examined skulls of *Mazama americana americana*: in two of these (a juvenile female, no. 20957, and an adult female, no. 21963) both are present, in the third (an adult female, no. 21666) it is only present on the right side; for further information see Brokx (1972: 360). In Table 60 the measurements of eleven skulls are provided.

The males of the two *Mazama* species occurring in Suriname are characterised by the fact that the antlers are simple and unbranched, and therefore are usually indicated as spikes. The other differences between the skulls of *Mazama* and *Odocoileus* are listed under *Odocoileus virginianus cariacou* (p. 359). In my 18 males of *Mazama americana americana* from Suriname the spikes are up to 101 mm long. In a single individual the two spikes rarely are of the same length, but usually the

TABLE 60

Skull measurements of eleven specimens of *Mazama americana americana* (Erxleben) from Suriname in the Leiden Museum.

Reg. number	21666	19657	18005	19660	18020	21963	19668	19664	18018	19667	21962
Sex	♀	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂
Greatest length	215	214	215	220	227	217	227	205	232	231	226
Condylbasal length	203	204	211	205	214	207	213	191	216	221	221
Palatal length	140	131.5	131.5	132	142	137	140	122	142	145	145
Length of nasals	57.6	64.0	60.5	68.5	68.5	58.7	66.0	61.0	66.5	73.0	66.5
Interorbital constriction	48.7	43.2	45.1	44.5	49.0	46.5	46.8	43.7	46.5	47.4	51.0
Zygomatic breadth	98.9	93.5	92.5	96.0	99.7	103.0	97.8	90.6	92.0	102.0	95.4
Breadth of braincase	62.2	59.5	63.5	63.6	66.0	62.0	62.1	61.1	63.0	66.0	64.5
Diastema	66.4	69.6	68.6	68.2	70.6	69.0	70.8	62.3	75.5	75.0	77.0
Length of upper tooth-row	62.5	60.4	60.1	63.5	63.2	62.3	65.6	61.7	69.6	65.0	62.4
Breadth of m^2	14.1	15.2	13.9	14.0	14.1	14.4	14.5	13.6	15.6	15.2	15.8
Length of mandible	165	165	175	171	180	171	175	157	170	180	177
Length of lower tooth-row	71.6	68.0	77.0	75.0	72.4	71.5	76.0	73.4	71.7	71.3	68.0
Breadth of m_2	10.0	9.6	9.6	9.8	10.2	9.4	9.9	9.4	9.3	10.3	9.5
Length of spike	-	-	-	-	-	-	76.6	73.5	85.0	49.5	81.5
Width between spikes	-	-	-	-	-	-	40.9	29.8	38.0	35.5	32.8

difference is quite small. In a male specimen (no. 23851) the left spike is abnormal in that it is very short (60 mm) and bifurcate, showing a faint resemblance to an *Odocoileus* antler; the right spike of the same animal, however, is normal in shape and 83.8 mm long.

The skulls of the Suriname *Mazama americana* are extremely similar to those of *M. gouazoubira nemorivaga*, but in the last mentioned species the skull is smaller in all its dimensions. In my material the skull measurements of the two species do not overlap (see Tables 60 and 61). So, e.g., in 27 skulls of *M. americana americana* the alveolar length of the upper tooth-row varies from 60.1 to 69.6 mm (mean: 63.4 mm) and the alveolar breadth of the second upper molar from 13.4 to 16.0 mm (mean: 14.5 mm), while in the five examined skulls of *M. gouazoubira nemorivaga* the first mentioned length varies from 49.0 to 54.9 mm and the second from 10.5 to 11.9 mm. The same is true for the alveolar length, and for the alveolar breadth of the second molar of the lower jaw (see Tables). Even the *Mazama* skull fragments that show the three premolars and the three molars or their alveoles, like those often found in or near human dwellings, can be identified with certainty as to the species on the basis of the size of these alveolar dimensions.

The external measurements of an adult female from near Matta (no. 19657) and of an adult male from Blakkawatra (no. 23862) are, respectively: head and body, 1135, 1120; tail, with tuft, 200, 160; hind foot, with hoof, 313, 318; ear, 94, 100 mm.

Remarks. — The present species is listed as game in the Game Ordinance 1954, as revised in 1970, under the names: "Boshert of pranasi-dia of prasara-dia (*Mazama americana*)". The species is hunted for food. Lenselink (1972: 40), who studied the consumption of game by the inhabitants of the Amerindian village of Alalapadoe (population: 450) in the Sipaliwini area of south-western Suriname, stated that during one month (March 1972) 7 specimens of *Mazama* (no distinction between the species was made) were shot and eaten by the Indians, while no specimens of *Odocoileus* were taken.

The Greater Red Brocket usually lives solitary, sometimes in pairs. In the daytime it hides in the dense forest or in shrubbery of the savannas; at nightfall it comes out to graze along the edges of the forests and in open land. It often causes damage to native gardens. Young have been observed in March and in July.

The brothers Penard ("De Surinamer", 22 October 1905) stated that this species prefers the woods and especially their edges near the savannas. It is found more commonly in the lowland areas than in the higher regions. In the dry season it may be found near the mangroves but usually it prefers to live among the Prasara palm (= *Euterpe oleracea* Martius) as expressed in its native name Prasara-dia, and also among bamboo.

In the literature dealing with the mammals of Suriname the name *Cervus rufus* F. Cuvier, 1817, in which *Cervus* later has been replaced by the generic names *Coassus* and *Mazama*, is often used for the present species.

Mazama gouazoubira nemorivaga (F. Cuvier, 1817)

Pl. 103 (skull; male, upper figures; female, lower figures)

Cervus nemorivagus F. Cuvier, 1817, Dictionnaire Sciences naturelles, 7: 485-486.

Type locality. — “Les mêmes parties de l’Amérique que l’espèce précédente” (= *Cervus rufus*, of which is stated “les contrées orientales de l’Amérique méridionale”). Only “la Guiane” is mentioned by name by F. Cuvier for his *Cervus nemorivagus*; his reference to Azara shows that Paraguay is also included. The type locality was restricted to “Cayenne”, French Guiana, by J. A. Allen (1915a: 531, 548-549).

Synonymies. — Cabrera, 1961: 339-340; Avila-Pirez, 1959: 550 (under *Mazama simplicicornis*).

Vernacular names. — (E) Brown Brocket, Grey Brocket; (N) Bosgeit, Klein Bos-hert; (S) Koeriakoe, Boeskrabita.

Distribution. — The species *Mazama gouazoubira* (G. Fischer, 1814) occurs in the greater part of South America: Colombia, Venezuela, the Guianas, Ecuador, Peru, Brazil, northern Argentina, Uruguay and Paraguay; it has also been reported from Yucatan (Mexico) and the Perlas Islands (Panama). The subspecies *M. gouazoubira nemorivaga* is known from south-eastern Venezuela, the Guianas and northern Brazil.

Occurrence in Suriname. — Although the very early authors dealing with the Suriname fauna (e.g., Warren, 1667: 10, 11) did not distinguish more than one species of deer, already in the middle of the 18th century the three species recognized at present were distinguished. Pistorius (1763: 56) well characterized these three species and indicated the present form as “*Kabritjes* of *Rheën*”. In much of the later literature in which Suriname deer are mentioned, there is a great confusion about the number and status of the species, and it is often difficult to decide which species are actually meant.

Mazama gouazoubira seems to be much rarer in Suriname than the previous species, *M. americana*. Most authors state that it lives farther in the interior. So, Pistorius (1763: 56) remarked: “zy onthouden zig meest op de Gebergten en Klippen” (they occur mostly in the mountains and rocky areas). Kappler (1887: 72) mentioned its habitat as “in den Wäldern”. The brothers Penard (“De Surinamer”, 25 October 1905) remarked that ‘it inhabits especially the mountainous regions, and it is rarely seen near the coast and then only during severe droughts’. Geijskes (1954: 75) also gave the habitat as hilly country.

I have seen material from the following Suriname localities:

1. Forest near Paris Jacob Creek, upper Nickerie River, 4°52'N, Nickerie District, 1 male (no. 21711, skin and skull).
2. Lower Coppename River, Saramacca District, 1 skull (no. 19665).
3. Matta, an Indian village at about 12 km west of Zanderij, Saramacca District, 5 skull fragments found in Amerindian dwellings (no. 19655).
4. Jodensavanne, east bank of Suriname River, Suriname District, 1 female (no. 19658, skull).
5. Phedra, west bank of Suriname River, between Jodensavanne and Berg en Dal, Brokoppo District, 1 male (no. 19681, skull).

6. Afobaka, west bank of Suriname River, just north of Brokopondo Lake, Brokopondo District, 1 juvenile (no. 19682, skin and skull).

7. Suriname, without a more precise locality indication, 1 adult female (no. 16789, skin and skull, specimen having lived for about 3.5 months in a zoo).

Description. — The following description is based on the only available adult skin, viz., that of a male (no. 21711).¹ The body is of a dull greyish brown colour dorsally, being somewhat darker in the middle and becoming lighter towards the sides. This colour extends rather uniformly over the full length of the animal from the neck to the tip of the tail. The hairs are here rather coarse and appressed; they are whitish in their basal half, this colour is followed by alternating dark brown and light yellowish rings, the distal part is light, sometimes with the extreme tip dark brownish. On the face the hairs are mostly very short, dark brown in the median area, paler on the cheeks; a more or less distinct crest of long coarse hairs is present on the forehead, these hairs being dark brown with the tip of those that form the actual crest paler, yellowish or reddish brown. The outer surface of the ears is dark brown, the inner surface has few and rather long whitish hairs. The upper lip is whitish, as is also the entire lower part of the head and the throat. The sides of the body are distinctly paler than the dorsal surface, but darker than the whitish ventral surface. The line of demarcation between the pale greyish brown of the sides and the white colour of the ventral surface is partly quite distinct. A pale greyish transverse band is found between the front legs, separating the white colour of the throat from that of the ventral surface of the body. The hairs of the sides have the basal two-thirds whitish, the distal third shows a pale brown and yellowish ring, the extreme tips are brownish. The hairs of the median ventral region are whitish all over. The legs have the same colour as the dorsal surface, but the whitish ventral colour extends onto the inner surface of the thighs and of the upper parts of the forelegs as a sharply defined narrow area. The short tail dorsally has the colour of the back but shows a conspicuous white tuft at the end, being also white below.

Dental formula: $I \frac{9}{1}, C \frac{0}{1}, P \frac{3}{3}, M \frac{3}{3}$. In no. 19665, sex unknown, only one small canine is present on the left side of the upper jaw, while on the right side the alveolus is almost completely filled with tissue. In Table 61 the measurements of five skulls are provided. In six skulls of male specimens the length of the spikes, including the coronet, varies from 44.0 to 80.3 mm.

External measurements of specimens from Suriname are unknown to me. Kappler (1887: 72) only noted: "Es ist ausgewachsen bei drei Fuss lang und im Widerrist zwei Fuss hoch. Seine Farbe ist graubraun, unten weisslich mit vier Zoll langem, weiss besetztem Schwanz". Further, Kappler noted that the weight of the animal is "kaum 30 Pfund", while the length of the spikes is "vier Zoll".

¹ Of specimen no. 16789, also the skin is preserved, but this is in a rather poor condition and therefore it is not further considered here; as stated before, the animal lived in a zoo for about 3.5 months.

TABLE 61

Skull measurements of five specimens of *Mazama gouazoubira nemorivaga* (F. Cuvier) from Suriname in the Leiden Museum.

Reg. number	19681	21711	19658	19665	16789
Sex	♂	♂	♀	♀	♀
Greatest length	180.0	183.0	164.0	173.5	167.0
Condylobasal length	171.0	166.0	153.3	161.0	157.6
Palatal length	112.7	105.9	98.5	103.6	101.6
Length of nasals	50.9	51.6	45.1	51.5	51.2
Interorbital constriction	38.5	43.1	35.8	40.0	37.2
Zygomatic breadth	73.1	77.0	72.5	71.2	72.3
Breadth of braincase	52.6	57.2	52.8	50.5	52.5
Diastema	52.7	55.0	48.9	52.8	48.8
Length of upper tooth-row	52.5	51.2	49.0	53.3	54.9
Breadth of m^2	11.9	11.5	10.5	11.9	10.5
Length of mandible	138.9	139.8	134.1	130.1	128.5
Length of lower tooth-row	59.0	59.1	58.1	54.2	63.3
Breadth of m_2	7.5	7.8	7.7	7.2	6.9
Length of spikes	67.7	80.3	-	-	-
Distance of spikes	28.8	40.0	-	-	-

Remarks. — In the Game Ordinance 1954, as revised in 1970, the present species is listed as game under the names: "Klein boshert of koeriakoe of boesikrabit (Mazama gouazoubira)".

In the key to the species of the Artiodactyla (see pages 346, 347), under *Odocoileus virginianus cariacou* (see p. 359) and under *Mazama americana americana* (see p. 365) the main characters by which *Mazama gouazoubira nemorivaga* differs from *Mazama americana americana* are noted.

The males of the present species usually have a distinct crest of hairs on the forehead; in the females this crest is often indistinct or lacking. The Brown Brocket, which is mainly diurnal, lives solitary or in pairs. It causes damage to native gardens, where it eats the leaves of the cassava, and to the plantations by harming the young cocoa plants.

The brothers Penard ("De Surinamer", 22 October 1905) mentioned that the animals prefer dense shrubbery and dark forest. In a general account the brothers Penard remarked that the colour of the Brown Brocket varies from pale yellowish or greyish brown to dark reddish brown; it seems likely that the observation that the species sometimes has a reddish brown colour is erroneous and was caused by a confusion with *Mazama americana*.

In the literature on the mammals of Suriname the younger synonyms *Cervus simplicicornis* Illiger, 1815, and *Cervus nemorivagus* F. Cuvier, 1817, have commonly been used for the present species. Also the incorrect name *Cervus humilis* Bennett, 1831, has been used for it.

ORDER LAGOMORPHA

As discussed on page 1, in early classifications the hares and the rabbits were included in the Rodentia as a suborder under the name Duplicidentata. This name points to the fact that in this group, behind the large incisors of the upper jaw, there is a second pair of incisors of small size (text-fig. 40a). The world-wide order Lagomorpha comprises the recent families Ochotonidae (pikas) and Leporidae (hares and rabbits). Only the second family is represented in South America, namely by the genus *Sylvilagus*, with the two species *S. floridanus* (J. A. Allen) and *S. brasiliensis* (Linnaeus); of these only the last mentioned is known to occur in Suriname.

Hall & Kelson (1959 (1): 251) discussed the question of the vernacular names of the genera of the Leporidae. These authors came to the conclusion that the name 'rabbit' must be used for the species of the genus *Sylvilagus*, because the "young are born naked, blind and helpless, in a nest especially built for them and lined with fur". This in contrast with the 'hares', of which the young are "born fully haired, with the eyes open, and able to run about a few minutes after birth. The young are born in the open, not in a nest".

FAMILY LEPORIDAE

Sylvilagus brasiliensis (Linnaeus, 1758)

Pl. 104 (animal), pl. 105 figs. a, b (tooth-rows), pl. 106 fig. 5 (hind foot), text-fig. 40 (skull) ¹
Lepus brasiliensis Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 58.

Type locality. — "Habitat in America meridionali". Restricted by Thomas (1911: 146) to "Pernambuco", Brazil.

Synonymies. — Cabrera, 1961: 345-351; Hershkovitz, 1950: 349-371, fig. 43 (map).

Vernacular names. — (E) Tapeti (Tapiti), Forest Rabbit; (N) Tapeti.

Distribution. — According to Hershkovitz (1950: 349, fig. 43) *Sylvilagus brasiliensis* (Linnaeus, 1758) has the following distribution: "From Rio Grande do Sul, Brazil, and the Argentine, Bolivian and Paraguayan Chaco, north through South and Central America into Veracruz, Mexico; not recorded from the Guianas but undoubtedly occurs there; limits of distribution in southeastern Peru and the Bolivian highlands unknown; absent from Chile. Altitudinal range, sea level to approximately 4,500 meters above". It is not known which subspecies occurs in Suriname (see further under Remarks).

Occurrence in Suriname. — I have examined only one juvenile female of the Tapeti, collected on 13 September 1965 near Kayserberg Airstrip (Zuid River, Nickerie District, south-western central Suriname). This specimen, of which the combined length of head and body is 112 mm, is too young for preparing the skin or taking out the skull; it is preserved in spirit in the Leiden Museum under no. 18229.

¹ As no adult skull of *Sylvilagus brasiliensis* is available to me, pl. 105 figs. a, b and text-fig. 40 show that of the closely related *S. floridanus nigronuchalis*.

In December 1964 a hare-like or rabbit-like animal was shot near Kabalebo airstrip (Kabalebo River, right branch of the Corantijn River, western Suriname). Unfortunately this specimen was eaten and the remains thrown away. There is, however, good reason to presume that this animal also was a Tapeti, because it was certainly not a *Dasyprocta* (Konkoni) or a *Myoprocta* (Maboela) as Dr. P. A. Florschütz, who saw the specimen, kindly informed me.

In August 1973 Dr. D. C. Geijskes, when visiting the Kabalebo airstrip, at my request made special efforts to obtain material of the Tapeti there, but did not succeed. He was told that the species indeed was known to occur in the area and he even collected droppings said to be of the Tapeti. A sample of these droppings is now in the collection of the Leiden Museum (no. 19677), and in both Dr. Geijskes's and my own view they can be hardly anything but those of *Sylvilagus brasiliensis*. The droppings, which have a pale yellowish brown colour, are very compact and consist mostly of short pieces of grass. They are somewhat compressed with a circular outline, the greatest diameter being 10 to 12.5 mm, the height about 8 mm. They were found grouped together like those of the European rabbit.

Dr. Geijskes is of the opinion that in Suriname *Sylvilagus brasiliensis* probably is restricted to the upper Corantijn basin, an area that is almost entirely uninhabited. The species is so conspicuous that it certainly would have been noted, if it did occur in the better known parts of the country.

Description. — The most striking characters of the Tapeti, when compared with the other 'rabbit- or hare-like' Suriname mammals as *Dasyprocta leporina* (pl. 129) and *Myoprocta exilis* (pl. 133), are (1) the relatively long ears, (2) the minute, strongly furred tail, (3) the incomplete white circumorbital ring, (4) the white throat which forms an incomplete collar, and (5) the densely furred hindfeet with four toes (pl. 106 fig. 5). The dorsal surface of the body is mottled with black and ochreous-yellow; the ventral surface is white. Since no adult specimens from Suriname are at my disposal I prefer to confine myself to this short description of the external characters.

Dental formula: $I \frac{2}{1}$, $C \frac{0}{0}$, $P \frac{2}{2}$, $M \frac{3}{3}$. The first upper incisors are large and rather deeply grooved on the anterior surface; the second upper incisors are small, more or less conical, without a cutting edge and placed immediately behind the first incisors (text-fig. 40a). The lower incisors are chisel-like, without a groove on the anterior surface. There are no canines; a large diastema separates the incisors from the first premolars both in upper and lower jaws. The enamel of the premolars and molars is infolded, dividing each tooth into two or more lobes; in the lower molars the fold is so deep that it divides the tooth into two halves, this being especially distinct in the last molar (pl. 105 figs. a, b). The condylobasal length is about 62 mm, the zygomatic breadth about 34 mm. The nasals are relatively long, about 27 mm in length, and broad. The alveolar length of the upper cheek-teeth is about 14 mm. The mandible is quite different from that of all other Suriname rodent-like mammals by the strongly developed ramus ascendens (text-fig. 40c) in comparison with the rest of the mandible.

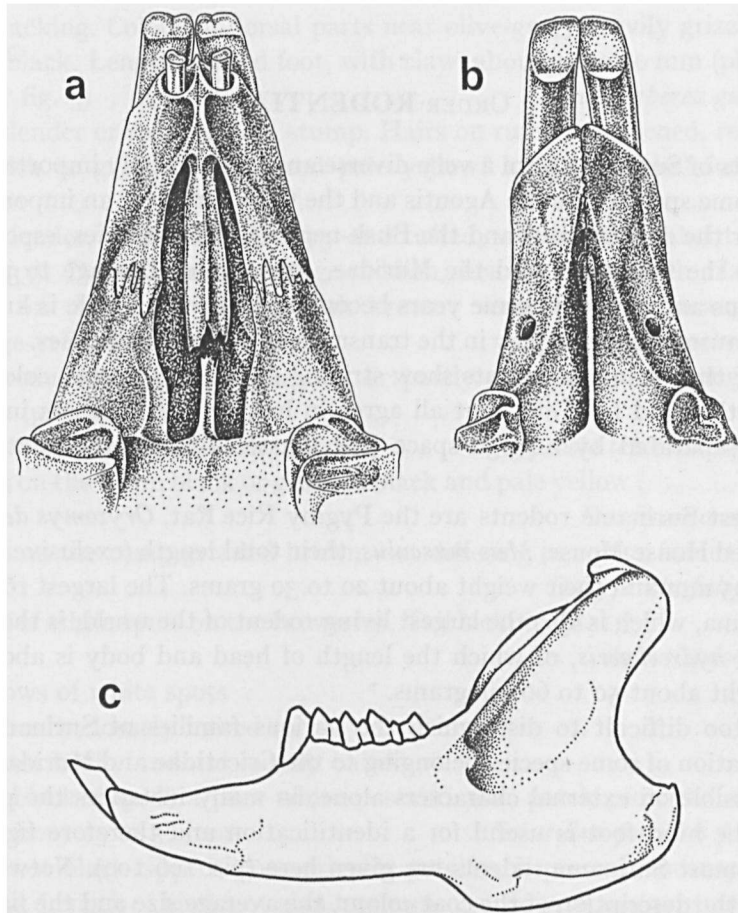


Fig. 40. *Sylvilagus floridanus nigronuchalis* (Hartert), male from Curaçao, anterior part of skull. a, upper jaw in ventral view; b, lower jaw in dorsal view; c, right half of mandible, inner view.

The only available Suriname specimen is young and has a total length of 120 mm (viz., head and body plus tail). The size of the adult Suriname Tapeti is not known, but according to the measurements given by Hershkovitz (1950) for the various subspecies of the South American *Sylvilagus brasiliensis* the total length of the species varies between about 310 and 390 mm.

Remarks. — The Kayserberg Airstrip specimen of *Sylvilagus brasiliensis* is the first of this species to be recorded from Suriname. As far as I know the species has not been recorded from the other Guianas either. The known localities of the species in Brazil nearest to Suriname are (1) the mouth of the Rio Negro, Amazonas, and (2) Itaituba, Rio Tapajóz, Pará. According to Hershkovitz (1950: 375, fig. 43) the subspecific status of these Amazonian specimens is not certain; he suggested that the Rio Negro individuals may belong to *Sylvilagus brasiliensis defilippii* (Cornalia, 1850) and those from Itaituba to *S. brasiliensis paraguensis* Thomas, 1901. More material of the Suriname Tapeti and data on its occurrence are badly needed to determine its systematic status and its exact range in Suriname.

ORDER RODENTIA

The rodents of Suriname form a very diverse and economically important group of mammals. Some species, like the Agoutis and the Capybaras, are an important source of protein for the Amerindians and the Bush-negroes. Other species, especially those belonging to the Cricetidae and the Muridae, cause much damage to plantations, native gardens and stores, in some years becoming real pests. Little is known as yet of the role that some rodents play in the transmission of human diseases.

Externally the Suriname rodents show striking differences in size, colour pattern, structure of the hind feet, etc., but all agree in having large incisors in upper and lower jaws, separated by a large space (the diastema) from the next tooth (see text-fig. 3).

The smallest Suriname rodents are the Pygmy Rice Rat, *Oryzomys delicatus*, and the introduced House Mouse, *Mus musculus*, their total length (exclusive of the tail) being 80 to 95 mm and their weight about 20 to 30 grams. The largest rodent of the Suriname fauna, which is also the largest living rodent of the world, is the Capybara, *Hydrochaeris hydrochaeris*, of which the length of head and body is about 1 metre and the weight about 50 to 60 kilograms.

It is not too difficult to distinguish the various families of Suriname rodents. The identification of some species belonging to the Cricetidae and Muridae, however, is hardly possible on external characters alone; in many instances the pattern and the size of the hind foot is useful for a identification and therefore figures of the hind foot of most Suriname rodents are given here (pls. 106-109). Notwithstanding the fact that the description of the coat colour, the average size and the figures of the animals as given here, in most instances will lead to a correct identification, it should be kept in mind that the examination of the skull is often essential to arrive at an identification that is beyond all doubt.

Key to the Suriname Rodentia

The following key may serve as a means for a preliminary identification of the rodents dealt with in the present work. It should be stressed that the characters and the data on measurements used in the key are based solely on adult specimens.

- 1a. Hind foot with three toes (pl. 106 upper figs. 1-4) 2
- b. Hind foot with four or five toes (pl. 106 lower figs. 1-3; pls. 107-109) 6
- 2a. Toes of hind foot webbed, nails short (pl. 106 upper fig. 4). Body sparsely clothed with coarse hairs; length of head and body up to 1 metre. Tail extremely short or lacking *Hydrochaeris hydrochaeris hydrochaeris*, p. 451
- b. Toes of hind foot with long nails (pl. 106 upper figs. 1-3). Length of head and body less than 50 centimetres 3

- 3a. Tail lacking. Colour of dorsal parts near olive-grey, heavily grizzled and lined with black. Length of hind foot, with claw, about 45 to 50 mm (pl. 126, pl. 106 upper fig. 3) *Cavia aperea guianae*, p. 449
- b. Tail slender or reduced to a stump. Hairs on rump lengthened, reddish brown, blackish or grizzled black and pale yellow. Length of hind foot more than 75 mm 4
- 4a. Tail slender, white-tipped, hairy and tufted, varying from about 50 to 80 mm (pl. 133). Dorsal surface orange-reddish, heavily lined with black, the long hairs on the rump are blackish brown; ventral surface orange-reddish or orange-yellowish *Myoprocta exilis*, p. 468
- b. Tail reduced to a stump, wholly or partly covered by the long hairs of the rump (pl. 129) 5
- 5a. Hairs on the rump reddish brown *Dasyprocta leporina leporina*, p. 457
- b. Hairs on the rump black or grizzled black and pale yellow
Dasyprocta cristata, p. 464
- c. Hairs on the rump grizzled brown, not differing in colour from the rest of the back *Dasyprocta fuliginosa*, p. 466
- 6a. Rows of white spots on the brown fur. Tail lacking (pl. 135)
Agouti paca paca, p. 472
- b. No rows of white spots 7
- 7a. Tail bushy, loosely haired (pl. 113) 8
- b. Tail not bushy and not loosely haired 9
- 8a. Ears black-tipped; a pure white postauricular patch present. Length of hind foot about 25 to 30 mm *Sciurillus pusillus pusillus*, p. 380
- b. Ears not black-tipped; postauricular patches, if present, inconspicuous, buffy yellow. Length of hind foot about 45 mm *Sciurus aestuans aestuans*, p. 383
- 9a. Hind foot with four toes (pl. 109 figs. 4, 5) 10
- b. Hind foot with five toes (pl. 106 lower figs. 1-3) 11
- 10a. Upper parts covered with thick spines or quills, not hidden by fur (pl. 137). . .
Coendou prehensilis prehensilis, p. 478
- b. Upper parts with spines hidden by long hairs (pl. 138)
Sphiggurus insidiosus, p. 484
- 11a. Fur spiny or intermixed with spines 12
- b. Fur not spiny, but soft, bristly or coarse 17
- 12a. A broad white streak of about 5 to 15 mm width, extends from the muzzle back to between the ears (pl. 125) *Echimys chrysurus chrysurus*, p. 440
- b. No white streaks from the muzzle to between the ears. The fur consists of (soft) hairs more or less intermixed with spines of the same length 13
- 13a. Animal small, length of hind foot about 18 mm *Neacomys guianae*, p. 406
- b. Animal larger, length of hind foot more than 25 mm 14
- 14a. Length of hind foot more than 35 mm 15
- b. Length of hind foot about 29 mm. Ventral surface of body creamy white, sharply

- set off from the brownish sides and dorsal surface. Spines of the dorsal surface ending in a firm sharp point, so that the fur feels spiny *Mesomys stimulax*, p. 438
- 15a. Ventral surface of body pure white or light creamy, sharply set off from the brownish sides and dorsal surface. Spines of the dorsal surface ending in a long soft point, so that the fur feels bristly rather than spiny 16
- b. Ventral surface whitish grey or light yellowish grey, not sharply set off from the sides, which are more pronouncedly yellowish grey; the dorsal parts are yellowish brown heavily lined with black. Spines of the dorsal surface with firm, though flexible, points, so that the fur feels spiny. Length of hind foot about 40 mm (38-42.5 mm) *Makalata armata armata*, p. 445
- 16a. Length of upper row of cheek-teeth 8.3 to 9.1 mm. Length of hind foot about 50 mm (44-53 mm) (pl. 122 upper figs.)
- Proechimys guyannensis guyannensis*, p. 429
- b. Length of upper row of cheek-teeth 7.2 to 7.7 mm. Length of hind foot 38 to 47 mm (p. 122 lower figs.) *Proechimys warreni*, p. 436
- 17a. Incisors grooved (text-fig. 42d) *Sigmodon alstoni savannarum*, p. 427
- b. Incisors not grooved (text-fig. 42c) 18
- 18a. Hind foot longer than 40 mm 19
- b. Hind foot shorter than 40 mm 21
- 19a. Ears densely haired, practically hidden in the fur (pl. C). Length of ears about 15 to 18 mm *Holochilus brasiliensis nanus*, p. 419
- b. Ears not densely haired, nor hidden in the fur. Length of ears more than 20 mm 20
- 20a. Hind foot distinctly webbed and narrow (pl. 107 fig. 3)
- Nectomys squamipes melanius*, p. 408
- b. Hind foot not webbed, broad (pl. 106 lower fig. 1)
- Rattus norvegicus*, p. 501
- 21a. Hind foot longer than 30 mm 22
- b. Hind foot shorter than 30 mm 23
- 22a. Upper parts rich reddish brown. Hind foot narrow, digits relatively long (pl. 108 fig. 3) *Oryzomys macconnelli macconnelli*, p. 392
- b. Upper parts bluish black or greyish brown. Hind foot rather broad, digits relatively short (pl. 106 lower fig. 2) *Rattus rattus*, p. 493
- 23a. Length of hind foot varying from 15 to 20 mm, usually 17 or 18 mm
- Mus musculus*, p. 507
- b. Length of hind foot more than 20 mm and less than 30 mm 24
- 24a. Tail short, about 60 percent of the length of head and body (pl. B left figure) . .
- Zygodontomys brevicauda microtinus*, p. 415
- b. Tail equal in length to head and body combined, sometimes either slightly longer or slightly shorter 25
- 25a. Ventral surface pure white, sharply set off from the darker sides, the hairs there being uniformly white all over 26

- b. Ventral surface not pure white, the base of the hairs being greyish or slaty 27
- 26a. Length of head and body varying from 93 to 118 mm, tail from 89 to 125 mm, hind foot from 20 to 24 mm and ear from 12 to 14 mm
Oryzomys bicolor bicolor, p. 399
- b. Length of head and body 133 mm, tail 140 mm, hind foot 26 mm, ear 16 mm.
Rhipidomys mastacalis nitela, p. 412
- 27a. Ventral parts distinctly greyish. Length of hind foot about 25 to 28 mm
Oryzomys capito velutinus, p. 388
- b. Ventral parts dirty white, or greyish washed with buff, or pinkish buff, or buffy 28
- 28a. Length of hind foot varying from 20 to 22.5 mm, usually 21 to 22 mm. Length of head and body from 74 to 93 mm; length of tail from 85 to 103 mm.
Oryzomys delicatus, p. 395
- b. Length of head and body varying from 93 to 137 mm, that of the tail from 89 to 137 mm 29
- 29a. Length of hind foot varying from 20 to 24 mm, that of the ear from 12 to 14 mm. Pads of the hind foot large and closely joined (pl. 108 fig. 4)
Oryzomys bicolor bicolor, p. 399
- b. Length of hind foot varying from 24 to 29 mm, that of the ear from 15 to 20 mm. Pads of the hind foot smaller and more widely spaced than in the preceding species (pl. 108 fig. 2) *Oryzomys concolor speciosus*, p. 403

Key to the Suriname Rodentia based on skull characters

The characters used in the following key are those of specimens of which the last (= third) molars are fully developed. In text-fig. 41 a diagrammatic outline of the skull of a rodent (*Oryzomys* spec.) is given, with the indication of the landmarks and distances commonly used in measuring a rodent skull. Only a few of these measurements are used in the present key. With the word "mean" the arithmetic mean is meant. In most cases the number of Suriname specimens examined by me is too small to give a reliable range of variation for the Suriname populations of the species in question; therefore no standard deviation (σ), as used in statistical studies, has been given.

- 1a. Number of cheek-teeth 5. Alveolar length of upper cheek-teeth rows about 4.5 mm (pl. 105 figs. c, d, pl. 114 lower figs.)
Sciurillus pusillus pusillus, p. 380
- b. Number of cheek-teeth 3 or 4. Alveolar length of upper cheek-teeth rows varying from about 2.5 to 85 mm 2
- 2a. Number of cheek-teeth 4 (families Sciuridae, Echimyidae, Caviidae, Hydrochaeridae, Dasyproctidae, Agoutidae and Erithizontidae) 3
- b. Number of cheek-teeth 3 (families Cricetidae and Muridae) 15

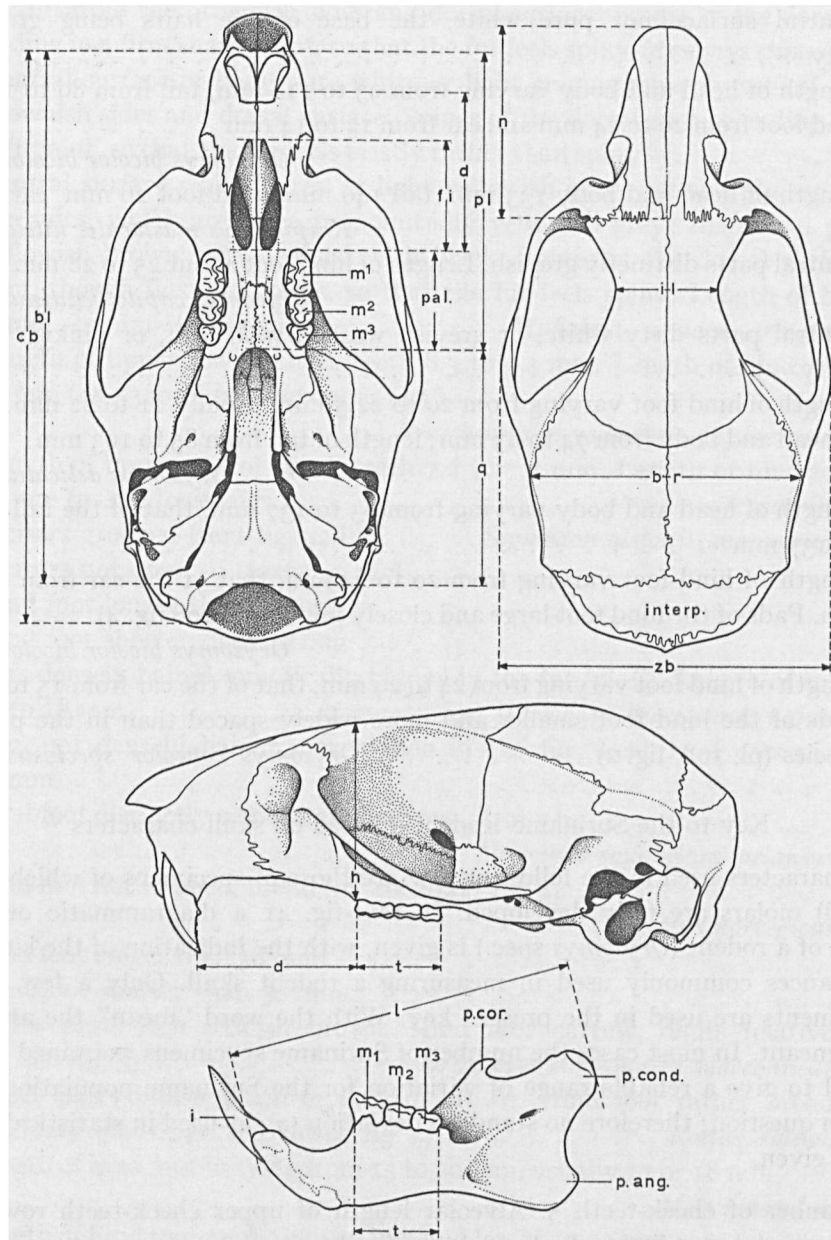


Fig. 41. Skull of a rodent (*Oryzomys* spec.). Upper figure, left: ventral view; upper figure, right: dorsal view. Middle figure, lateral view of left side of skull. Lower figure, inner side of right lower jaw. — bl, basal length; br, breadth of braincase; cb, condylobasal length; d, diastema; fi, foramen incisivum; h, height of skull; i, incisor; il, interorbital constriction; interp., interparietal; l, length of mandible; m, molars; n, length of nasals; p. ang., processus angularis; p. cond., processus condylicus (= processus articularis); p. cor., processus coronioideus (= processus muscularis); pal., palatine; pl, palatal length; q, posterior part of basal length; t, length of molars combined (= alveolar length of molars); zb, zygomatic breadth.

- 3a. The two rows of upper cheek-teeth strongly converging anteriorly (text-fig. 47, pl. 127) 4
- b. The two rows of upper cheek-teeth not strongly converging anteriorly, but more or less parallel 5
- 4a. Length of upper cheek-teeth rows less than 20 mm. The four cheek-teeth of about the same size (pl. 127) *Cavia aperea guianae*, p. 449
- b. Length of upper cheek-teeth rows more than 50 mm, up to about 85 mm. The last (= third) molar greatly enlarged (text-fig. 47)
Hydrochaeris hydrochaeris hydrochaeris, p. 451
- 5a. Jugal and part of maxillary strongly expanded, forming a thick, rugose, bony plate (pl. 136). The alveolar length of rows of cheek-teeth varying from 26.8 to 33.0 mm (mean of 12 specimens: 28.8 mm)
Agouti paca paca, p. 472
- b. Zygomatic arch normally developed, not forming a strong, rugose, bony plate (e.g., pl. 114) 6
- 6a. Alveolar length of upper cheek-teeth less than 10 mm 7
- b. Alveolar length of upper cheek-teeth more than 10 mm 10
- 7a. Posterior end of palatine practically straight, not V-shaped, ending behind level of posterior margin of last molars. Upper cheek-teeth rows slightly curved outwards (pl. 114 upper figs.). Alveolar length of upper tooth-rows varying from 6.8 to 7.7 mm (mean of 17 specimens: 7.2 mm).
Sciurus aestuans aestuans, p. 383
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FAMILY SCIURIDAE

Sciurillus pusillus pusillus (E. Geoffroy, 1803)

Text-fig. 42a (mandible), pl. 105 figs. c, d (tooth-rows), pl. 114 lower figures (skull)

Sciurus pusillus E. Geoffroy, 1803, Catalogue Mammifères Muséum National Hist. nat. Paris: 177-178.

Type locality. — "Cayenne", French Guiana.

Synonymies. — Cabrera, 1961: 354; Anthony & Tate, 1935.

Vernacular names. — (E) South American Pygmy Squirrel.

Distribution. — The species *Sciurillus pusillus* (E. Geoffroy, 1803) occurs in the Amazon basin of north-eastern Peru and Brazil (Tapajoz and Madeira areas), and in the Guianas. A map showing the known distribution of the species has been provided by Anthony & Tate (1935: 6, fig. 6). The nominate subspecies, *S. pusillus pusillus*, originally described from French Guiana, is now known from French Guiana and Suriname.

Occurrence in Suriname. — I have examined only one specimen of the present species, an adult female (no. 17221, skin and skull) obtained by A. van Aerde in the Emmaketen (Emma Range), in central Suriname, at an altitude of 350 metres between 17 July and 15 October 1959 during a botanical expedition to that area (see Jonker & Wensink, 1960). The specimen was captured near the base camp of the expedition. In the literature dealt with I found no Suriname records of *Sciurillus*. Actually, the present is the fifth specimen of the nominate subspecies to become known, all the others were reported from French Guiana. Fermin (1769 (2): 121-122) stated that two species of squirrels occur in Suriname. As pointed out on p. 384, Fermin's description is insufficient to decide whether his second species is *Sciurillus pusillus* or just a juvenile *Sciurus aestuans*. If it is *Sciurillus pusillus*, this description would be the first published account of the species.

Description. — The following description of this small squirrel is based on the specimen from the Emmaketen. The fur of the body is soft, dense and short; the hairs of the bushy tail are about fifteen mm in length. The coat colour of the dorsal

surface is dark grey finely grizzled with light yellowish white, the bases of the hairs are dark greyish, the tips are whitish. The head anterior to the ears shows a decidedly reddish brown shade. The tip of the snout is pure reddish brown. The ears are black-tipped, while large, pure white postauricular patches are present. Around the eyes there is a narrow yellowish white ring. Without a line of demarcation the colour of the dorsal surface passes into the more rusty brown colour of the ventral surface. The dorsal surface of the tail is of a somewhat lighter colour than the back, owing to the fact that the hairs have longer yellowish white tips. The ventral surface of the tail is of the same colour as the dorsal, with the exception of the extreme base, which is dark reddish brown. The hands, feet and legs show the same colour as the body, above dark grey, beneath tinged with reddish brown. The hind foot has five toes.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{2}{1}$, $M \frac{3}{3}$. The anterior upper premolar is very small, being about half as long and half as wide as the second premolar (pl. 105 fig.c). The skull is very wide in relation to its length (pl. 114 lower figs.), while also the interorbital constriction is relatively wide. In the lower jaw both the processus coronoideus and the processus angularis are short and rounded.

The following external measurements were taken of the specimen after it had been preserved in spirit for several years: head and body, 97; tail, without pencil of hairs at the end, 114; tail, including the pencil of hairs, 139; hind foot, with nails,

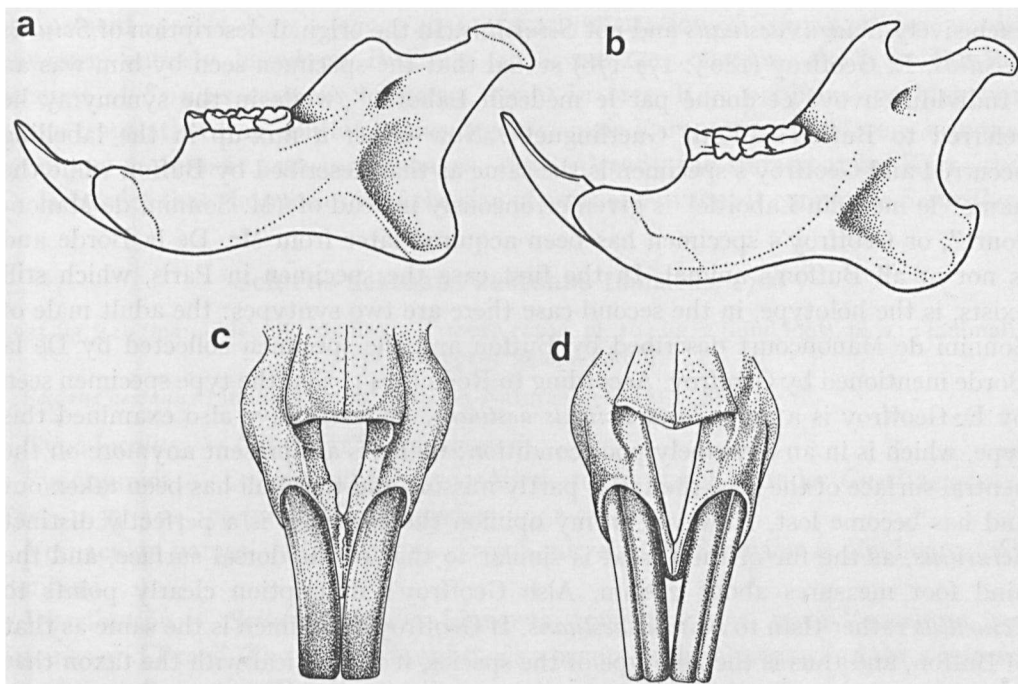


Fig. 42. a, b, right half of mandible, inner view; c, d, front view of upper incisors. a, *Sciurillus pusillus pusillus* (E. Geoffroy); b, *Sciurus aestuans aestuans* L.; c, *Holochilus brasiliensis nanus* Thomas; d, *Sigmodon alstoni savannarum* (Thomas).

27 mm. — Skull: greatest length, 28.1; condylobasal length, 24.8; basal length, 22.1; palatal length, 11.4; palatilar length, 10.6; length of foramen incisivum, 1.9; diastema, 5.5; length of nasals (outer edge), 8.0; greatest breadth of nasals, 4.7; zygomatic breadth, 19.6; interorbital constriction, 11.6; breadth of braincase, 15.0; alveolar length of upper cheek-teeth, 4.6; alveolar length of upper molars combined, 3.2; length of mandible, 16.8; alveolar length of lower cheek-teeth combined, 4.3 mm.

Remarks. — I consider the Suriname specimen to belong to the nominate subspecies because of its black-tipped ears and by the fact that the head anterior to the ears shows a decidedly reddish shade.

The first time that the present species was extensively described and figured, was by Buffon (1789: 261, pl. 46) under the vernacular name "petit guerlinguet". Buffon received his material, an adult male from French Guiana, from Mr. C.N.S. Sonnini de Manoncourt. Buffon's description and figure are clear and leave no doubt as to the identity of his specimen with the present species. In his (1789) discussion of "le petit guerlinguet" and "le grand guerlinguet" (= *Sciurus aestuans* Linnaeus, 1766, also described and figured by Buffon, 1789: 261, pl. 45) he mentioned that a certain Mr. de la Borde, physician in Guyane, had already informed him of the existence of squirrels in Guyane; this information was first published by Buffon in 1776 (pp. 146-147). It is evident that Mr. de la Borde did not send any material to Buffon, but only communicated to him his observations; the latter concerned exclusively *Sciurus aestuans* and not *Sciurillus*. In the original description of *Sciurus pusillus*, E. Geoffroy (1803: 177-178) stated that the specimen seen by him was an "Individu envoyé et donné par le médecin Laborde", while in the synonymy he referred to Buffon's "Petit Guerlinguet". Now either a mix-up in the labelling occurred and Geoffroy's specimen is the same as that described by Buffon while the name "le médecin Laborde" is given erroneously instead of "M. Sonnini de Manoncourt", or Geoffroy's specimen has been acquired later from Mr. De la Borde and is not at all Buffon's animal. In the first case the specimen in Paris, which still exists, is the holotype, in the second case there are two syntypes: the adult male of Sonnini de Manoncourt described by Buffon and the specimen collected by De la Borde mentioned by Geoffroy. According to Rode (1943: 385) the type specimen seen by E. Geoffroy is a juvenile of *Sciurus aestuans*. I myself have also examined this type, which is in an extremely poor condition: no hairs are present anymore on the ventral surface of the legs, the tail is partly missing and the skull has been taken out and has become lost. However, in my opinion the specimen is a perfectly distinct *Sciurillus*, as the fur of the throat is similar to that of the dorsal surface, and the hind foot measures about 28 mm. Also Geoffroy's description clearly points to *Sciurillus* rather than to *Sciurus aestuans*. If Geoffroy's specimen is the same as that of Buffon, and thus is the holotype of the species, it is identical with the taxon that is commonly called *Sciurillus pusillus*. If, however, two specimens are involved, then I am still convinced that they both belong to the same species. Because there does not exist complete certainty concerning the identity of Geoffroy's specimen

whilst no lectotype has ever been chosen for the species, I indicate the specimen described and figured by Buffon (1789: 261, pl. 46) as the lectotype of *Sciurus pusillus* E. Geoffroy, 1803. In this way any doubt concerning the validity of the specific name *pusillus* for the present species is removed. Some authors reject, in my opinion incorrectly, E. Geoffroy's (1803) publication, and they regard the name *Sciurus pusillus* E. Geoffroy, 1803, as unavailable, using instead the name *Sciurus pusillus* Desmarest, 1817. In this connection the lectotype of *Sciurus pusillus* E. Geoffroy, 1803, is here also selected as the lectotype of *Sciurus pusillus* Desmarest (1817a: 109-110).

Anthony & Tate (1935: 10) remarked that females of *Sciurillus pusillus glaucinus* Thomas, 1914, from Tapajoz, with embryos and lactating mammae, were obtained in June.

The history of the generic names used for the present species has been extensively dealt with by Anthony & Tate (1935: 1-6). The genus *Sciurillus* differs in so many respects from the other genera of Sciurinae that it occupies an isolated position within the subfamily Sciurinae, as distinctly shown in Moore's (1959) studies. Moore's (1959: 191; 1961: 14) hypothesis as to how the genus has reached South America is built up of so many far-fetched and unrealistic speculations that it is not further considered here.

Herskovitz (1969: 21; 1972: 353) used the name *Sciurillus guajanensis* (Kerr) for the present species. Kerr's (1792: 265) original description of *Sciurus guajanensis* is, however, entirely based on Buffon's (1776: 146-147) citation of De la Borde's account of *Sciurus aestuans* Linnaeus, 1766. In fact, Kerr published nothing but a free translation from Buffon. *Sciurus guajanensis* Kerr, 1792, therefore is a junior synonym of *Sciurus aestuans* Linnaeus, 1766. Already the statement by Kerr (and De la Borde) that the species is of the size of a rat shows that it cannot be *Sciurillus*.

***Sciurus aestuans aestuans* Linnaeus, 1766**

Text-fig. 42b (mandible), pl. 105 figs. e, f (tooth-rows), pl. 107 fig. 2 (hind foot), pl. 113 (animal), pl. 114 upper figures (skull)

Sciurus aestuans Linnaeus, 1766, Systema Naturae, (ed. 12) 1: 88.

Type locality. — "Habitat in Surinamo".

Synonymies. — Cabrera, 1961: 359; Allen, 1915: 254-260 (under *Guerlinguetus*); Tate, 1939: 174-176 (under *Guerlinguetus*).

Vernacular names. — (E) Guiana Tree Squirrel; (N) Surinaamse Eekhoorn; (S) Bonboni.

Distribution. — *Sciurus aestuans* Linnaeus, 1766, is known from Venezuela, the Guianas and Brazil. The nominate subspecies occurs in the Guianas and the adjacent areas of north-eastern Brazil.

Occurrence in Suriname. — The Guiana Tree Squirrel has a wide distribution in Suriname, occurring in forested areas from the coastal plain to the Brazilian border.

Pistorius (1763: 61) is one of the first authors who mentioned the occurrence of squirrels in Suriname. The information by Pistorius is, however, very brief (free translation from the Dutch): 'Squirrels are present in this Colony; they have a large, thick tail; their hairs are woolly and curled around the entire body; these animals are the most swift of all'. Fermin (1765: 14) stated: "Écureuil, en Latin *Sciurus Niger*, en Hollandois *Eickhoorn*. Je ne connois qu'une seule espece d'Écureuil à Surinam. Il est noir, sa queue est toute remplie de longs poils, & lui sert à lui donner une espece d'ombrage. Il est beaucoup plus petit que ceux d'Europe". However, four years later Fermin (1769 (2): 121-122) mentioned two species of squirrels from Suriname: "L'Écureuil est un joli petit animal, qui n'est qu'à demi-sauvage, & qu'on apprivoise facilement. Il n'est ni carnassier, ni nuisible, quoiqu'il fasse, quelquefois, la chasse aux oiseaux. Il se nourrit, ordinairement, des fruits qu'il trouve, toute l'année, sur les arbres. Il est fort propre, leste, vif, très-alerte à sauter d'un arbre à l'autre; il a les yeux pleins de feu, la physionomie fine, le corps nerveux, les membres très-dispos; & sa jolie figure est encore rehaussée par une belle queue, en forme de panache, qu'il releve, jusques par-dessus sa tête, & sous laquelle il se met à l'ombre. Il y en a de deux Especies à *Surinam*: le premier, qui est plus petit que l'*Écureuil* d'Europe, est d'un gris obscur, dans la partie supérieure du corps, & d'un gris blanc, dans la partie inférieure. Les poils de sa queue sont courts, & un peu roussâtres. Le second est presque de la couleur du café brûlé, & assez garni de poils. Il est d'un tiers plus petit que le précédent; & sa queue est assez courte". Whether or not Fermin's second Suriname squirrel species is *Sciurillus pusillus* (see p. 380) is difficult to decide. His indication of its size as about two-thirds of that of *Sciurus aestuans* would be about right, but his statement that the tail is rather short does not fit at all. It is possible that Fermin's second species was only a juvenile of *Sciurus aestuans*.

The information about Suriname squirrels by Hartsinck (1770 (1): 95) runs as follows (free translation from the Dutch): 'The squirrels are much smaller than those in Europe, being entirely black or rufous, and have the tail with long hairs, by which the animals protect themselves from sunshine'.

Stedman (1796 (2): 16-17) observed squirrels along the Tempati Creek, right branch of the Kleine Commewijne River, and gave the following account: "During the first day's march we met some very pretty squirrels, which are of several kinds in this country. Those that we saw were brown, with the belly white, the tail not so bushy; nor were they, on the whole, so large as those of Europe. There are also white squirrels in this country with red eyes, and flying squirrels. These, it is well known, have no wings, but a membrane between the fore and hinder leg, being a part of their skin, which, when they leap, expands like the wing of a bat, and by this, like a parachute, they rest upon the air, and in their flights are carried over a considerable distance". Evidently Stedman observed *Sciurus aestuans*. His account of white and flying squirrels is (as can be surmised from his own statement) based on hearsay evidence, as they did not belong among "those that we saw". Albino *Sciurus aestuans*

might occur in Suriname, but apart from Stedman's record no such information is known to me. The occurrence of flying squirrels in Suriname is highly unlikely as so far these animals have not been found in South America; of the two species of American flying squirrels, *Glaucomys volans* (Linnaeus, 1758) occurs in North and Central America only as far south as Honduras, while the second, *Glaucomys sabrinus* (Shaw, 1801), is only known from Canada and the northern U.S.A. (Hall & Kelson, 1959 (1): 405-411, maps 259, 260).

In his list of specimens sent to the Stuttgart Museum, Kappler (1881: 164) also mentioned *Sciurus aestuans*. More information was given by Kappler in his 1887 book (on page 76): "Von Eichhörnchen kenne ich nur eine Art, *Sciurus aestuans*, bei den Karaiben Krengren genannt. Es hat ganz die Form des europäischen, ist aber viel kleiner, olivenbraun mit gelbem Unterleib, und hat keine Ohrpinsel. Den buschigen Schwanz legt es beim Fressen auf den Rücken. Ich hatte im Jahre 1840 auf dem Militärposten Prins Willem Frederik am Maroni ein zahmes Eichhörnchen. Es lief ganz frei herum, schlief in meinem Bette, das es aber schon mit Tagesanbruch verliess, fehlte aber beim Kaffe nie, um seine Milch zu bekommen. Eines Tages fand ich es wohl eine halbe Stunde weit vom Posten entfernt am See-strande, wo es den Sandkrabben [*Ocypode quadrata* (Fabricius); see Holthuis, 1959: 259-260] nachjagte, aber sogleich an mir hinaufsprang, als es mich erblickte. Es nagte alles durch, wenn man es einschloss".

The brothers Penard ("De Surinamer", 9 April 1905) mentioned that squirrels are very numerous in the coastal area, but because of their shyness and their preference for dense foliage are rarely observed. Their diet is almost entirely vegetarian, consisting of nuts, seeds, etc., but also insects and young birds are eaten. Furthermore the brothers Penard remarked that the squirrels in Suriname are exclusively diurnal, and sleep at night between thick branches of high trees with a dense foliage. Sanderson (1949: 774) mentioned specimens from the savannas around Zanderij, noting that "squirrels were not seen or obtained from the maritime coastal plain".

In many other publications on Suriname *Sciurus aestuans* has been mentioned, but they do not give more information than that cited here.

I myself have examined the following material:

1. Avanavero Falls in the Kabalebo River, eastern tributary of Corantijn River, Nickerie District, 1 male (no. 23889, skin and skull).
2. Blanche Marie Falls in upper Nickerie River at about 4°40'N, 1 female (no. 22550, skin and skull).
3. Lucie River, eastern tributary of Corantijn River, at about 3°12'-3°30'N, 1 male (no. 17846, skull), 1 female (no. 18118, skin and skull).
4. Near Sipaliwini airstrip, extreme south-eastern Nickerie District, near the Brazilian border, 2 females (nos. 18125, 18284, skins and skulls).
5. Near Raleigh Falls in upper Coppename River, about 4°40'N, Saramacca District, 1 male (no. 18126, skin and skull).
6. Northern slope of Wilhelmina Range, southern Saramacca District, 1 male (no. 17845, skin and skull).
7. Near Paramaribo, Suriname District, 1 female (no. 18127, skin and skull).

8. Near Brokopondo, west bank of Suriname River north of Brokopondo Lake, Brokopondo District, 1 male (no. 23872, skin and skull), 1 female (no. 8691, skin and skull).

9. Lombé on Suriname River, locality now submerged by the Brokopondo Lake, Brokopondo District, 1 male (no. 18124, skin and skull).

10. Commetewane Creek, southern tributary of lower Commewijne River, about 54°52'W, Commewijne District, 1 female (no. 18122, skin and skull).

11. Morico Creek, about 30 km east of Paramaribo, Commewijne District, 1 male (no. 18123, skin and skull).

12. Near confluence of Peninika and upper Commewijne Rivers, 2 males (nos. 18128, 18129, skins and skulls).

13. Mapane Creek near Gododrai, upper Commewijne River, slightly south-west of previous locality, Commewijne District, 1 female (no. 18130, skin and skull).

14. Wane Creek, north of Moengotapoe, northern Marowijne District, 1 male (no. 18119, skin and skull).

15. Nassau Mountains at 3.5 km west of the Marowijne River at about 4°45'N, 1 male (no. 18120, skin and skull).

16. Nassau Mountains at 12.9 km west of the Marowijne River, Marowijne District, 1 male (no. 18121, skull).

Description. — The following description is based on 18 skins of specimens from Suriname. In this series the dorsal surface of the body shows hardly any variation: it is dark olivaceous grey, grizzled with brown yellow; the hairs, namely, are almost black, with a distinct brownish yellow ring slightly below the dark tip. The grizzled colour extends uniformly over the dorsal surface of head, body and basal part of the tail, while it also covers the outer surface of the legs; in a few specimens very inconspicuous buffy yellow postauricular patches are present, in most specimens these patches are absent. A narrow pale yellowish brown ring is present around the eyes. In some specimens a slightly rufous shade is visible in the basal part of the outer surface of the forelegs. The dorsal surface of the feet in both fore and hind legs is often paler than the rest. The bushy, loosely haired tail is dorsally as well as ventrally of the same colour as the dorsal surface of the body; the hairs, however, are longer, like also their ochraceous rings. The colour of the ventral surface of the body shows more variation than the dorsal. It usually is pale reddish brown, sharply separated from the colour of the dorsal surface, at least in about the middle of the body, but considerably less so in the anterior and posterior parts. In juvenile specimens the colour is more greyish white, in the adults the rufous colour is most distinct, varying from uniformly bright reddish brown (no. 18122), because the hairs are unicolorous, to dirty reddish (e.g., no. 17845) because the reddish brown hairs have a dark grey base. Also the intensity of the red colour may vary somewhat. The reddish colour is most distinct in the anterior part of the body, between the bases of the forelegs, anteriorly abruptly changing into the paler, slightly more greyish throat, posteriorly narrowing and extending sometimes almost as far as the bases of the hind legs. In the lactating female a pale, light yellowish brown, area around each mamma (mammary formula: $1 + 2 + 1 = 8$) is visible. The forefeet have four, the hind feet five toes with nails.

Dental formula: $I \frac{1}{1}, C \frac{0}{0}, P \frac{1}{1}, M \frac{3}{3}$. The upper premolar is distinctly smaller than the first molar and is about triangular in outline, narrowing anteriorly. The last upper

molar is also triangular, narrowing posteriorly. The diastema is longer than the combined row of upper cheek-teeth. The foramen magnum is short, about 3 mm in length. The palate ends shortly behind the level of the last molars. In the mandible the premolar is distinctly smaller than the first lower molar. The last lower molar is somewhat longer than the other molars. Apart from its larger size, the shape of the mandible differs remarkably from that of *Sciurillus pusillus* (text-fig. 42b).

In Table 62 the external and skull measurements of twelve specimens of the present species from Suriname are given.

TABLE 62
External and skull measurements of twelve specimens of *Sciurus aestuans*
aestuans Linnaeus from Suriname in the Leiden Museum.

Reg. number	18127	18122	8691	18130	22550	18284	18123	23889	18126	18124	18120	18119
Sex	♀	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂	♂
Head and body	180	180	174	178	169	160	165	170	186	175	-	-
Tail, without tuft	120	200	180	182	188	164	175	171	182	173	-	-
Tail, with tuft	163	250	244	234	247	221	230	229	232	226	-	-
Hind foot, with nail	45	46	47	48	48	40	48	48	48	46	-	-
Ear	23	20	-	23	19	20	20	22	24	-	-	-
Weight, grams	210	-	188	180	160	-	-	190	180	-	-	-
Creastest length skull	44.8	46.1	44.7	44.7	45.5	44.9	45.1	45.7	45.7	45.2	45.3	44.9
Condylbasal length	39.9	41.2	39.7	40.4	41.4	39.6	40.4	41.2	41.3	40.6	40.7	40.7
Basal length	37.2	38.4	37.7	37.4	38.2	36.9	38.1	38.4	38.3	37.8	37.9	37.8
Palatal length	21.6	22.1	21.5	21.5	22.9	21.4	22.3	23.2	22.0	22.3	22.4	22.0
Length of nasals	10.9	11.8	11.5	11.8	11.8	11.2	11.5	10.8	11.6	12.1	11.9	11.1
Zygomatic breadth	27.5	27.5	27.6	26.8	27.4	26.4	27.0	27.0	26.6	-	26.8	26.5
Interorbital constriction	15.3	-	15.6	16.0	15.3	14.4	16.2	14.9	15.7	15.3	14.9	15.7
Postorbital constriction	16.7	-	16.7	16.9	16.0	16.0	16.5	16.3	17.1	16.1	16.0	17.5
Breadth of braincase	20.8	21.3	21.0	20.7	21.0	21.0	20.3	21.0	20.5	20.1	21.1	21.2
Height of rostrum	14.4	-	13.6	13.7	13.8	13.2	13.3	13.0	13.2	13.3	13.8	13.0
Diastema	10.9	12.0	10.9	11.3	11.6	11.4	11.0	11.1	10.7	11.5	11.8	11.6
Alveolar length p-m ³	7.0	6.9	7.2	7.1	7.4	7.5	7.5	7.7	7.4	7.3	6.9	7.1
Length of mandible	28.1	28.5	28.1	27.4	29.0	28.8	28.4	28.9	28.6	27.5	28.7	29.1
Alveolar length p-m ₃	7.2	7.1	7.6	7.1	7.6	7.9	7.8	7.7	8.0	7.4	7.5	7.5

Remarks. — In connection with Sanderson's statement (1949: 774) that he had no information on the occurrence of the present species in the "maritime coastal plain" of Suriname, it would be interesting to determine the northern boundary of the species in Suriname. The northernmost material that I examined myself came from the region of the lower Commewijne and Cottica Rivers and from the Wane Creek in the north-east of Suriname.

In the material examined by me the specimens from the interior and from the mountainous areas of Suriname show a tendency to have the ventral surface more

washed with grey than those from the lowlands in the north. My material, however, is too scanty to allow a decision whether or not this difference is of a subspecific nature, and whether or not the specimens from the southern part of Suriname should be assigned to any of the subspecies recognized from northern Brazil and the mountain regions of Guiana. For these subspecies see Allen (1915: 257-260) under *Guerlinguetus aestuans gilvigularis* (Wagner, 1842), *G. aestuans macconnelli* (Thomas, 1901) and *G. aestuans quelchii* (Thomas, 1901). For the time being it seems preferable not to make a restriction of the type locality, within Suriname, for *Sciurus aestuans* Linnaeus, 1766.

Both *Sciurus bancrofti* Kerr (1792: 265), the type locality of which is British Guiana, and *Sciurus guajanensis* Kerr (1792: 265), type locality Cayenne, are junior subjective synonyms of *Sciurus aestuans* Linnaeus, 1766 (see also under *Sciurillus pusillus*, p. 383).

In the literature on Suriname mammals the generic name *Guerlinguetus* has often been used instead of *Sciurus*. In recent years there exists a tendency to treat *Guerlinguetus* as a recognized genus or as a subgenus of *Sciurus*. The generic name *Sciurus* is used here for the present species without any prejudice concerning the status of *Guerlinguetus*, as I am not in a position to give a definite opinion whether or not these South American squirrels should be separated, generically or subgenerically from the genus *Sciurus*.

FAMILY CRICETIDAE

Oryzomys capito velutinus J. A. Allen & Chapman, 1893

Text-fig. 43a (mandible), pl. 108 fig. 1 (hind foot), pl. 110 fig. 4 (tooth-rows), pl. 115 upper figures (skull)

Oryzomys velutinus J. A. Allen & Chapman, 1893, Bull. American Mus. Nat. Hist., 5: 214-215.

Type locality. — "Princentown, Trinidad", the West Indies.

Synonymies. — Cabrera, 1961: 387.

Vernacular names. — (E) Terrestrial Rice Rat.

Distribution. — According to Cabrera (1961: 385-387) the species *Oryzomys capito* (Olfers, 1818) occurs in northern South America, south to Peru, Bolivia, Paraguay, and southern Brazil. The subspecies *O. capito velutinus* J. A. Allen & Chapman, 1893, is known from eastern Venezuela, Trinidad, Guyana, Suriname and the adjacent regions of northern Brazil.

Occurrence in Suriname. — Considering the available literature the present species so far had not been reported from Suriname. Now the following Suriname material of this taxon has been examined:

1. Wonotobo Falls in the Corantijn River, 4°22'N, Nickerie District, 1 juvenile male (no. 17231, skin and skull).

2. Luciekamp, Lucie River, eastern tributary of Corantijn River, 1 female (no. 21640, skin and skull).

3. Coeroeni Island, near the confluence of the Coeroeni and Corantijn Rivers, at about 3°21'N, Nickerie District, 1 female (no. 17216, skin and skull).

4. Agricultural Experimental Station (Cultuurtuin), Paramaribo, Suriname District, 3 males (nos. 21948, 22365, 22366, skins and skulls), 4 females (nos. 21947, 22361, 22362, 22367, skins and skulls).
5. Jodensavanne, east bank of Suriname River, about 50 km south of Paramaribo, Suriname District, 1 male (no. 16085, skin and skull).
6. Upper Coropina Creek, north of Zanderij airport, Para District, 1 male (no. 22364, skin and skull), 1 female (no. 22363, skull).
7. Finisanti on Saramacca River, Brokopondo District, 1 male (no. 21736, skin and skull).
8. Brownsberg, western shore of Brokopondo Lake, Brokopondo District, 1 male (ZMA no. 15.455, skin and skull).
9. Between Moengotapoe and the coast near the Wiawia bank, northern Marowijne District, 1 female (no. 16054, skin and skull).

Description. — The following description is based on the 16 specimens listed above. The colour of the dorsal surface varies from rust-brown to slate grey with intergradations. The median area of the back is usually darker than the sides. The basal half to two-thirds of the hairs is dark grey, the distal part is pale brown to dark grey; the length of the soft hairs is about 8 to 10 mm. The tinge of the back is determined by the larger or smaller percentage of the grey- and brown-tipped hairs, and by the extent of the rusty-brown colour on the hairs. The head sometimes is a shade more reddish brown than the back. Around the eyes sometimes an indistinct dark ring may be seen. The ears are relatively large and broadly oval, they are sparsely haired inside and out. The sides of the body are slightly paler and often more rufous than the back; the colour of the sides extends on to the outer surface of the basal part of the legs. The ventral surface of the body, including throat and chin, are dirty white to grey. The hairs have a greyish base and a whitish tip. The grey usually is lighter than that of the dorsal hairs. The extent of the grey colour of these hairs determines the white or more grey colour of the ventral surface. The line of demarcation between the sides and the ventral surface is distinct in some specimens (especially in those that are more brownish dorsally) and less so in others. The inside of the basal part of the legs is of the same colour as the ventral surface of the body. The upper surface of the feet shows scattered white hairs, sometimes sprinkled with a few brownish or spotted ones. The forefeet show four well developed toes, the hind feet five of which the middle three are longest; this character is present in all Suriname Cricetidae. The tail is furry in the extreme basal part only, the hairs being greyish brown like the dorsal surface of the body. The rest of the tail bears stiff appressed coarse brown or grey hairs; no tuft is present in my material. The examined young specimens all are of a dark grey colour with hardly any brown tinge.

There are two pairs of pectoral, no abdominal and two pairs of inguinal mammae.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The foramen incisivum is relatively short and widely open; it ends distinctly before the upper tooth-rows. The palate ends distinctly behind the last upper molars. The supraorbital ridges are only noticeable over the posterior part of the orbit and extend on the parietals. The interorbital constriction is situated in about the middle of the skull. In the mandible the processus coronoi-

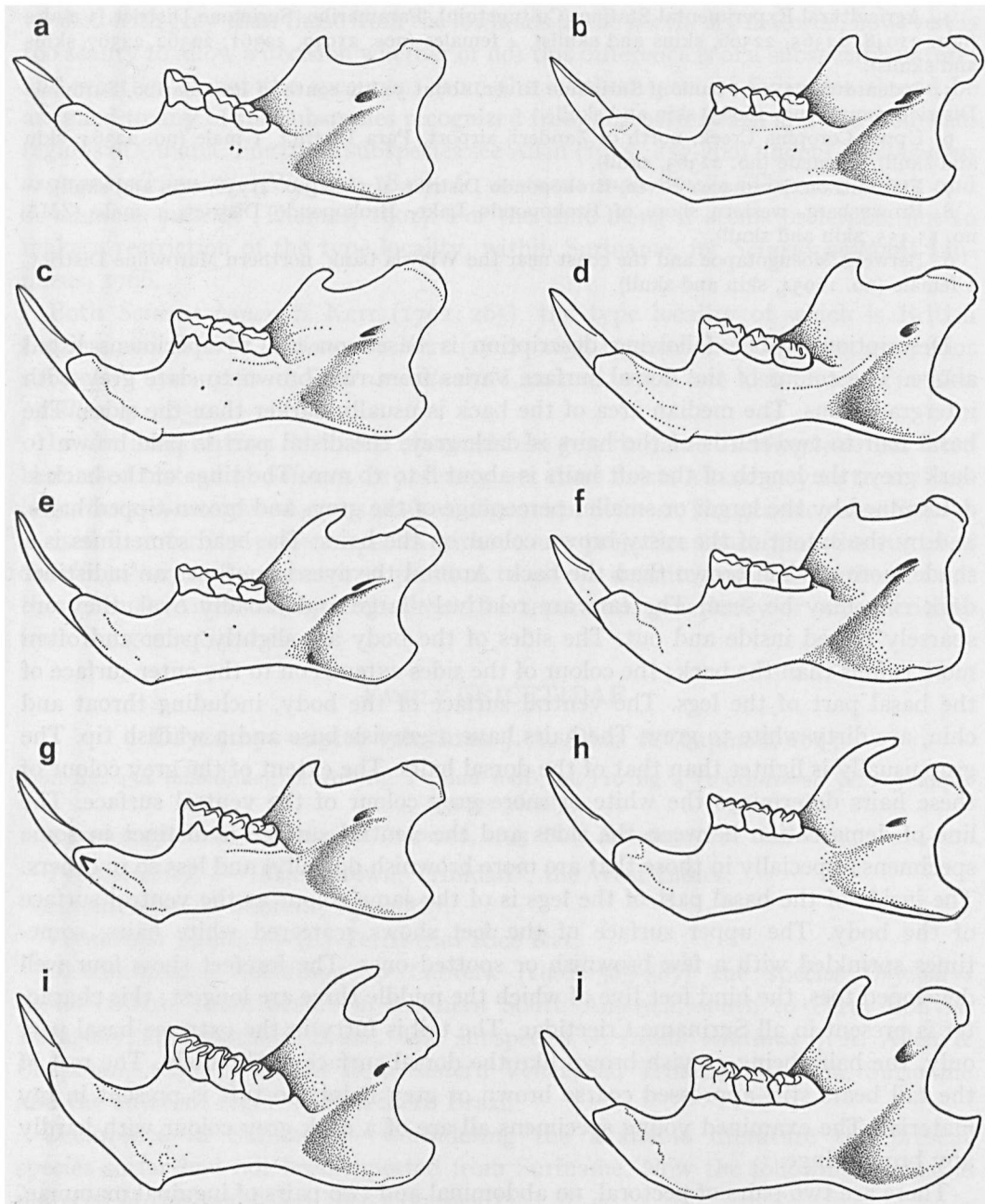


Fig. 43. Right half of mandible, inner view. a, *Oryzomys capito velutinus* J. A. Allen & Chapman; b, *Oryzomys delicatus* J. A. Allen & Chapman; c, *Oryzomys bicolor bicolor* (Tomes); d, *Oryzomys concolor speciosus* J. A. Allen & Chapman; e, *Neacomys guianae* Thomas; f, *Nectomys squamipes melanius* Thomas; g, *Rhipidomys mastacalis nitela* Thomas; h, *Zygodontomys brevicauda microtinus* (Thomas); i, *Holochilus brasiliensis nanus* Thomas; j, *Sigmodon alstoni savannarum* (Thomas).

deus is elongate triangular and curved posteriorly, dorsally it reaches beyond the processus condylicus. The processus angularis is short, broad and widely rounded; it does not reach beyond the processus condylicus.

In Table 63 external and skull measurements of 11 Suriname specimens of *Oryzomys capito velutinus* are given. In all skulls the three upper molars are erupted and functional.

TABLE 63

External and skull measurements of eleven specimens of *Oryzomys capito velutinus* J. A. Allen & Chapman from Suriname.

Museum	RMNH	ZMA	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH
Reg. number	22364	15,455	22366	21736	21640	22363	22361	17216	16054	21947	22367
Sex	♂	♂	♂	♂	♀	♀	♀	♀	♀	♀	♀
Head and body	106	114	122	110	122	121	120	-	-	111	113
Tail	-	112	103	110	107	107	101	-	-	93	90
Hind foot	27	30	27	28	27	26	26	-	-	26	27
Ear	18	17	18	18	16	-	18	-	-	17	16
Weight, grams	-	-	55	45	-	-	65	-	-	-	60
Greatest length skull	30.6	29.7	-	28.0	32.3	31.0	30.5	28.9	27.5	27.5	-
Condylobasal length	28.0	27.7	-	25.7	29.2	28.6	27.8	26.6	25.3	24.5	-
Basal length	26.4	25.1	-	23.7	27.1	26.3	25.9	24.8	23.3	22.8	-
Palatal length	15.4	14.7	15.4	14.3	15.9	15.6	15.1	15.1	14.1	13.5	14.3
Length of nasals	12.1	10.4	10.9	10.5	12.4	10.9	11.4	10.3	10.1	10.4	10.7
Interorbital constriction	4.9	5.0	4.9	5.0	5.0	4.8	4.9	4.8	5.0	4.8	4.9
Zygomatic breadth	14.8	14.0	15.4	14.8	15.9	15.4	14.9	15.0	14.6	13.7	14.5
Breadth of braincase	12.0	11.9	12.4	12.0	12.3	12.5	11.7	12.1	12.2	11.8	12.0
Diastema	8.2	7.0	7.9	7.4	8.2	8.0	7.9	7.4	6.9	6.8	7.9
Height of rostrum	8.2	8.0	7.9	7.4	8.2	8.0	8.5	7.7	7.3	7.2	7.7
For. incisivum, l x br	4.4x2.3	4.5x2.1	4.2x2.0	4.0x2.4	4.8x2.4	4.8x2.4	4.2x2.1	4.2x2.2	4.0x1.8	3.5x2.0	4.6x2.2
Alveolar length m ¹ - m ³	4.4	4.4	4.6	4.4	4.5	4.5	4.4	4.5	4.5	4.5	4.4
Length of mandible	17.4	16.1	17.2	16.3	18.0	17.1	17.1	16.3	15.5	15.1	15.9
Alveolar length m ₁ - m ₃	4.7	4.7	4.8	4.6	4.5	4.7	4.6	4.5	4.7	4.6	4.4

Remarks. — The Suriname specimens were found in forests in the savanna area and on the sand-ridges near the coast. Several were taken in the Cultuurtuin (Agricultural Experimental Station) at Paramaribo. According to J. A. Allen & Chapman (1893: 215) the species "was met with in the forests, where it seemed to live beneath the roots of trees or stumps". Tate (1939: 190) remarked that the present species "is the commonest of the forest-dwellers among the Guiana oryzomine mice".

The female (no. 22362), collected on 12 January 1963 in the Cultuurtuin at Paramaribo, had two embryos of about 12 mm; the external measurements of this

specimen are: head and body, 108; tail, 89; hind foot, 26; ear, 16 mm; weight, 45 grams.

Haverschmidt (1962: 241, Table II; 1968: 158) reported upon skull fragments of the present species from pellets of the Barn Owl, *Tyto alba hellmayri* Griscom & Greenway, 1937, collected in January 1960 at Plantage Peperpot, opposite Paramaribo, just south of Meerzorg. The species evidently forms a very minor part of the diet of the Barn Owl.

Haverschmidt (1962; 1968) reported upon the species under the name *Oryzomys laticeps*. It is possible that *Oryzomys capito laticeps* (Lund, 1841) from eastern Brazil and *O. capito velutinus* J. A. Allen & Chapman, 1893, from Trinidad, are synonyms, but a revision of the *capito* group of *Oryzomys* is needed to make this definitely certain. For the time being I follow Cabrera (1961: 387) in using the name *O. capito velutinus* for the specimens occurring in Suriname.

The differences between the present form and *Oryzomys macconnelli* Thomas, 1910, are dealt with under the latter species.

***Oryzomys macconnelli macconnelli* Thomas, 1910**

Pl. 108 fig. 3 (hind foot), pl. 116 (skull)

Oryzomys macconnelli Thomas, 1910, Annals Magazine Nat. Hist., (8) 6: 186-187.

Type locality. — "The River Supinaam, a tributary of the Lower Essequibo", British Guiana (Thomas, 1910; 184).

Synonymies. — Cabrera, 1961: 392-393.

Distribution. — The species *Oryzomys macconnelli* has been reported from Suriname, British Guiana, southern Venezuela, southern Colombia (east of the Andes) and eastern Ecuador. The nominate subspecies *O. macconnelli macconnelli* is known only from Suriname to eastern Venezuela. Cabrera (1961: 393) considered the animals from southern Colombia and eastern Ecuador to belong to a distinct subspecies, *O. macconnelli mureliae* J. A. Allen, 1913. Tate (1939: 189), however, synonymized it with the nominate form.

Occurrence in Suriname. — Sanderson (1949: 767) reported upon a female of the present species from the "dry floor of tall virgin forest near Raleigh Falls on Coppename River"; he noted, however, too few data on this only specimen to accept his identification with full confidence. Unfortunately I could not find this specimen in the British Museum (Nat. Hist.) in 1966. I have examined the following Suriname material:

1. Wilhelmina Range near the source of the Oost River, a tributary of the Lucie River, at about 3°35'N 56°18'W, Nickerie District, 1 young male (no. 17841, skin and skull).
2. Brownsberg, western shore of Brokopondo Lake, alt. 500 m, Brokopondo District, 1 adult female (no. 20539, skin and skull).
3. Ganiakondre on Suriname River, a locality now submerged by the Brokopondo Lake, Brokopondo District, 1 young male (no. 18206, skin and skull).

The identity of the last mentioned specimen is not quite certain, as it is young and the skull is damaged.

Description. — The following description is based on the three above mentioned Suriname specimens. The colour of the dorsal surface of the adult female is ochraceous tawny interspersed with black. Especially the median dorsal area is dark, the sides and the cheeks are almost pure ochraceous; this colour is also found on the outer surface of the basal part of the legs. The hairs are long and soft, measuring about 12 mm; their basal three-fourths or slightly more is slate grey, the distal part is either ochraceous, usually with a minute dark tip, or blackish brown. The snout has a distal whitish spot at either side of the nose. There is an indication of a small dark ring around the eye. The ears are large, oval and dark brownish; they are sparsely haired on inner and outer surfaces. The ventral surface is dirty white all over, the whitish colour being sharply separated from the ochraceous of the sides; the throat, the chin and the inner surface of part of the legs are of the same colour. The throat and chin may be even brighter white. The ventral hairs are shorter than the dorsal, but likewise very soft. The basal third of the hairs is slate grey, the distal part being white. The upper surface of the fore and hindfeet are covered with short white hairs. The tail is furry in only its extreme basal part; the rest has short sparse appressed hairs. The hairs in the basal four-fifth of the ventral surface of the tail are whitish, the rest is dark brownish, almost black; especially in the proximal part this bicolouration is distinct. There is no distinct tuft.

The larger of the two young males (no. 18206) resembles the female in all respects, except that the dorsal colour is dark grey all over with only a faint ochraceous tinge on the sides. The smaller young male (no. 17841) shows still less of the ochraceous colour and gives the impression of a dark grey animal with slightly lighter grey ventral colour.

There are two distinct pectoral mammae on each side, the two pairs of inguinal mammae are more difficult to locate; no abdominal mammae were found.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The skull, at least in the full-grown specimen, is larger than that of *Oryzomys capito velutinus*. In practically all other respects the skulls of the two species are very similar (see further under Remarks).

In Table 64 the external and skull measurements of 6 specimens are noted. The external measurements of the British Museum (Nat. Hist.) specimens are those taken from the labels; those of the Leiden Museum specimens were taken after preservation in alcohol. The skull measurements (between brackets) of the holotype (BMNH, no. 10.5.4.34) are partly as published by Thomas (1910: 186) in the original description of the species. I found that the values as noted by Thomas are correct, except those of the greatest length and the length of the foramen incisivum; Thomas gave as greatest length 36.3 mm and as length of the foramen incisivum 6.1 mm, while I found 35.6 mm and 5.6 mm, respectively.

Remarks. — I compared the adult female specimen from the Brownsberg (no. 20539) with the holotype and five paratypes of the species preserved in the British

TABLE 64

External and skull measurements of six specimens of *Oryzomys macconnelli macconnelli* Thomas from Guyana and Suriname.

Museum	BNNH	BNNH	BNNH	BNNH	RNNH	RNNH
Reg. number	10.5.4.34	10.5.4.32	10.5.4.29	10.5.4.30	20539	17841
Sex	♀	—	♂	—	♀	♂
Head and body	145	150	135	150	132	70
Tail	145	170	135	130	152	82
Hind foot	35	35	34	33	34	26
Ear	24.5	22	—	22	20	—
Greatest length skull	(36.3)	33.7	32.8	34.7	34.4	26.7
Condylbasal length	32.3	30.3	29.8	31.4	31.2	24.3
Basal length	29.7	28.0	27.6	29.0	29.1	22.1
Palatal length	18.0	17.0	16.4	17.7	—	13.5
Length of nasals	(14.6)	14.0	13.0	—	14.9	10.5
Interorbital						
constriction	(5.7)	5.6	5.5	5.9	5.5	5.3
Zygomatic breadth	(17.3)	16.1	16.3	16.6	17.5	—
Breadth of braincase	(13.7)	13.2	13.3	—	13.4	12.0
Diastrama	(9.8)	8.7	8.5	9.0	9.1	7.0
Height of rostrum	—	8.1	8.3	—	8.3	7.1
For. incisivum, l x br	(6.1x-)	5.3x2.7	4.9x2.7	5.2x2.8	5.1x-	3.7x2.1
Alveolar length $m^1 - m^3$	(5.3)	5.0	5.1	5.1	5.1	5.0
Length of mandible	—	18.7	18.2	—	18.7	14.7
Alveolar length $m_1 - m_3$	5.5	5.1	5.7	5.4	5.5	5.3

Museum (Nat. Hist.) and found no noticeable differences. In my opinion, therefore, there is no doubt that my material belongs to the same species as Thomas's types.

It is clear that *Oryzomys macconnelli* is a good species and not a synonym of *Oryzomys capito velutinus*. Of the latter species, it is true, there are specimens, which in the coat colour show no differences from the former. However, there are a number of differential characters in the examined material, which I consider to be of specific value: (1) The hind foot (including the claw) in full-grown specimens of *Oryzomys macconnelli* is more than 30 mm long, varying in 7 specimens from 31 to 35 mm, while in 16 specimens of *Oryzomys capito velutinus* this length varies from 24 to 29 mm; moreover, the hind foot of *O. macconnelli* gives a more slender impression than that of *O. capito velutinus*. (2) In 16 specimens of *O. capito velutinus* (including the semi-adult specimens in which the three upper molars are erupted and functional) the alveolar length of the upper molars combined varies from 4.3 to 4.7 mm (mean: 4.5 mm); in 6 specimens of *O. macconnelli*, including the two young specimens in the Leiden Museum, this length varies from 5.0 to 5.3 mm (mean: 5.1 mm). (3) In 11 specimens of *O. capito velutinus* the interorbital constriction varies from 4.8 to 5.0 mm (mean: 4.9 mm); in 6 specimens of *O. macconnelli* this breadth varies from 5.3 to 5.9 mm (mean: 5.6 mm).

Although the two species are sharply differentiated by the skull characters, it often is impossible to distinguish them on external characters alone, which makes a certain identification in the field practically impossible.

Oryzomys delicatus J. A. Allen & Chapman, 1897

Text-fig. 43b (mandible), pl. 108 fig. 5 (hindfoot), pl. 117 upper figures (skull), pl. B (animal)
Oryzomys delicatus J. A. Allen & Chapman, 1897, Bull. American Mus. Nat. Hist., 9: 19.

Type locality. — "Caparo, Trinidad", the West Indies.

Synonymies. — Cabrera, 1961: 388-389; Hershkovitz, 1966: 738 (under *Oryzomys nigripes* complex).

Vernacular names. — (E) Pygmy Rice Rat.

Distribution. — According to Cabrera (1961: 388-389) the species *Oryzomys delicatus* occurs in Venezuela, Trinidad, Guyana, and the adjacent parts of Colombia and Brazil. It has been once reported from Suriname by Jentink (see below).

Occurrence in Suriname. — The species was first recorded for Suriname by Jentink (1888: 78 no. tt), who under the incorrect name *Hesperomys leucopus* (Rafinesque) [= *Peromyscus leucopus* (Rafinesque, 1818)], mentioned a specimen (no. 17889) collected by H.F.C. ten Kate between 30 June 1885 and 19 February 1886 somewhere in the coastal region of Suriname (for the activities of Ten Kate in Suriname see Holthuis, 1959: 26).

As shown by our material, the species occurs throughout Suriname, from the coastal region to far into the interior; in some areas it can become a pest to agriculture. I examined the following Suriname specimens (all but three (nos. 16088, 22376 and 22378) represented by skins and skulls):

1. Prins Bernhard polder, Nieuw Nickerie, northern Nickerie District, 1 female (no. 22080).
2. Hertenrits, north of Wageningen, 1 male (no. 17291).
3. Rice project area, Wageningen, Nickerie District, 28 males (nos. 22042, 22044-22049, 22051, 22053, 22055, 22058, 22060-22062, 22064-22072, 22081-22083, 22376, 22377) and 12 females (nos. 21734, 22041, 22043, 22050, 22052, 22056, 22057, 22059, 22063, 22073, 22378, 22379).
4. Sipaliwini, savanna near airstrip, extreme south-eastern part of Nickerie District near the Brazilian border, 1 male (no. 17228), 2 females (nos. 17229, 22380).
5. Coronieweg, highway from Totness to Paramaribo at 21.6 km east of Totness, Coronie District, 1 specimen (no. 22077).
6. Jodensavanne on east bank of Suriname River at about 50 km south of Paramaribo, Suriname District, 1 female (no. 16083), 1 skull (no. 16088).
7. Savanna near railroad at 62 km south of Paramaribo, Brokopondo District, 1 specimen (no. 22075).
8. Finisanti on Saramacca River near Loksiehatti, Brokopondo District, about 80 km south-west of Paramaribo, 1 male (no. 22074).
9. 0.6 km south of the coast near Wiawia bank, northern Marowijne District, 1 female (no. 22076).
10. Upper Tapanahony River 15 km east of Lada Falls, extreme south-western part of Marowijne District, 1 male (no. 21658).
11. Suriname, without a more precise locality indication, 1 male (no. 17889).

Description. — The following description is based on all Suriname specimens mentioned above (with the exception of nos. 16083 and 17889, which are discoloured). The dorsal surface is uniformly greyish brown to brownish grey; in some specimens the grey tones dominate, in others the colour is more brownish. The hairs have the basal two-thirds to three-fourths slate grey, the distal third or fourth being pale yellowish brown to rufous brown or even almost blackish brown; some hairs are distally pale brown with a blackish tip. The sides of the body have the same colour

as the dorsal surface or are slightly lighter. The ears are distinct and protrude through the fur; they are rounded and hairy inside and outside. The ventral surface is much lighter than the dorsal, but varies greatly in colour, ranging from dirty white or light greyish to pale chestnut, the throat sometimes being lighter than the rest. The colour of the ventral surface is not distinctly separated from that of the sides, here too there is some variation. The hairs have the basal one-third or half of a greyish colour and the distal part whitish or pale chestnut brown. On the chin the hairs are sometimes white or pale yellowish all over. The outer surface of the basal part of the fore and hind legs has fur of the same colour as the sides of the body; the inner surface is similar in colour to the ventral surface of the body. The upper surfaces of the fore and hind feet are covered with very pale yellowish short hairs, and thereby strongly contrast with the colour of the dorsal parts of the body. The hind feet are comparatively long. The tail is furred only in its extreme basal part; the rest shows very short appressed dark hairs, only in the basal ventral part these hairs are lighter. In some specimens the tip of the tail ends in a very short pencil. The tail is always longer than the combined length of head and body; the ratio of the length of tail/length of head and body varies in 42 specimens from 1.03 to 1.50 (mean: 1.18).

There are two pectoral, no abdominal and two inguinal pairs of mammae, but in our material these are very difficult to locate.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The small size of the skull distinguishes the present species immediately from most other oryzomine rodents of Suriname. The alveolar length of the upper molar series varies in 39 specimens from 2.8 to 3.2 mm (mean: 3.0 mm). The only other very small oryzomine Suriname species is *Neacomys guianae*, in which the upper alveolar length in 3 specimens varies from 2.5 to 2.7 mm and thus is even smaller than in *Oryzomys delicatus*; the interorbital constriction in *Neacomys guianae*, however, varies in the three specimens from 4.0 to 4.6 mm (mean: 4.3 mm), while in my material of *Oryzomys delicatus* it is smaller, varying in 12 specimens from 3.4 to 3.8 mm (mean: 3.6 mm). The combination of these two characters will enable the distinction of the skulls of these species in practically all cases.

The foramen incisivum of *Oryzomys delicatus* is elongate oval with the greatest width posteriorly; it ends at about the level of the anterior margin of the upper first molars. The palate ends distinctly behind the posterior end of the last upper molars.

In Table 65 the external and skull measurements of 12 Suriname specimens of *Oryzomys delicatus* are noted.

Remarks. — In the Suriname material examined by me only two pregnant females were found, both taken in June near Wageningen: no. 22043, taken on 8 June 1963, carried 4 embryos, and no. 22057, taken on 12 June 1963, had 2 embryos. Juveniles were noted for June, October and December.

According to Tate (1939: 191) the species is "found most commonly in rather open environments where shrubs grow instead of trees". This statement also holds for my material from Jodensavanne and Sipaliwini, where the species was found in

TABLE 65
External and skull measurements of twelve specimens of *Oryzomys delicatus* J. A. Allen & Chapman from Suriname in the Leiden Museum.

Reg. number	22074	22067	22045	22048	22062	17228	22065	21734	22063	22041	17229	16083
Sex	♂	♂	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Head and body	90	87	80	83	88	75	84	79	89	82	64	-
Tail	95	103	96	93	90	85	98	105	99	92	96	-
Hind foot	21	23.5	22.5	21.5	20	20.5	22	22.5	22	21.5	21	-
Ear	13	12.5	12	12	11	-	12	12.5	11	11.5	-	-
Weight, grams	23	-	12	-	-	-	-	-	-	-	-	-
Greatest length skull	23.1	23.3	22.0	22.5	22.5	22.4	22.3	22.9	22.9	21.6	21.5	20.5
Condylobasal length	21.0	20.7	19.2	19.9	19.8	19.8	19.7	20.2	19.9	19.1	18.9	18.5
Basal length	19.2	18.8	17.3	17.8	17.9	17.5	17.8	18.1	18.1	17.1	16.5	16.3
Palatal length	11.3	11.3	10.2	-	10.4	10.2	10.4	10.9	10.8	10.1	10.2	9.7
Length of nasals	7.5	7.5	7.0	7.3	7.5	7.7	7.0	7.0	7.2	7.0	6.8	6.8
Interorbital constriction	3.8	3.6	3.8	3.6	3.6	3.6	3.6	3.8	3.7	3.7	3.4	3.5
Zygomatic breadth	12.3	12.0	11.6	11.1	11.3	11.9	11.2	11.8	11.3	11.4	10.8	10.4
Breadth of braincase	10.4	10.5	10.5	10.3	9.8	10.6	10.4	10.4	10.5	10.5	10.1	10.4
Diastema	6.2	5.7	5.1	5.3	5.8	5.2	5.6	5.2	5.5	5.1	5.1	5.0
Height of rostrum	6.5	6.3	6.0	5.7	6.4	6.3	6.0	6.0	5.9	5.8	5.5	5.5
For. incisivum, l × br	4.1x1.8	4.1x1.6	3.8x1.7	4.1x1.7	3.8x1.7	3.8x1.9	3.8x1.5	3.9x1.6	4.5x1.8	3.3x1.5	3.6x1.8	3.3x1.4
Alveolar length m ¹ - m ³	3.0	3.1	3.0	3.0	3.0	2.9	3.0	3.0	3.1	3.0	2.9	3.0
Length of mandible	12.4	12.0	11.5	11.1	11.7	11.4	11.5	12.1	12.0	11.0	10.8	11.0
Alveolar length m ¹ - m ³	3.1	3.2	3.1	3.1	3.0	3.0	3.0	3.1	3.1	3.0	3.0	3.1

grass savannas. In the dry ricefields of the Wageningen area the species builds its nests in the rice plants at 50 to 80 cm above ground level. It is quite common there in the ricefields, on the dikes, in the nearby fallow fields, and of course in the rice storage area, where it can cause considerable damage (e.g., in 1963); also the native gardens suffer from this pest. The species is usually found together with *Holochilus brasiliensis nanus* (see p. 419) and *Zygodontomys brevicauda microtinus* (see p. 415); it is difficult to decide which of the three is the most harmful to agriculture.

Haverschmidt (1962: 241; see also 1968: 158) noted *Oryzomys delicatus* among the preys of the Barn Owl, *Tyto alba hellmayri* Griscom & Greenway, 1937, in Suriname, although it occurs far less frequently in the pellets examined than *Holochilus* and *Zygodontomys*; only in one instance, viz., in the plantation Peperpot, east bank of the Suriname River, south-east of Paramaribo, it was found in greater numbers than *Holochilus*.

Externally, especially in its size and coat colour, *Oryzomys delicatus* closely resembles some specimens of the Common House Mouse, *Mus musculus* (see p. 507), with which it sometimes is found together (e.g., in rice storage plants). Apart from the differences in the pattern of the tooth-rows, which are the most reliable characters to distinguish the two species, in some cases the length of the hind foot is useful, since in *Mus musculus* this length varies from 16 to 20 mm, usually 17 to 18 mm, while in *Oryzomys delicatus* these values are 20 to 22.5 mm, usually 21 to 22 mm.

The distribution of *Oryzomys delicatus* in Suriname is insufficiently known. It would be very important to compare a large series of specimens from the Sipaliwini savannas with a similar series from the coastal region in order to determine whether or not these two populations, which occupy so very different habitats, can be distinguished subspecifically.

The systematic position of the smaller forms of the genus *Oryzomys* is not quite clear. The oldest name for a species in this group of rice mice seems to be *Mus nigripes* Desmarest, 1819 (= *Oryzomys nigripes*). Bangs (1900: 94) erected a new subgenus for these small mice under the name *Oligoryzomys*. Some authors (e.g., Gyldenstolpe, 1932: 26; Tate, 1939: 191) gave *Oligoryzomys* generic status, others maintain its subgeneric rank (e.g., Hershkovitz, 1966a: 137). Pending a revision of the group I use here the generic name *Oryzomys*, and as specific name the oldest name given to a species of this group described from northern South America, namely, *Oryzomys delicatus* J. A. Allen & Chapman, 1897, originally described from Caparo, Trinidad, the West Indies. In the original description of the species by J. A. Allen & Chapman (1897: 19) evidently the skull measurements are incorrect in so far that the zygomatic breadth is given as 6.5 mm and the width of the braincase as 15 mm, while in the present species as well as in all related forms the zygomatic breadth is greater than the width of the braincase.

In the literature on Suriname mammals the names *Oryzomys navus messorius* Thomas, 1901, *Oryzomys navus* Bangs, 1899, and *Oryzomys messorius* Thomas, 1901, have been used for this species.

Oryzomys bicolor bicolor (Tomes, 1860)

Text-fig. 43c (mandible), pl. 108 fig. 4 (hind foot), pl. 110 fig. 3 (tooth-rows), pl. 118 upper figs. (skull), pl. A (animal)

Hesperomys bicolor Tomes, 1860, Proc. Zool. Soc. London, 1860: 217-219.

Type locality. — "Gualaquiza", Ecuador; emended by Hershkovitz (1960: 535) to "Gualaquiza, Río Gualaquiza, Santiago-Zamora Province, southeastern Ecuador; altitude, 885 meters above sea level".

Synonymies. — Cabrera, 1961: 403; Hershkovitz, 1960: 528-532, 534-540, figs. 1 (map), 4a (right hind foot), pls. 1-11 (skull and tooth-rows).

Vernacular names. — (E) Arboreal Rice Rat.

Distribution. — Hershkovitz (1960: 528) noted the distribution of the species *Oryzomys bicolor* (Tomes, 1860) as follows: "Tropical zones of Panama, Venezuela (exclusive of the Maracaibo basin), Ecuador, the Guianas, the Amazonian and upper Rio Paraguay basins of Brazil, and the Amazonian regions of Bolivia, Peru, and Colombia; altitudinal range, from near sea level to about 2,000 meters above. The apparent distributional hiatus in northwestern Venezuela and in northern and western Colombia may not be real". According to the same author (p. 535) the nominate subspecies, *O. bicolor bicolor* (Tomes, 1860) occurs: "From the Amazonian region of Brazil north into the Guianas, west into the foothills of the Cordillera Oriental in Venezuela, Colombia, Ecuador, and the Ríos Ucayali and Huallaga basins of Peru, south into the upper Río Paraguay drainage basin in Mato Grosso, Brazil; altitudinal range from sea level to possibly 1,000 meters above".

Occurrence in Suriname. — The present species is known from the coastal plain as well as from the interior of Suriname. The animals are sometimes found in native dwellings, but it is not clear whether they are permanent residents there, or just occasional strays in search of food.

The species was first reported from Suriname by Haverschmidt (1962: 241; 1968: 158), who found the species in owl pellets (see below under Remarks). I have examined material from the following localities:

1. Avanavero Falls, Kabalebo River, east branch of Corantijn River, Nickerie District, 2 females (nos. 21732, 21733, skins and skulls).
2. Coronieweg, highway between Totness and Paramaribo at 21.6 km east of Totness, Coronie District, 1 female (no. 18216, skin and skull).
3. Heidoti, east bank of Coppename River south of the mouth of the Wayombo River, Saramacca District, 1 male (ZMA no. 1525, skin and skull).
4. Near the Raleigh Falls, Coppename River, 2 males (ZMA nos. 16822, 16823, skins and skulls).
5. Amerindian village of Matta, about 12 km west of Zanderij airport, Saramacca District, 1 female (no. 21966, skin and skull).
6. Neighbourhood of Paramaribo, Suriname District, 1 skull (no. 17251).
7. Rijdsijkweg between Copieweg and Bernharddorpe, about 20 km south of Paramaribo, Para District, 1 female (no. 16079, skin and skull).
8. Republiek, north of Zanderij airport, Para District, 1 male (no. 18491, skin), 1 female (no. 16087, skin and skull).

9. Brownsberg, west bank of Brokopondo Lake, Brokopondo District, 1 female (no. 23402, skin and skull).

10. Lower Gran Rio about 16 km south-west of Djoemoe, west branch of Upper Suriname River, 1 male (ZMA no. 10135, skin and skull).

11. Lower Gran Rio, Brokopondo District, 1 male (no. 17864, skin and skull).

12. Gododrai, on the Mapane Creek, upper Commewijne basin, Commewijne District, 3 males (nos. 17866-17868, skins and skulls), 2 females (nos. 17865, 17870, skins and skulls), 1 specimen (no. 17869, skin and skull).

I further examined four specimens from Suriname preserved in the Field Museum (Nat. Hist.) at Chicago; these specimens were collected by Dr. P. Hershkovitz and Mr. H. A. Beatty in 1961 and 1962 near Lelydorp (south of Paramaribo, Suriname District), near the Coropina Creek (north of Zanderij airport, Para District), and near the Paloemeu airstrip (near the confluence of the Paloemeu and upper Tapanahony Rivers, southern Marowijne District) (see Hershkovitz, 1962).

Description. — The following description is based on the Suriname material mentioned above (with the exception of no. 16079, the colour of which evidently was greatly altered by preservation in impure alcohol). The colour of the dorsal surface of the body varies from brownish grey (almost slate grey) to warm brown; it is uniform on the entire dorsal surface. Also the sides have this colour or are a fraction lighter. The basal three-fourth of each hair is slaty grey, the rest is ochraceous brown or dark brown; in each individual the colour of the distal part of the hairs may vary from light to very dark brown. The fur is dense and soft. The rounded ears are distinctly visible, they are hairy on the inner and outer surfaces. The ventral surface of body and head is white, pure or dirty white in some specimens, with a faint light ochraceous tinge in others. The white colour is sharply separated from the brown colour of the sides. The hairs of the ventral surface are either unicoloured whitish or have a short darker base. The base of the outer surface of the legs is similar in colour to the sides of the body, the inner surface is white. The upper surface of the feet is pale brown or yellowish. In my material the tail is somewhat longer than the combined length of head and body; it is unicoloured dark brown or blackish with short appressed hairs, the latter becoming longer in the terminal one-fourth or one-third; the tail is ending in a thin pencil. The fur of the body extends for only a slight distance on to the base of the tail.

There are two pectoral, no abdominal, and two inguinal mammae on each side.

Dental formula: $I \frac{1}{1}, C \frac{0}{0}, P \frac{0}{0}, M \frac{3}{3}$. The relatively large foramen incisivum is elongate triangular in outline, broadest in its posterior part; it reaches almost or fully to the level of the anterior margin of the first upper molars. The rounded posterior margin of the palate ends somewhat behind the last upper molars. The supraorbital region has sharply defined edges, which continue on the parietals; the sides of this region diverge markedly posteriorly. The braincase is proportionally large and rounded. The rostrum is relatively short. The anterior border of the nasals protrudes distinctly beyond the anterior plane of the upper incisors, which are recurved. In side view, the nasals and the frontals form an almost straight line. The bullae are small. The

TABLE 66
External and skull measurements of thirteen specimens of *Oryzomys bicolor bicolor* (Tomes) from Suriname.

Museum	RNH	RNH	RNH	ZHA	RNH	ZHA	RNH	ZHA	RNH	ZHA	RNH	RNH	
Reg. number	17866	21733	17868	17864	17251	6,823	10,135	17867	18216	16,822	1525	16087	21966
Sex	♂	♀	♂	♂	-	♂	♂	♂	♀	♂	♂	♀	♀
Head and body	104	108	110	-	-	92	-	104	-	89	-	-	89
Tail, without tuft	116	113	-	-	-	-	-	-	-	-	-	-	94
Tail, with tuft	120	119	118	-	-	105	-	110	-	102	-	-	97
Hind foot, with nail	22	21.5	22	-	-	21	-	20	-	21	-	-	20
Ear	12	15	13.5	-	-	14	-	13	-	14	-	-	-
Weight, grams	40	-	32	-	-	-	-	32	-	-	-	-	-
Greatest length skull	28.3	28.3	28.0	27.2	27.4	27.6	27.2	27.3	27.1	26.7	25.2	25.2	25.0
Condylbasal length	25.9	25.8	25.7	24.9	24.8	24.8	24.4	24.7	24.4	24.1	23.1	22.5	22.5
Basal length	23.8	23.6	23.7	22.6	22.2	22.9	± 22.2	22.6	22.3	21.9	21.0	20.1	20.4
Palatal length	13.5	14.4	13.5	13.2	12.9	12.9	13.0	12.8	12.7	-	12.1	12.0	11.6
Length of nasals	9.4	8.8	9.0	8.3	8.8	8.3	8.2	8.8	8.4	8.7	8.1	8.5	8.0
Interorbital constriction	5.2	5.2	5.0	4.7	5.0	5.0	5.0	4.5	4.8	4.9	4.7	4.8	4.5
Zygomatic breadth	15.2	15.3	14.9	14.9	14.6	13.8	15.3	14.4	14.2	14.6	13.4	12.8	13.2
Breadth of braincase	12.5	12.9	12.1	12.3	12.5	12.1	12.8	12.4	12.0	12.5	11.6	11.8	12.0
Diastema	7.2	7.4	7.0	6.9	7.1	6.8	6.8	6.7	6.5	6.6	6.3	6.0	5.9
Height of rostrum	8.0	7.4	7.7	7.5	7.5	7.5	7.2	7.5	7.2	7.1	6.6	6.6	6.9
For. incisivum, l x br	4.6x2.0	4.7x2.3	4.6x2.1	4.4x2.1	4.6x2.2	4.0x2.2	4.5x2.2	4.6x2.1	4.4x2.1	4.0x2.1	4.0x2.0	3.8x1.8	4.1x1.8
Alveolar length m ₁ - m ₃	3.9	4.0	4.0	3.9	3.6	3.8	3.9	3.9	3.9	3.8	3.7	3.7	3.8
Length of mandible	15.1	15.7	14.9	14.7	14.8	14.5	14.8	14.5	14.5	14.5	13.6	14.0	13.6
Alveolar length m ₁ - m ₃	4.0	4.1	4.1	4.1	3.7	3.9	3.9	4.2	4.0	3.9	3.8	3.8	3.9

processus coronoideus of the mandible is distinct and rather sharply triangular, it does not reach as far dorsally as the processus condylicus. The processus angularis is angularly rounded and projects less far posteriorly than the processus condylicus (see text-fig. 43c).

Table 66 gives the external and skull measurements of some adult specimens from Suriname, in which the three upper molars are erupted and functional. Dr. P. J. H. van Bree took the measurements of the specimens ZMA nos. 16822 and 16823, after these had been preserved in formalin. The specimens nos. 21733 and 21966 were measured also in the flesh by Mr. P. Staffeleu; all other measurements, likewise of specimens in the flesh, were taken by myself.

Remarks. — Among the 20 examined Suriname specimens of the present species, there were two pregnant females. One of these, collected on 7 April 1971 (no. 21732) near the Avanavero Falls by Mr. P. Staffeleu, had 4 embryos; the other, collected on 16 August 1961 (Field Museum (Nat. Hist.), Chicago, no. 94025) near Paloemeu airstrip by Mr. H. A. Beatty, had three embryos.

In Suriname one of the natural enemies of *Oryzomys bicolor* is the Barn Owl, *Tyto alba hellmayri* Griscom & Greenway, 1937 (see Haverschmidt, 1962: table II on page 241; 1968: 158).

Thomas (1906: 444-445) erected the new subgenus *Oecomys* (type: *Rhipidomys benevolens* Thomas, 1901) of the genus *Oryzomys*. To this subgenus Thomas brought also the present species. Thomas's subgenus was recognized by several later authors (e.g., Cabrera, Hershkovitz); some (e.g., Tate), even elevated *Oecomys* to the status of a genus. Thomas gave the name *Oecomys* (derived from οἶκος, a house, and μῦς, a mouse) because "Quite a number of specimens, of different species, are noted as having been caught in native houses". This also holds for many of the specimens of *Oryzomys bicolor* obtained in Suriname: the five specimens from Gododrai and the one from Matta, namely, were caught at night indoors; the traps were baited with cassave. A female from the Avanavero Falls (no. 21732) was taken on the campsite of the expedition.

The specimen taken on 10 August 1910 at the Gran Rio (no. 17864), is the first ever collected in Suriname for scientific purposes. It was obtained by the 1910-1911 Corantijn Expedition before this expedition proceeded from the Gran Rio in the Suriname basin to the Lucie River in the Corantijn River basin (see Käyser, 1912; Holthuis, 1959: 37-38). It was collected by the zoologist of the expedition, the medical officer of the Netherlands Navy, J. F. Hulk.

Oryzomys bicolor strongly resembles *O. concolor speciosus* J. A. Allen & Chapman, 1893, the differences between the two are discussed under the latter species (see p. 406).

In the present paper the revision of the subgenus *Oecomys* by Hershkovitz (1960) is followed in preference to Cabrera's 1961 check-list. Although published later, Cabrera's fundamental work could not take into account Hershkovitz's revision, as Cabrera died in 1960, and his work was published posthumously.

***Oryzomys concolor speciosus* J. A. Allen & Chapman, 1893**

Text-fig. 43d (mandible), pl. 108 fig. 2 (hind foot), pl. 110 fig. 2 (tooth-rows), pl. 118 lower figures (skull)

Oryzomys speciosus J. A. Allen & Chapman, 1893, Bull. American Mus. Nat. Hist., 5: 212-213.

Type locality. — "Princentown, Trinidad".

Synonymies. — Hershkovitz, 1960: 542-544, 553-556, figs. 2 (map), 4b (right hind foot), pls. 1-6, 8-11 (skull and tooth-rows).

Vernacular names. — (E) Arboreal Rice Rat.

Distribution. — Hershkovitz (1960: 542, fig. 2) noted as range of the species *Oryzomys concolor* (Wagner, 1845): "Tropical and subtropical forested zones of Costa Rica, Panama, Colombia, Venezuela, Trinidad, the Guianas, Brazil, and the Amazonian regions of Bolivia, Peru, and Ecuador; altitudinal range from near sea level to approximately 2,000 meters above". The same author (on page 554) considered the range of the subspecies *O. concolor speciosus* J. A. Allen & Chapman, 1893, to be: "Trinidad, the Guianas, and eastern Venezuela, including the coast and delta and basin of the lower Río Orinoco; altitudinal range from sea level to about 1,500 meters above".

Occurrence in Suriname. — I have examined only eleven specimens of the present species, their localities show that it occurs in the coastal plain as well as in the interior of Suriname. These localities are:

1. Wakay, north of the mouth of the Kaboeri Creek, eastern tributary of the Corantijn River, Nickerie District, 1 female (no. 21730, skin and skull).
2. Avanavero Falls in the Kabalebo River, eastern tributary of the Corantijn River, Nickerie District, 1 female (no. 21731, skin and skull).
3. Matta, about 12 km west of Zanderij airport, Saramacca District, 1 male (no. 22375, skin and skull).
4. Plantation "Clevia", west bank of Suriname River north-east of Paramaribo, Suriname District, 1 young female (no. 18207, skin and skull).
5. Neighbourhood of Paramaribo, Suriname District, 2 young specimens (nos. 18508, 18509, skins and skulls).
6. Javaweg, south of Lelydorp, 16 km south of Paramaribo, Para District, 2 males (nos. 21841, 21842, skins and skulls).
7. Lelydorpplan, near Lelydorp, 1 male (no. 17863, skin and skull).
8. Upper Coropina Creek, tributary of the Para River, near Republiek, north of Zanderij, Para District, 1 female (no. 22374, skin and skull).
9. Along Wilhelmina River, a few km south of its confluence with the Emma River, Gonini River basin, 3°50'N 54°32'W, Marowijne District, 1 female (no. 17887, skin and skull).

In the Field Museum (Nat. Hist.) at Chicago there is a series of at least 11 specimens of this species collected in the coastal region of Suriname by Dr. P. Hershkovitz in 1961 and 1962. I studied this material, of which the skulls were then (1963) not cleaned. Unfortunately I neglected to make notes of the colour variation of these specimens; only the external measurements of the largest three specimens were copied from the field labels.

Description. — The following description is based on 8 adult and 3 juvenile specimens (two of these, nos. 21841 and 17887 are not used for the colour description

as the colour has considerably changed during preservation). The dorsal surface of the body is dull dark buffy brown sprinkled with black and yellowish brown. The fur is soft and dense. The hairs have the basal three-fourth to four-fifth thin and slate grey, the distal part is yellowish brown or black, or partly yellowish brown with the tip or the basal part black. Sometimes there is a faint indication of a somewhat darker median dorsal stripe. The ears are relatively large and protrude through the fur; they have many short hairs inside and out. The dorsal surface of the head, and the sides of the body have the same colour as the back. The colour of the ventral surface is pale and rather sharply set off from the dark colour of the sides. There is considerable variation in the ventral colour, ranging from almost pure white to cinnamon pink, sometimes with a narrow pale rufous zone between the ventral and the lateral colours. In the palest specimens the central ventral part is dirty white turning to pure white on the throat, the chin and the internal parts of the front legs, while also the internal parts of the hind legs and the area near the base of the tail are pure white. In the cinnamon coloured specimens the throat and chin usually remain whitish, while the inner surfaces of the legs and the base of the tail have the same colour as the belly. The hairs of the central ventral part always have the base grey and the tips white or cinnamon, those of the anterior and posterior ventral parts are more unicolorous. The basal outer surface of the legs is of the same colour as the dorsal surface of the body, but the dorsal surface of the feet is covered with many yellowish or brownish short hairs. The tail has the hairs rather numerous and appressed, they are usually black, but white hairs do occur and sometimes are more numerous ventrally than dorsally in the basal part of the tail, and then cause this part to seem faintly bicolorous. Sometimes the tail shows a short distal tuft. The fur of the body extends only on the extreme basal part of the tail; the tail is slightly or distinctly longer than the combined length of head and body.

In my scanty material two forms can be roughly distinguished: one, originating from localities in the interior (Wakay, Avanavero Falls, Matta, and Wilhelmina River), has the ventral surface more whitish and sharply set off from the colour of the sides and has the dorsal hairs of the feet dark; the second, originating from the coastal area (Paramaribo, Lelydorp, and Zanderij), has the ventral surface darker cinnamon coloured, less sharply separated from the colour of the sides, while the upper surface of the feet is pale. The juveniles, however, all resemble the form of the coastal area.

There are two pectoral, no abdominal, and two inguinal mammae on each side.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The skull of *O. concolor speciosus* is essentially similar to that of *O. bicolor bicolor* (see p.400). The difference is that in the full-grown skulls of *O. concolor speciosus* the supraorbital ridges are strongly wing-like, extending over the orbit, and after an angular curve continue over the whole length of the parietals as sharply defined ridges. In side view, the braincase is dorsally more flattened than in *O. bicolor bicolor*, and is even somewhat depressed between the orbits. The rounded palate usually ends slightly further behind the last upper molars than in *O. concolor concolor*.

TABLE 67

External and skull measurements of eight specimens of *Oryzomys concolor speciosus*
J. A. Allen & Chapman from Suriname in the Leiden Museum.

Reg. number	21731	21841	22374	21842	21730	17887	17863	18207
Sex	♀	♂	♀	♂	♀	♀	♂	♀
Head and body	124	-	118	-	118	-	110	89
Tail, with tuft	129	-	141	-	140	-	123	110
Hind foot	28	-	27	-	26	-	27	23
Ear	17	-	15	-	16	-	15	13
Weight, grams	80	-	-	-	59	-	35	-
Greatest length skull	35.1	33.9	32.8	32.9	-	-	29.0	27.0
Condylbasal length	31.5	30.8	29.9	29.8	-	28.2	25.7	24.3
Basal length	29.0	28.4	27.4	27.4	-	-	23.3	21.8
Palatal length	17.4	17.0	16.0	16.2	15.6	15.2	14.3	13.4
Length of nasals	11.5	11.4	11.2	11.7	10.4	10.6	10.8	9.7
Interorbital constriction	6.8	6.1	5.8	5.8	5.4	5.5	5.6	4.6
Zygomatic breadth	19.0	17.4	17.4	17.3	17.4	17.3	15.8	14.9
Breadth of braincase	14.6	13.2	13.8	13.1	-	13.5	13.3	12.6
Diastema	9.0	8.8	8.2	8.2	7.9	7.5	7.1	6.5
Height of rostrum	9.3	9.1	8.8	8.7	8.0	8.3	7.4	7.2
For. incisivum, l x br	5.8x2.5	5.8x2.4	6.0x2.4	5.7x2.4	5.2x2.7	4.6x2.9	4.8x2.3	5.1x2.0
Alveolar length $m^1 - m^3$	5.5	5.1	4.8	4.7	4.8	5.1	5.1	4.9
Length of mandible	19.0	19.0	18.5	17.7	17.7	17.9	16.3	15.0
Alveolar length $m_1 - m_3$	5.5	5.1	5.0	4.8	5.0	5.1	5.1	5.0

In Table 67 external and skull measurements are noted of the adults in which the three upper molars are erupted and functional. The external measurements of the three largest Suriname specimens, preserved in the Field Museum (Nat. Hist.) at Chicago, as copied from Dr. P. Hershkovitz's field labels, are, respectively: head and body, 132, 131, 128; tail 165, 138, 150; hind foot, 26, 29, 25; ear, 16, 18, 15 mm; weight, 55, 65, 65 grams.

Remarks. — The female from Wakay (no. 21730), collected on 24 March, had one embryo; the female from the Avanavero Falls (no. 21731), collected on 10 April, had four. Both specimens were caught by Mr. P. Staffeleu during the 1971 Expedition to north-western Suriname (see Geijskes, 1973).

In Suriname one of the natural enemies of *O. concolor speciosus* is the Barn Owl, *Tyto alba hellmayri* Griscom & Greenway, 1937. Haverschmidt (1962: table II on page 241; 1968: 158), namely, reported the species from Barn Owl pellets collected in the coastal region. It is, however, one of the rarer species in these pellets.

There are no positive indications that any of the examined Suriname specimens of this Arboreal Rice Rat has been collected indoors, like so often was the case with *O. bicolor bicolor* (see p. 402). The specimen from the Avanavero Falls (no. 21731) was found alive in an experimental pit; the specimen from the upper Coropina Creek (no. 22374) was caught in a savanna forest, while that from Matta (no. 22375) was obtained along the edge of a forest.

The first specimen of *O. concolor speciosus* collected for scientific purposes in Suriname is the female (no. 17887) taken on 16 September 1903 by G. M. Versteeg, the zoologist of the Gonini Expedition, at some km south of the confluence of the Wilhelmina and Emma Rivers, south-eastern Suriname (see Franssen Herderschee, 1905).

Oryzomys concolor speciosus closely resembles *O. bicolor bicolor*, but may be distinguished by the following features: (1) It is larger in all its dimensions; the alveolar length of the three upper molars combined varies in 10 Suriname skulls from 4.7 to 5.5 mm (mean: 5.0 mm), while in 17 skulls of *O. bicolor bicolor* from Suriname this length varies from 3.6 to 4.3 mm (mean: 3.9 mm). (2) The length of the hind foot of *O. concolor speciosus*, with nails, ranges between 24 and 29 mm, in *O. bicolor bicolor* between 20 and 24 mm. (3) In *O. concolor speciosus* the colour of the ventral parts as a rule is more brownish and less sharply set off from that of the sides and the dorsal surface; in *O. bicolor bicolor* there is usually a sharp demarcation between the pure or dirty white ventral parts and the dark brownish or greyish lateral and dorsal surfaces. Specimens with pure white, unicolorous hairs on the ventral surface, as they are known to occur in *O. bicolor bicolor*, are never found in *O. concolor speciosus*.

Like *Oryzomys bicolor*, the present species is placed in the subgenus *Oecomys*. These two species superficially resemble *Oryzomys capito velutinus* (see p. 388) and *O. macconnelli* (see p. 392), even though the latter are placed in the different subgenus *Oryzomys*. Useful characters to distinguish the skulls as well as the skins of these four species are to be found in the keys (see pp. 379-380 and 374-375).

In Cabrera's (1960) check-list neither of the epithets *concolor* or *speciosus* are cited within the genus *Oryzomys*. Evidently this is due to an oversight.

***Neacomys guianae* Thomas, 1905**

Text-fig. 43e (mandible), pl. 119 (skull)

Neacomys guianae Thomas, 1905, Annals Magazine Nat. Hist., (7) 16: 310.

Type locality. — "Demerara River, British Guiana. Alt. 120 feet".

Synonymies. — Cabrera, 1961: 410-411; Tate, 1939: 192.

Vernacular names. — (E) Bristly Mouse, Spiny Mouse; (N) Stekelmuis.

Distribution. — *Neacomys guianae* occurs in the Guianas, the southern part of Venezuela and probably in the adjacent regions of northern Brazil.

Occurrence in Suriname. — Of the present species I have examined only three specimens:

1. Loksiehatti, upper Saramacca River, about 80 km south-west of Paramaribo, Brokopondo District, 1 adult male (CNHM no. 95642), 1 adult female (CNHM no. 95643).
2. Nassau Mountains, at 18.5 km west of the Marowijne River at about 4°45'N, Marowijne District, 1 specimen (no. 23891, skin and skull).

Description. — The original description by Thomas (1905: 310) reads as follows: "Very similar to *N. spinosus*, but conspicuously smaller. Fur of medium length; hairs and spines of back about 8 mm. long. General colour dark fulvous, heavily

lined with blackish; head and fore-quarters darker; sides brighter fulvous, especially in front of the hips. Lower flanks greyer, an ochraceous line edging the white of the belly. Under surface pure sharply defined white throughout, the hairs white to their bases. Lips and chin also white. Outer side of fore limb greyish fulvous, of hind limb clearer fulvous; inner side of limbs white. Upper surface of hands and feet dull white. Tail of medium length, nearly naked, brown above, whitish below proximally, darkening terminally. Skull similar to that of *N. spinosus*, but smaller throughout. Dimensions of type (measured in the flesh): — Head and body 64 mm; tail 67; hind foot 18.5. Skull: greatest length 20; basilar length 15; length of nasals 7; interorbital breadth 4; breadth of brain-case 10; diastema 5.5; palatal foramina 3; length of upper molar series 2.5''.

My specimen from the Nassau Mountains, the skin of which is badly damaged, lacking the tail and three of the legs, agrees very well with Thomas's description, the fulvous brown dorsal surface and the whitish ventral parts being quite distinct and clearly separated. The presence of numerous small, grooved spinous hairs among the soft fur is quite conspicuous in my specimen.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The foramen incisivum is relatively large and wide and extends backward almost to the level of the anterior margin of the first molar. Skull measurements of the three Suriname specimens are noted in Table 68.

The following external measurements are those of the two Suriname specimens in the Field Museum at Chicago, as noted on the labels: head and body, 82, 66; tail, 72, 69; hind foot, 18, 18; ear, 14, 12 mm. The first mentioned specimen, the male, had a weight of 20 grams.

Remarks. — By its spiny fur *Neacomys guianae* is immediately distinguished from two other Suriname mammals, which are of about the same size: *Oryzomys delicatus* (see p. 395) and *Mus musculus* (see p. 507).

TABLE 68

Skull measurements of three specimens of
Neacomys guianae Thomas from Suriname.

Museum	CNM	CNM	RMNH
Reg. number	95642	95643	23891
Sex	♂	♀	—
Greatest length	20.4	19.5	—
Condylbasal length	18.4	17.0	—
Basal length	16.6	15.1	—
Palatal length	9.6/9.8	9.0	—
Length of nasals	7.7	7.0	7.0
Interorbital constriction	4.6	4.2	4.1
Zygomatic breadth	10.8	10.3	—
Breadth of braincase	10.1	9.6	9.3
Diastema	5.1	4.7	4.4
Height of rostrum	5.7	5.5	5.3
For. incisivum, l x br	3.3x1.5	3.0x1.4	2.5x1.4
Alveolar length $m^1 - m^3$	2.7	2.5	2.6
Length of mandible	11.4	10.7	—
Alveolar length $m_1 - m_3$	2.9	2.8	2.7

It is almost certain that the present species is not as rare in Suriname as might be concluded from the few specimens seen by me; the small size of the species and our lack of knowledge concerning its biotope may be the cause of the scarcity of the material. Tate (1939: 192) remarked that the species was found by him in very dense, dark, humid forests and usually was trapped under rotten logs.

***Nectomys squamipes melanius* Thomas, 1910**

Text-fig. 43f (right mandible), pl. 107 fig. 3 (right hind foot), pl. 120 lower figures (skull)

Nectomys squamipes melanius Thomas, 1910, *Annals Magazine Nat. Hist.*, (8) 6: 185-186.

Type locality. — "Lower Essequibo River, 12 miles from mouth. Alt. 40 feet", British Guiana.

Synonymies. — Cabrera, 1961: 414-415; Hershkovitz, 1944: 32, 49-52, map 1. Vernacular names. — (E) Guiana Water Rat; (N) Surinaamse Waterrat.

Distribution. — The species *Nectomys squamipes* (Brants, 1827) has a wide range of distribution in South America. The species has been reported from "Trinidad, Venezuela, the Guianas, Brazil, Paraguay, Misiones in Argentina; in Bolivia, Peru, Ecuador, areas to an altitude of approximately 2000 meters above sea level in the Amazonian drainage basin system, and in the Magdalena-Cauca Valley, Colombia, to not above 2200 meters". The subspecies *Nectomys squamipes melanius* is known from "British Guiana, Dutch Guiana, southern Venezuela in the departments of Bolívar and Amazonas, south to the north bank of the Amazon River in the state of Amazonas, Brazil, west to the lower Huallaga in northeastern Peru. North of the Marañon, in Ecuador, . . ." (Hershkovitz, 1944: 32, 49, map 1).

Occurrence in Suriname. — It is possible that Fermin (1765: 26; 1769: 114) with "Rat d'eau, en Latin *Mus aquaticus*, en Nègre Anglois *Watra-Rata*" (1765) dealt with the present species, which he described as follows (1769): ". . . tout le corps est couvert de poils noirs & roux, à la partie supérieure; le reste de son corps est d'une couleur cendrée, & mêlée d'un peu de jaune". The first reliable record from Suriname is the one by Thomas (1897: 497), who probably based his notes on a male specimen preserved in alcohol (skull extracted and cleaned), collected by A. Kappler in Suriname, and at present still in the collection of the British Museum (Nat. Hist.) as no. 70.6.21.1. This is probably the same as the Suriname specimen that Thomas (1910: 186) in the original description of *Nectomys squamipes melanius* listed under the paratypes.

Hershkovitz (1944: 51) mentioned two specimens from Suriname without exact locality, which are not further dealt with by him. Sanderson (1949: 776) "tentatively" referred two immature individuals to *Nectomys squamipes*, both were "taken from a nest under a pile of brushwood in an estate garden near Paramaribo". In the British Museum (Nat. Hist.) these specimens could no longer be found.

The following material of the present species from Suriname has been examined by me:

1. Forests near Avanavero Falls in Kabalebo River, eastern tributary of Corantijn River, Nickerie District, 1 adult female (no. 21729, skin and skull).
2. Coronie District, 2 juveniles (nos. 21641, 21642, skins and skulls).
3. Dirkshoop, lower Saramacca River, south-east of Groningen, Saramacca District, 1 male (CNHM no. 95647).
4. Plantation "Clevia" on west bank of Suriname River north-east of Paramaribo, Suriname District, 1 adult male (no. 22005, skin and skull).
5. Near Finisanti, upper Saramacca River, Brokopondo District, 1 male (CNHM no. 95646), 2 females (CNHM nos. 95644, 95645).
6. Tempati Creek, eastern tributary of upper Commewijne River, 1 juvenile female (ZMA no. 4470, skin and skull).

Description. — The following description is based on the four specimens preserved in the Leiden Museum (reg. nos. 22005, 21641, 19642, and 21729). The dorsal surface of head and body is glossy blackish dark brown (Mummy Brown of Ridgway), sprinkled with yellowish. The basal half to two-thirds of the hairs is thin and slaty in colour, the distal part is broader and heavier, either entirely blackish (most hairs) or having a yellowish band below the tips. The ears protrude distinctly beyond the fur and are of a blackish colour, thinly clothed with hairs inside and out. On the cheeks and the sides of the body the distally yellowish hairs start to predominate, hereby giving the area a pale brownish grey colour. The ventral surface is still paler yellowish grey and is more greyish and less brownish than the sides; this is particularly true for the ventral surface of the head, which is either entirely grey or whitish grey, as is also the inner surface of the forelegs. The colour of the outer surface of the legs is like that of the lateral parts of the body; the colour of the inner surface of the hind legs is like that of the ventral surface. The line of demarcation, separating the sides and the ventral surface of the body, is not sharply defined. The upper surfaces of the hind and forefeet are covered by short pale hairs which at either side of the sole form a kind of fringe. At the base of the claws the hairs are darker, forming there a dark spot. The hind feet are webbed; the webs are especially distinct between the first phalanges of the three middle toes, they are reduced or obsolete between the fourth and the fifth toes (pl. 107 fig. 3). The tail is unicolorous blackish with sparse rather short hairs; only the extreme basal part bears fur like the rest of the body. A small distal tuft is present. The length of the tail is equal to, somewhat shorter or somewhat longer than the combined length of head and body.

In the juvenile female (ZMA no. 4470) the fur is more woolly and soft than in the adults and less glossy. The hairs are uniform in colour and thereby give a darker appearance to the dorsal colour. The sides, although lighter than the back, are distinctly darker and less yellow than in the adults. The ventral surface is more grey and less yellowish than in most adults.

There are two pairs of pectoral, no abdominal, and two pairs of inguinal mammae. In the preserved specimens the mammae are often very difficult to locate.

Dental formula: $I \frac{1}{1}, C \frac{0}{0}, P \frac{0}{0}, M \frac{3}{3}$. The skull is heavy, it is larger than that of any of the other species of Suriname oryzomine rodents. One of its most striking characters is the peculiar, more or less pear-shaped, outline of the foramen incisivum, which is

broadest in its posterior part. The foramen incisivum extends almost to the anterior level of the first upper molars. The palate ends distinctly behind the level of the last upper molars. The supraorbital ridges are well developed. In ten specimens, four from Suriname and six from British Guiana (including the type), the interorbital constriction varies from 6.6 to 7.5 mm (mean: about 7 mm), and the alveolar length of the upper molars from 6.1 to 7.2 mm (mean: 6.6 mm).

TABLE 69

External measurements of six specimens of *Nectomys squamipes melanius* Thomas from Suriname (first six columns), and those of the lectotype of the subspecies (last column).

Museum	CNHM	CNHM	CNHM	CNHM	RJNH	RJNH	BMNH
Reg. number	95644	95645	95646	95647	22005	21729	6.4.8.32
Locality	Finisanti	Finisanti	Finisanti	Dirkshoop	Clevia	Avanavero F.	Low. Essquibo
Sex	♀	♀	♂	♂	♂	♀	♂
Head and body	198	199	205	206	181	168	(244)
Tail	177	196	185	186	179	184	(200)
Hind foot	46	49	50	48	45	47	(s.u.46)
Ear	23	22	23	22	-	19.5	(24)
Weight, grams	200	220	250	-	-	200	-

In Table 69 the external measurements of six specimens of *Nectomys squamipes melanius* from Suriname are noted; for comparison also those of the type specimen are added in parentheses. In Table 70 the skull measurements of four Suriname specimens are given, and those of the type specimen in parentheses. All the measured

TABLE 70

Skull measurements of four specimens of *Nectomys squamipes melanius* Thomas from Suriname (first four columns) and those of the lectotype of the subspecies (last column).

Museum	BMNH	RJNH	RJNH	RJNH	BMNH
Reg. number	70.6.21.1	21729	21641	21642	6.4.8.32
Sex	♂	♀	♀	-	♂
Greatest length	45.2	41.6	39.9	36.5	(44.5)
Condylobasal length	41.5	39.5	37.3	33.2	(41.5)
Basal length	38.2	36.5	34.4	30.5	(38.8)
Palatal length	23.4	22.0	21.3	18.7	(23.0)
Length of nasals	18.8	13.8	16.7	13.8	(18.1)
Interorbital constriction	7.4	6.9	6.7	6.6	(7.2)
Zygomatic breadth	24.1	22.2	21.2	19.8	(23.6)
Breadth of braincase	17.3	15.7	15.4	15.3	(16.0)
Interparietal, l x br	-	3.3x9.0	3.9x10.1	3.4x10.1	-
Diastema	12.4	11.3	11.2	9.6	(12.2)
Height of rostrum	-	12.2	11.3	10.4	-
For. incisivum, l x br	8.0x3.7	6.9x3.2	7.1x3.4	6.5x3.1	(8.1x3.8)
Alveolar length m ¹ - m ³	6.8	6.9	6.4	6.1	(6.4)
Length of mandible	26.1	24.5	23.0	21.3	(# 25)
Alveolar length m ₁ - m ₃	6.8	6.9	6.7	6.3	(6.5)

skulls are from adult specimens in so far as in all the upper and lower molars are erupted and functional, but the type and the specimen collected by A. Kappler are older than the rest as is shown by the wear of the crowns. The skull measurements of the type were taken during my visit to the British Museum (Nat. Hist.) in 1966; they differ in several respects from the measurements given by Thomas (1910: 186).

Remarks. — About the habitat of the present species Hershkovitz (1944: 32) noted: "In general, the species is confined to forests — rain forest, gallery forest, or forest types bordering streams of the arid or semiarid parts of Brazil and the Andes". The fact that the hind feet of the species are distinctly webbed might indicate that it lives near or in water, or in marshy places. Walker (1964(2):764) remarked that "*N. squamipes* has been found in buildings but is seen more often in woodland and cultivated areas near water". The above specimens from Coronie (no. 2) and Dirkshoop (no. 3) were obtained in cultivated areas near water. The specimen from the Avanavero Falls (no. 1) was taken in a trap placed at a distance of 60 m from the river bank. That from the plantation "Clevia" (no. 4) came from a swampy area. The one from Tempati Creek (no. 6) was caught by a cat at nightfall (8 p.m.) near a settlement of the Bruynzeel Bosexploitatie.

Externally the Suriname *Nectomys* closely resembles the Suriname *Holochilus* (see p. 419) in its size and coat colour. The most striking characters in which the two forms differ, are: (1) the ears in *Nectomys* are larger (about 19 to 24 mm) and much less hairy than those of *Holochilus*, in which the ears at a first glance seem hidden by the fur, their length varying from about 15 to 18 mm; (2) the hind foot of *Nectomys* is distinctly webbed, slender and relatively longer, measuring from about 45 to 53 mm; in *Holochilus* the webbing of the toes of the hind foot is poorly developed or obsolete (while the shape of the hind foot is broader), measuring from about 42 to 47 mm (see pl. 107 figs. 3, 4); (3) the fur of the dorsal parts in *Nectomys* is conspicuously glossy, in *Holochilus* it is dull; (4) on the whole the colour of *Nectomys* is darker than that of *Holochilus*.

My material of *Nectomys* and *Holochilus* from Suriname shows conspicuous differences in the skull characters. The most striking of these is the width of the interorbital constriction: in *Nectomys* the width of the skull at the constriction varies from 6.6 to 7.5 mm (mean: about 7 mm), in *Holochilus* from 3.8 to 5.1 mm (mean: 4.4 mm). The mandible of *Holochilus* has the processus coronoideus long and slender, visible as a prominent and narrow process pointing dorsally and posteriorly. In *Nectomys* this processus is very short and low, visible only as a short triangular prominence. The posterior margin of the mandible between the processus condylicus and the processus angularis is deeply concave in *Holochilus*, much less so in *Nectomys* (see text-fig. 43 f, i).

Rhipidomys mastacalis nitela Thomas, 1901

Text-fig. 43g (mandible), pl. 115 lower figures (skull)

Rhipidomys nitela Thomas, 1901, Annals Magazine Nat. Hist., (7) 8: 148-149.

Type locality. — "Kwaimattat, Kanuku Mts.", south-western British Guiana, alt. 72 metres.

Synonymies. — Cabrera, 1961: 423.

Vernacular names. — (E) Long-tailed Climbing Mouse.

Distribution. — The species *Rhipidomys mastacalis* (Lund, 1841) occurs in Venezuela, the Guianas, and the larger part of Brazil. The subspecies *R. mastacalis nitela* is known from Suriname, British Guiana, and the adjacent regions of Venezuela and Brazil.

Occurrence in Suriname. — The species was reported upon by the brothers Penard in their papers on the fauna of Suriname ("De Surinamer", 20 April 1905). However, they did not positively state that the species occurs in Suriname, but only that it was found in the "Guyana's".

In January and February 1963, Mr. P. Staffeleu of the Rijksmuseum van Natuurlijke Historie, collected the following specimens, using traps which were placed at night in Amerindian dwellings (Sipaliwini, Matta), and in a bunker (Zanderij):

1. Sipaliwini savanna near Sipaliwini airstrip, extreme south-eastern part of Nickerie District near the Brazilian border, 1 adult female with 3 young (no. 22360, skin and skull).

2. Matta, an Amerindian village about 15 km west of Zanderij airport, Saramacca District, 4 juvenile or semi-adult males (nos. 21968, 21970, 21972, 21976, skins and skulls), 8 females (nos. 21969, 21971, 21973-21975, 22353, 22358, 22359, skins and skulls); all females are adult except no. 22358 which is semi-adult.

3. Bunker near Zanderij airport, about 40 km south of Paramaribo, Para District, 1 juvenile male (no. 22357, skin and skull), 3 adult females (nos. 22354-22356, skins and skulls).

Description. — The following description is based on all specimens mentioned above. The dorsal parts have a greyish fawn colour, which varies from almost pure dark greyish to pale chestnut brown. The basal parts of the hairs are blackish, followed by a yellowish band, while the tips have a fawn colour. Sometimes the entire distal half of the hairs is yellowish or brownish. Between these two- or three-coloured hairs, several, somewhat more rigid and somewhat longer, entirely blackish hairs are interspersed. Sometimes a faint longitudinal dark median band is visible. The dorsal surface of the head is of the same colour as the back, or slightly more brownish. The ears are conspicuously darker than the rest of the head, being dark brownish inside and out, with few short hairs. The outside of the legs is of the same colour as the back, except for the feet, which are very pale yellowish with a dark brownish area in the middle, this feature being more pronounced in the hind than in the front legs. The ventral surface of the head and the body is almost pure white, sharply separated from the dark upper parts; the hairs are uniformly white from base to tip. The white colour extends onto the basal part of the inner surface of both fore and hind legs, in the forelegs reaching usually as far as the feet; in the hind legs usually a narrow greyish area separates the white parts from the feet. The

TABLE 71
External and skull measurements of eleven specimens of *Rhipidomys mastacalis nitela* Thomas from Suriname in the Leiden Museum.

Reg. number	22354	22355	22356	22353	21975	21973	21971	22358	21974	21972
Sex	♀	♀	♀	♀	♀	♀	♀	♀	♀	♂
Head and body	108	119	109	103	114	104	113	102	111	103
Tail, without tuft	171	142	136	128	152	135	144	122	120	139
Tail, with tuft	180	149	144	136	159	145	153	134	129	146
Hind foot, with nail	26	23	21	23	24	22	24	22	22	25
Ear	16	-	17	-	-	-	-	-	-	-
Weight, grams	150	-	-	-	-	-	-	-	-	-
Greatest length skull	31.1	30.0	27.3	29.4	30.5	30.8	29.7	26.9	27.9	29.4
Condylobasal length	27.8	26.9	25.1	26.6	27.5	28.1	27.6	24.4	25.8	26.4
Basal length	26.9	24.6	23.1	24.5	25.1	26.1	25.1	22.1	23.6	24.1
Palatal length	14.9	13.7	12.7	13.5	13.7	14.5	13.8	12.2	13.1	13.2
Length of nasals	9.8	10.4	8.9	8.9	10.1	10.2	10.1	8.8	8.9	9.1
Interorbital constriction	5.1	5.4	4.6	4.9	5.0	4.9	4.8	4.8	4.6	5.1
Zygomatic breadth	16.2	16.5	14.6	15.3	15.6	16.0	15.3	14.5	14.4	15.6
Breadth of braincase	13.5	13.3	12.1	12.9	13.2	13.3	12.8	12.3	12.8	13.3
Diastema	8.3	7.8	6.8	7.7	7.7	7.8	7.8	6.5	7.3	7.2
Height of rostrum	8.2	8.1	7.3	7.6	8.2	8.5	7.9	7.4	7.5	7.8
For. incisivum, I x br	6.6x2.8	5.7x2.3	6.5x2.3	5.6x2.4	6.0x2.6	6.0x2.5	5.9x2.7	5.2x2.4	5.8x2.5	5.6x2.3
Alveolar length m ₁ -m ₃	4.5	4.1	4.2	4.4	4.2	4.5	4.4	4.1	4.5	4.4
Length of mandible	17.1	16.1	15.0	16.0	16.1	16.4	16.4	13.8	15.7	15.9
Alveolar length m ₁ -m ₃	4.8	4.3	4.3	4.5	4.2	4.5	4.6	4.3	4.5	4.5

soles of the feet are naked. The base of the lower surface of the tail behind the anus is greyish, the white colour of the ventral parts of the body reaching only as far as the anus. The tail is uniformly blackish over its entire length, both dorsally and ventrally; it is sparsely haired, except in its extreme basal part, which is covered by fur similar to that of the body. The tail ends in a peculiar thin tuft of long hairs which measure about 8 to 15 mm.

There are only three mammae on each side, one pectoral, one abdominal, and one inguinal; in the dried skins the mammae are pale brownish, sharply set off from the white fur of the ventral surface.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The foramen incisivum is large, widely open, its length exceeds that of the upper tooth-rows; it ends posteriorly at the level of the anterior margin of the first upper molars. The posterior end of the palate (palatine) is straight, weakly curved forwards, or shows in the middle a posteriorly directed blunt point; the palate ends almost at the level of the posterior margin of the last upper molars. By these two characters the species can immediately be distinguished from all other Suriname oryzomine rodents. The length of the upper molar series varies from 4.1 to 4.5 mm (mean of 13 specimens: 4.4 mm). The supraorbital ridges are distinct, but not strongly developed.

In Table 71 the external and skull measurements of 11 Suriname specimens are given. All these specimens have the three molars erupted and functional. The tail is always longer than head and body combined, the ratio showing a large variation.

Remarks. — All specimens collected so far in Suriname have been captured either in human dwellings or in buildings constructed by man. Also the six type specimens from British Guiana are all labelled as being taken indoors. From my material can be concluded that the females and their young prefer human buildings, but no adult male was captured there. Tate (1939: 196) collected his material "in the forests at Auyan-tepui, in gallery woods about Roraima and Limao. It seems to affect the drier phases of the forests of the localities in which it occurs". The Suriname specimens were taken in the northern and southern savannas of Suriname (Zanderij, Matta, and Sipaliwini).

In my material of twelve females, three are pregnant: no. 22355, 5 embryos; no. 22354, three embryos; no. 21969, an unknown number of embryos; and two have neonates (nos. 22360, 3 juveniles; 22359, five juveniles). The smallest of these females (no. 22354) has the length of head and body 106 mm; the largest specimen (no. 22359, five neonates) has the length of head and body 131 mm (the skull is strongly damaged and therefore not mentioned in the table). Thomas (1901: 149) gave the length of his type specimen, a male, as 133 mm.

The systematic position of the various described forms of the genus *Rhipidomys* (see Cabrera, 1961: 422-424; Tate, 1939: 195-196) is not quite clear. For the time being I follow Cabrera, who considered the present form to be a subspecies of *Rhipidomys mastacalis* (Lund, 1841). It is possible that a second species of *Rhipidomys* does occur in Suriname, viz., *R. sclateri* (Thomas, 1887).

Zygodontomys brevicauda microtinus (Thomas, 1894)

Text-figs. 3 (skull), 43h (mandible), pl. 107 fig. 5 (hind foot), pl. 111 fig. 1 (tooth-rows), pl. 121 upper figures (skull), pl. B (animal)

Oryzomys microtinus Thomas, 1894, *Annals Magazine Nat. Hist.*, (6) 14: 358-359.

Type locality. — "Surinam". Restricted here to the plantation "Clevia", north of Paramaribo.

Synonymies. — Cabrera, 1961: 464 (under *Z. microtinus microtinus*); Hershkovitz, 1962a: 196-207, fig. 50 (map), fig. 51 (skull).

Vernacular names. — (E) Cane Mouse; (N) Grasmuis.

Distribution. — The species *Zygodontomys brevicauda* (J. A. Allen & Chapman, 1893) "ranges from north of the Rio Amazonas into Central America" (Hershkovitz, 1962a: 203); it is known from Brazil, the Guianas, Trinidad, Tobago, Venezuela, Colombia, Panama and Costa Rica. The subspecies *Z. brevicauda microtinus* occurs in the Guianas and the adjacent regions of Venezuela and northern Brazil.

Occurrence in Suriname. — Possibly the first record of the Cane Mouse from Suriname is by Teenstra (1837 (2): 401; see under Remarks on *Holochilus*, p. 426). The first reliable record is by Kappler (1881: 164), who listed a specimen under "Hesperomys?" (see further under Remarks, pp. 417, 418). As mentioned above, Thomas (1894: 358-359) described his *Oryzomys microtinus* after a specimen collected in Suriname by E. Bartlett. Goodwin (1965) listed 6 specimens of the present form from Suriname (including the type), gave their measurements and figured (figs. 1c, 2c) the skull of a specimen from La Poule (on the Saramacca River, west of Uitkijk) from the collection of the Chicago Museum; also the specimens from Carolina Creek (50 km south of Paramaribo), Loksiehatti (on the Saramacca River, about 80 km south-west of Paramaribo) and Dirkshoop (on the Saramacca River, south of Groningen) mentioned by Goodwin are the property of the Chicago Museum.

The nocturnal and burrowing *Zygodontomys brevicauda* is one of the most common cricetine rodents in Suriname. The numerous specimens of the species examined all originate from the coastal region. The southernmost localities in my material are Gododrai and Loksiehatti, at 55 and 90 km inland respectively. From the following localities specimens have been examined:

1. Wageningen, lower Nickerie River, northern Nickerie District, 6 males (nos. 21599-21603, 22247, skins and skulls), 3 females (nos. 21598, 21604, 21605, skins and skulls).
2. Matta, Amerindian village about 15 km west of Zanderij airport, Saramacca District, 1 female (no. 21967, skin and skull).
3. Garnizoenspad, 19 km west of Paramaribo, Suriname District, 2 skulls (nos. 21853, 21854).
4. Plantation "Clevia", west bank of Suriname River north-east of Paramaribo, 12 males (nos. 17230, 21590, 21591, 21606-21610, 21957, 22389, skins and skulls; 21629, skull; 21956, skin), 7 females (nos. 18208, 21589, 21592, 21611, skins and skulls; 21627, 21628, 22386, skulls).
5. Agricultural Experimental Station (Cultuurtuin), Paramaribo, 21 males (nos. 18260a, b, 21587, 21588, 21597, 21949, 21951, 21952, 22382, 22384, skins and skulls; 21617b, c, e, f, l, m, o, p, r, skulls; 21953, 21955, skins), 16 females (nos. 18260c-e, 21950, 21958, 22383, 22385, skins and skulls; 21617a, d, g-j, n, q, skulls; 21954, skin).
6. Lelydorp, about 15 km south of Paramaribo, Suriname District, 2 females (nos. 21616, 23320, skins and skulls).

7. Loksiehatti on upper Saramacca River, Brokopondo District, about 80 km south-west of Paramaribo, 1 female (no. 21615, skin and skull).

8. Finisanti near Loksiehatti, 2 males (nos. 21613, 21614, skins and skulls).

9. Berg en Dal, west bank of Suriname River, north of Brokopondo Lake, about 75 km south of Paramaribo, Brokopondo District, 1 male (no. 22381, skin and skull).

10. Gododrai, upper Commewijne River, about 5°25'N 54°40'W, Commewijne District, 3 males (nos. 21594, 21595, skins and skulls; 22388, skull), 3 females (nos. 21593, 21596, 22387, skins and skulls).

11. Between Moengotapoe and the coast near the Wiawia Bank, at 0.5 to 2.5 km from the sea-shore, northern Marowijne District, 3 specimens (nos. 21612, 21625, skins and skulls; 21626, skull).

12. Suriname, without more precise locality indication, 1 adult female holotype (BMNH no. 66.8.11.16, skin and skull), 3 specimens (ZMA nos. 1601, 8855, 8858, skins and skulls).

Description. — The following description is based on all the material mentioned above. The general colour of the dorsal surface is dark greyish brown finely grizzled with tawny. There is a faint indication of a darker median area on the back. The hairs have a dark slaty colour from their base up, the tips are either black or light brown to tawny. In the fur of the sides the tawny tips are more yellowish, the sides hereby becoming somewhat lighter than the dorsal surface; this lighter colour slightly extends on to the head. The colour of the sides merges imperceptibly both with that of the back and that of the ventral surface. The latter has the hairs dark to very dark slate grey with lighter, yellowish or dirty white tips. The grey ventral colour extends on to the throat and chin. The dorsal fur is long, soft and glossy. The ears are rounded, rather large and distinctly protrude through the fur; they show short hairs on both inner and outer surfaces. The basal part of hind and forelegs have the outside colour of the fur similar to that of the sides of the body, while the inside colour is greyish like the ventral surface. The upper surface of the feet is covered with sparse pale brown short hairs. The tail is much shorter than the combined length of head and body; in the 31 examined specimens the ratio length of tail/length of head and body varies from 0.63 to 0.82 (mean: 0.73). The fur of the body extends only onto the extreme basal part of the tail. The rest of the tail bears rather short black appressed scattered hairs; sometimes these hairs have a greater or smaller distal part white, such pale hairs usually being most numerous ventrally.

Dorsally the juveniles are darker than the adults, being almost uniformly slate grey over the greater part of the back.

There are two pectoral, no abdominal and two inguinal mammae on each side.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The most characteristic feature of the skull of this species is the foramen incisivum, which is very long, being longer than the part of the palate (palatine) behind it. The foramen is elongate pear-shaped, being widest in or behind the middle; posteriorly it reaches to the anterior margin of the upper molars or slightly beyond. The posterior margin of the upper molars is situated distinctly before the end of the palate. The crown of the upper molars is characterized by that the inner and outer folds are placed opposite each other and do not alternate as in other small Suriname cricetine rodents. The alveolar length of the

upper molars combined varies in 48 examined specimens from 4.2 to 4.9 mm (mean: 4.5 mm). The mandible has the processus coronoideus slender, elongate and hook-shaped curved posteriorly.

In Tables 72 and 73 the external and skull measurements of 11 males and 11 females from Suriname (including those of the holotype of the species) are given. Of the holotype, the skull measurements were taken by me during a visit to the British Museum (Nat. Hist.), while the external measurements are copied from Thomas (1894: 359).

Remarks. — A pregnant female was collected on 17 January 1963 in the Cultuurtuin (Agricultural Experimental Station) at Paramaribo; it bore two embryos. We found on the same date and in the same place two juveniles of the species. No other data on the reproduction of the Cane Mouse in Suriname are available. Walker (1964 (2): 781), in his account of the life history of the genus *Zygodontomys*, noted (1) that after a gestation period of 28 days two to eight young are born, the usual number being four, and (2) that the animals become sexually mature at three or four months of age.

Some specimens from Gododrai were caught indoors at night, they were apparently in search of food.

As is furtheron pointed out under *Holochilus brasiliensis nanus* (see p. 426) it is possible that the field rats mentioned by Teenstra (1837 (2): 401), which caused great damage to the sugar plantations in Suriname, might have been the present species. At present the Cane Mouse is still a pest in the coastal plain wherever suitable habitats are found. The animal is attracted by human cultivation and causes much damage to the rice fields in the Wageningen-Nieuw Nickerie area as well as to the native gardens, where it feeds on rice, seeds, corn, egg plant, cabbage, beans and other vegetables. Although the animal is usually found near water, it seems to prefer, at least in Suriname, drier places than *Holochilus*, occurring higher up on the dykes and in grass lands.

One of the enemies of the Cane Mouse in Suriname is the Barn Owl, *Tyto alba hellmayri* Grison & Greenway, 1937, as is shown by Haverschmidt (1962: 241, table II; see also Haverschmidt, 1968: 158), who based himself on the examination of a great number of pellets of the Barn Owl, collected at five localities in the coastal region, four of which are situated near Paramaribo and one on the Commewijne River. Haverschmidt's investigations clearly showed that *Zygodontomys* is one of the most important preys of the Suriname Barn Owl. After examination of many pellets of this Owl from the Wageningen rice project I came to the same conclusion. Also in the stomachs of birds of prey, viz., *Buteo nitidus nitidus* (Latham, 1790) and *Elanus leucurus leucurus* (Vieillot, 1818), I found remains of the Cane Mouse (see Voous, 1969: 133, 143; on page 133 the generic name *Zygodontomys* is misspelled *Zygodon*). Haverschmidt (1968: 47) has already mentioned *Elanus* as a predator of *Zygodontomys*.

Kappler (1881: 164) listed "Hesperomys?" in his list of the mammals of Suriname. His remarks were, without doubt, based on the mounted juvenile male specimen,

TABLE 72

External and skull measurements of eleven males of *Zygodontomys brevicauda microtinus* (Thomas) from Suriname in the Leiden Museum.

Reg. number	21591	21599	21953	21957	21603	21590	21625	21956	21601	21607	21606
Sex	♂	♂	♂	♂	♂	♂	♂	♂	♂	♂	♂
Head and body	123	116	130	135	142	131	-	137	103	114	111
Tail	96	95	80	85	99	96	-	95	72	91	80
Hind foot	28	27.5	27	27	29	28	-	27	25.5	25	25
Ear	17	16.5	16	17	17	16	-	17	16	16	15
Weight, grams	-	-	-	-	-	-	-	-	-	-	-
Greatest length skull	31.2	28.6	29.4	28.9	32.9	32.3	31.1	30.6	25.4	28.9	28.1
Condylobasal length	30.0	26.6	27.5	27.0	30.8	30.1	29.1	28.8	24.0	27.4	26.0
Basal length	27.5	24.0	24.8	24.5	28.0	27.9	26.3	26.5	21.6	24.9	23.7
Palatal length	16.0	14.2	14.6	14.3	16.6	16.0	15.0	15.4	12.4	14.6	13.8
Length of nasals	13.2	10.0	12.1	11.2	11.9	13.3	12.9	12.6	9.6	12.0	10.7
Interorbital constriction	5.3	5.0	5.0	4.6	5.2	5.3	5.1	4.7	5.0	4.9	5.1
Zygomatic breadth	-	14.1	15.1	14.8	17.1	16.5	15.9	15.5	13.2	14.8	14.0
Breadth of braincase	13.3	12.3	12.4	12.5	13.1	12.8	12.8	12.4	12.2	12.3	12.4
Diastema	8.7	7.5	7.7	7.4	8.7	9.0	8.1	8.1	6.3	7.6	7.1
Height of rostrum	8.7	7.5	8.2	7.5	8.4	8.5	8.1	8.1	6.8	7.6	7.5
For. incisivum, l x br	6.9x3.2	5.8x2.3	6.5x2.4	6.1x2.4	7.1x2.6	6.9x3.1	6.7x2.7	6.2x2.5	5.0x2.1	6.5x2.6	6.4x2.5
Alveolar length $m^1 - m^3$	4.8	4.3	4.3	4.3	4.9	4.9	4.5	4.5	4.5	4.6	4.7
Length of mandible	17.7	15.6	16.3	15.8	17.7	17.6	16.6	17.0	14.4	16.0	15.6
Alveolar length $m_1 - m_3$	5.0	4.4	4.4	4.4	5.0	4.8	4.6	4.5	4.7	4.6	4.7

TABLE 73

External and skull measurements of eleven females of *Zygodontomys brevicauda microtinus* (Thomas) from Suriname; the first specimen is the holotype of the subspecies.

Museum	BMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH
Reg. number	66.8.11.16	21605	22385	21628	21589	21604	22383	21617a	21616	21615	21950
Sex	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀
Head and body	115	131	110	124	125	119	122	-	131	136	145
Tail	84	92	83	79	84	85	90	-	89	92	77
Hind foot	24.5	26	26	26	26	26	27	-	27	25	25
Ear	16	17	15	16	15	15	18	-	18	19	15
Weight, grams	-	-	40	-	-	-	55	-	60	70	-
Greatest length skull	29.5	29.7	27.9	30.1	29.1	27.9	30.2	27.9	29.9	29.4	28.7
Condylobasal length skull	27.3	27.8	26.0	27.7	27.4	25.9	28.0	26.5	27.1	27.5	26.8
Basal length	24.7	25.3	23.8	25.6	25.0	23.5	25.8	23.9	24.4	25.2	24.4
Palatal length	14.3	14.7	13.7	14.9	14.5	13.8	14.9	14.2	14.4	14.5	14.0
Length of nasals	13.0	11.9	11.2	12.3	11.5	10.9	12.4	11.9	12.0	12.3	11.5
Interorbital constriction	4.7	4.9	4.6	4.8	5.0	4.7	4.8	4.9	5.0	4.8	4.8
Zygomatic breadth	15.9	14.8	14.2	15.5	14.6	14.5	15.8	14.0	14.3	15.9	14.9
Breadth of braincase	12.5	12.9	11.9	12.4	12.4	12.2	12.5	12.1	12.5	12.2	12.1
Diastema	8.0	7.8	7.1	7.8	7.4	7.1	8.2	7.3	7.4	7.4	7.2
Height of rostrum	-	7.8	7.7	7.8	7.7	6.9	8.2	7.7	7.4	7.4	7.2
For. incisivum, l x br	6.1x2.9	6.2x2.6	5.6x2.2	6.8x2.6	6.4x2.7	5.9x2.3	6.2x2.9	6.1x2.4	6.3x2.6	6.3x2.7	6.0x2.9
Alveolar length $m^1 - m^3$	4.2	4.4	4.4	4.6	4.6	4.3	4.4	4.3	4.9	4.7	4.3
Length of mandible	16.6	16.9	15.1	16.5	16.1	15.7	16.2	15.6	16.4	16.8	15.2
Alveolar length $m_1 - m_3$	4.3	4.6	4.6	4.5	4.8	4.5	4.6	4.5	4.9	4.7	4.5

preserved in the Stuttgart Museum, labelled: "513a ♂ juv. *Oryzomys arvicoloides* Wagner, Surinam, Kplr. 1854". Extraction of the broken skull showed the specimen to be a juvenile of *Zygodontomys brevicauda microtinus*, in which only two molars are erupted.

The female (ZMA no. 1604, skin preserved in alcohol, skull extracted), collected during the 1922 expedition to the Hendriktop (summit of Mount Hendrik; alt. 1080 m), does not have an exact indication of the locality. As all the Suriname specimens examined by me were collected in lowlands, it seems likely that this specimen was collected during the expedition before or after its stay in the interior (see Gonggrijp & Stahel, 1923, pl. 1, map).

Originally the Suriname Cane Mouse was described as a separate species under the name *Oryzomys microtinus* by Thomas (1894: 358). Some years later Thomas (1898: 270) placed it in the genus *Zygodontomys*, erected by J. A. Allen in 1897 (p. 38). Tate (1939: 188) recognized two subspecies in *Zygodontomys microtinus*, to which Cabrera (1961: 464) added a third. Hershkovitz (1962a: 205) considered *Zygodontomys brevicauda* (J. A. Allen & Chapman, 1893) to be an older synonym of *Z. microtinus* (Thomas, 1894), but accepted the subspecific status of *Z. microtinus*. Consequently he used the name *Zygodontomys brevicauda microtinus* (Thomas, 1894) for the Suriname Cane Mouse. Goodwin (1965) described a new subspecies *Zygodontomys brevicauda soldadoensis* from Trinidad, the West Indies, and compared this subspecies extensively with *Z. brevicauda microtinus* from Suriname and with some other subspecies of *Z. brevicauda*.

***Holochilus brasiliensis nanus* Thomas, 1897**

Text-figs. 42c (incisors), 43i (mandible), pl. 107 fig. 4 (hind foot), pl. 111 fig. 2 (upper and lower tooth-rows), pl. 120 upper figures (skull), pl. C (animal)

Holochilus nanus Thomas, 1897, *Annals Magazine Nat. Hist.*, (6) 19: 495-496.

Type locality. — "Source [misspelling for Soure], Island of Marajó, Mouth of the Amazon", Pará, north-eastern Brazil.

Synonymies. — Cabrera, 1961: 504-505; Hershkovitz, 1955a: 648, 666-667, 668-670, tabs. 2 and 6, figs. 139, 140 (maps), pls. 17-20, 22-29 (teeth and skull).

Vernacular names. — (E) Web-footed Marsh Rat; (N) Surinaamse Moerasrat.

Distribution. — According to Hershkovitz (1955a: 648) *Holochilus brasiliensis* (Desmarest, 1819) has the following distribution: "Swamps, grasslands, and other moist, unforested situations from the coastal plains of Venezuela west [recte east] into the Guianan lowlands, thence into suitable habitats in Brazil, Uruguay, Paraguay, the Amazonian basin in Peru and Bolivia, the Río Paraguay basin in Bolivia, and in Argentina the Paraná basin, the department of Buenos Aires, and possibly the department of Eva Perón; altitudinal range, sea level to approximately 2,000 meters above". The subspecies *H. brasiliensis nanus* is found in the coastal region of the Guianas and the lower Amazon basin (see further under Remarks, p. 427).

Occurrence in Suriname. — The Marsh Rat occurs throughout the coastal plain of Suriname. The swamps, the grass-lined banks of creeks and the ditches form ideal habitats for this rodent, which is specialized for living in paludine and semi-aquatic environments. Such regions have always been inhabited by the Marsh Rat, but cultivation has opened new areas to them, often causing a rapid increase of the population, so that in some years the species can become a real pest. As is known from many other small rodents, such an increase in the population is usually followed by an even more sudden decrease, the causes of which are as yet unknown. In the polders of the rice projects, which were started in 1949 in north-western Suriname, *Holochilus* caused enormous damage by destroying a large part of the young rice plants (bibit). In the native gardens the Marsh Rat feeds on bibit, egg plant, cabbage, tomatoes, beans, cow beans and many other vegetables.

The first actual specimen of the Marsh Rat obtained by the Leiden Museum dates from the 1948-1949 Suriname Expedition (see Bakker & Lanjouw, 1949), when on 30 November 1948 a male (no. 16423, skin and skull) was found in an experimental pit near Wiawia, north-eastern Suriname. The first specimen sent in for identification in connection with rat control in agriculture was received in 1954. This semi-adult specimen (no. 16424, skin and skull) came from the Prins Bernhard Polder, south-east of Nieuw Nickerie, north-western Suriname, where in 1949 the first virginial swamps were cultivated for a mechanized rice project (see Van Beukering, 1952).

The Leiden Museum possesses at present material of the Marsh Rat from the following localities:

1. Prins Bernhard Polder, south-east of Nieuw Nickerie, extreme north-western part of Nickerie District, 2 specimens (nos. 16424, 22040, skins and skulls).
2. Wageningen, rice project, north bank of lower Nickerie River, northern Nickerie District, 40 males and 22 females (nos. 21735, 21945, 21946, 21977-22004, 22006, 22008-22039, 22333, 23109, 23110, skins and skulls).
3. Garnizoenspad, 19 km due west of Paramaribo, Saramacca District, 3 specimens (nos. 21849-21851, skins and skulls).
4. Kwatta, west of Paramaribo, Suriname District, 2 specimens (nos. 10442, 10443, skins and skulls).
5. Plantation "Clevia", west bank of Suriname River north-east of Paramaribo, 2 specimens (nos. 22006, 22007, skins and skulls).
6. Kernkampweg, Paramaribo, 4 specimens (nos. 21941-21944, skins and skulls).
7. Domburg, west bank of Suriname River, about 16 km south-east of Paramaribo, Suriname District, 1 specimen (no. 17257, skin and skull).
8. North coast of Marowijne District near Wiawia Bank, 1 specimen (no. 16423, skin and skull).

Description. — The following description is based on all Suriname specimens mentioned above. The dorsal surface of the animal is rather uniformly dark greyish brown finely grizzled with yellow; in some specimens a faint darker median area can be distinguished. Where the yellow dominates the colour becomes dark golden brown. The hairs of the rather woolly fur are somewhat shiny, but never obtain the glossy appearance shown by *Nectomys* (see p. 409). The thin basal half to three-

fourth of the hairs has a slaty colour, the stronger distal part is either uniformly dark brownish in colour or shows broad pale yellowish bands, while also entirely yellowish hairs do occur. The head is sometimes slightly darker than the rest of the dorsal surface. The ears hardly protrude through the fur and are very hairy inside and out.

The sides of the body are paler and more brown, varying from buffy cinnamon to yellowish brown; this colour merges imperceptibly with the colour of the dorsal surface. In many specimens the colour of the sides reaches farthest dorsally at the base of the forelegs, while the cheeks also are often of a yellowish brown colour, as is the lower part of the snout.

The ventral surface is of a rather uniform pale colour. In the various specimens this colour varies greatly. In some it is pale grey washed with pale chestnut or cinnamon, in others the grey background is replaced by white; also the intensity of the chestnut or cinnamon colour is variable, in some specimens it dominates entirely. All intergradations between these extremes occur. The basal fourth to the basal half of the hairs is slate grey, the distal part being whitish, yellowish, brownish, cinnamon or greyish. In most specimens the throat and the inner surface of the forelegs, sometimes also the inner surface and the base of the hind legs, are distinctly lighter than the rest of the ventral surface. The colour of the ventral parts is set off from that of the sides, be it not always clearly so. In the basal part the outer surface of the legs has the same colour as the dorsal surface of the body; the dorsal part of the feet, however, is much lighter, being yellowish white to pale yellowish brown; often a spot of dark hairs is visible just before the base of the nails. The hind feet are very weakly or not at all webbed between the middle three of the toes.

The dark greyish tail is furred only in its very extreme basal part, the colour of this fur is the same as that of the adjoining body; the rest of the tail is sparsely haired with short and stiff brown hairs both dorsally and ventrally. Sometimes a very small apical tuft may be seen. In almost all animals the tail is shorter than the combined length of head and body; in a few specimens the length of the tail is equal to or somewhat longer than the combined length of head and body.

The dorsal surface of the juveniles, in which one or two molars are erupted, is darker, more greyish than in the adults (with three molars erupted and functional); the ventral surface is usually light greyish, so that the line of demarcation is more pronounced here than in the adults.

According to Hershkovitz (1955a: 652) there are "2 pairs pectoral, 2 pairs abdominal, 1 pair inguinal" mammae in *Holochilus brasiliensis*. In my material, however, I found in total 8 mammae. It is difficult to decide whether the pair of mammae following the anterior pectoral mammae are true abdominal mammae or still must be considered pectoral mammae, the latter seems more likely to me. The same problem occurs with the inguinal mammae: the mammae just before the posterior (inguinal) mammae in my opinion are rather inguinal than abdominal mammae. Therefore it is most likely that in my material the mammae formula is: $(2 + 0 + 2) =$

8. In the examined females, which are all non-lactating, the mammae are hidden by the fur and are extremely difficult to locate.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The foramen incisivum is elliptical and long, about three times as long as broad. In most specimens it ends slightly before the line connecting the anterior margins of the first two upper molars, but also skulls are found in which the posterior end of the foramen incisivum reaches to this line or even slightly beyond. The palate usually ends slightly behind the line connecting the posterior margins of the last two molars; sometimes it just reaches that line. The interorbital constriction is rather narrow, varying in 53 specimens from 3.8 to 5.1 mm (mean: 4.4 mm); by this character the skull of the Suriname Marsh Rat immediately can be distinguished from that of *Nectomys*, in which the constriction varies from 6.6 to 7.5 mm. The supraorbital ridges of *Holochilus* are, at least in full-grown specimens, well developed, continuing to about the middle of the parietals. The bullae are remarkably small, about 5 mm long and broad. In 53 skulls from Suriname the alveolar length of the upper molar series (m^1 - m^3) varies from 6.8 to 8.1 mm (mean: 7.4 mm).

In Table 74 the external and skull measurements of nine females from Suriname are given; in parentheses are added the skull measurements of the type specimen of *Holochilus nanus*, taken by me in the British Museum (Nat. Hist.). The type of *Holochilus nanus* (no. 97.4.1.2) is a young female, in which the three molars are erupted and functional. My rather extensive material from Suriname shows that when the combined length of head and body is about 115 to 120 mm, the three molars are all erupted and functional. The skull at that body size is smooth and the

TABLE 74

External and skull measurements of nine females of *Holochilus brasiliensis* (Desmarest) from Suriname (first nine columns), and of the holotype of *Holochilus nanus* Thomas (last column).

Museum	BMNH	BMNH	BMNH	BMNH	BMNH	BMNH	BMNH	BMNH	BMNH	BMNH
Reg. number	10442	22037	23110	21988	22021	21941	21998	21977	21992	97.4.1.2
Head and body	-	189	175	170	176	169	164	150	150	(122)
Tail	-	169	163	150	135	145	-	150	130	(112)
Hind foot	-	42	40	39	42	38	42	39	40	(32)
Ear	-	16	16	-	16	16	-	-	-	(14)
Greatest length skull	41.7	41.5	39.8	39.0	37.2	36.8	36.9	36.4	35.4	(32.5)
Condylbasal length	39.6	39.2	37.8	35.9	35.0	34.8	34.5	34.4	33.6	(30.9)
Basal length	36.7	36.4	35.5	33.1	32.2	32.2	31.9	32.0	31.1	(28.4)
Palatal length	23.0	23.4	22.7	21.5	20.8	20.6	20.4	20.4	19.6	(18.4)
Length of nasals	16.9	15.3	16.1	16.0	14.3	13.9	14.8	14.4	14.5	(12.3)
Interorbital constriction	4.6	4.3	4.9	4.6	4.9	4.6	4.5	4.2	4.5	(4.7)
Zygomatic breadth	22.7	22.4	21.8	21.0	21.2	18.9	20.6	20.1	19.5	(18.7)
Breadth of braincase	14.4	14.9	13.9	-	14.5	13.3	13.4	13.4	13.3	(14.0)
Diastema	12.6	13.5	12.4	11.7	10.6	11.0	10.4	10.4	10.1	(9.5)
Height of rostrum	13.4	13.8	13.4	12.0	11.5	11.0	11.4	10.9	10.5	(-)
For. incisivum, l x br	8.9x2.8	8.6x2.9	8.0x3.0	8.1x2.8	7.8x2.7	7.7x2.6	7.9x2.7	7.5x2.5	7.7x2.7	(6.9x2.3)
Alveolar length m^1 - m^3	7.5	7.6	7.4	7.3	7.6	7.4	7.3	7.3	7.0	(6.6)
Length of mandible	25.3	25.8	24.5	23.3	22.8	22.3	22.5	22.6	21.8	(20.5)
Alveolar length m_1 - m_3	7.3	8.0	7.5	7.7	7.6	7.4	7.4	7.3	7.0	(6.8)

interorbital ridges are only weakly developed, while all suturae are distinctly visible. During my visit in June 1963 to the rice fields at Wageningen I obtained only one pregnant specimen carrying five embryos; the combined length of head and body of the female was 176, the length of the tail 135, the hind foot 42, and the ear 16 mm.

In Table 75 the external and skull measurements of ten males from Suriname are given; in parentheses are added (1) those of the male holotype of *Holochilus sciureus berbicensis* Morrison-Scott, 1937, from the "Blairmont Plantation, Berbice, British Guiana", preserved in the British Museum as no. 1937.6.24.2, and (2) those of the male holotype of *Holochilus guianae* Thomas, 1901, from the Kanuku Mountains, British Guiana, preserved in the British Museum as no. 1.6.4.87, of which the skull measurements were taken by me in 1966. The type specimen of *H. guianae* does not show a single striking difference from my material and fits well within my large Suriname series; it undoubtedly belongs to the same species. However, all my specimens originate from the coastal plain, and apart from the type of *H. guianae*, I have not examined any mountain specimens of the present species. It is, therefore, possible that when large series of *H. brasiliensis* from the coastal area and from the mountains of the Guianas can be compared subspecific characters will appear.

Unfortunately I collected not only fewer females than males, but after extraction of the skull of the full-grown females most of them proved to be more or less strongly damaged. Therefore, after comparing the measurements as given in Tables 74 and 75, one obtains the impression that on an average the males are larger than the females. This impression may be correct, but also may be due to the fact that the material is not homogeneous.

Remarks. — Little can be remarked about the time of the breeding season(s), if any can be distinguished. The only pregnant female (with five embryos) in my material was obtained in June. Juveniles, of which the combined length of head and body varies from 85 to 115 mm, were caught in December and June.

As already pointed out above the Marsh Rat has become a serious pest in the extensive rice fields in the Wageningen-Nieuw Nickerie area, north-western Suriname. Many interesting data on this subject were mentioned by De Wit (1956; 1960: 193-198, figs. 45-47). As De Wit pointed out, the methods used to fight these rats in Suriname are entirely based on the methods employed in Java against the Javanese "sawah rats", which belong to the genus *Rattus*. The relatively minor success of these methods in Suriname might be due to the fact that the biology of *Holochilus* is entirely different from that of *Rattus*. In order to develop an effective method for the control of the Marsh Rat, as well as of *Zygodontomys brevicauda microtinus* (Thomas, 1894) and *Oryzomys delicatus* J. A. Allen & Chapman, 1893, which likewise can become pests in the rice fields, a thorough investigation in loco of the biology, habits and habitats of the species involved is a primary necessity. The only efficient way to control *Holochilus* is to try to destroy its habitat as much as possible. The new methods described by De Wit (1960: 198), based on a study of the habitat

TABLE 75

External and skull measurements of ten males of *Holochilus brasiliensis* (Desmarest) from Suriname (first 10 columns), those of the lectotype of *H. sciureus berbicensis* Morrison-Scott (eleventh column), and those of the holotype of *H. guianae* Thomas (last column).

Museum	RUNH	RUNH	RUNH	RUNH	RUNH	RUNH	RUNH	RUNH	RUNH	RUNH	RUNH	RUNH	RUNH	RUNH	RUNH
Reg. number	23109	21989	21735	22004	21987	22015	22025	22018	21942	22022	1937.6.24.2	1.6.4.87			
Head and body	205	188	202	186	190	192	198	182	173	186	(178)	(178)			
Tail	155	180	171	162	-	139	145	166	145	149	(144)	(159)			
Hind foot	41	47	47	46	41	41	43	43	42	44	(39)	(38)			
Ear	16.5	-	18	-	-	16.5	17.5	17	17	16.5	(16)	(15)			
Greatest length skull	43.0	42.4	42.6	40.0	42.6	42.3	39.9	40.8	39.5	38.6	(39.0)	(37.1)			
Condylobasal length	40.3	40.3	40.0	39.8	39.6	39.1	38.0	37.9	37.9	36.8	(36.3)	(35.5)			
Basal length	38.0	37.5	37.1	36.9	36.7	37.1	35.5	35.0	35.1	33.4	(34.0)	(32.8)			
Palatal length	24.0	23.4	23.7	23.6	23.5	23.7	22.8	22.1	22.1	21.1	(21.8)	(21.0)			
Length of nasals	16.8	16.4	18.1	14.7	16.2	16.1	15.7	16.1	15.4	14.9	(15.1)	(14.3)			
Interorbital constriction	4.9	4.9	4.8	5.0	4.4	4.8	4.6	4.8	4.1	4.7	(4.3)	(4.9)			
Zygomatic breadth	23.9	23.9	23.1	22.9	22.5	23.2	22.4	21.8	21.6	21.6	(21.4)	(20.2)			
Breadth of braincase	15.2	16.0	15.5	15.3	15.5	14.7	15.0	14.5	14.4	14.6	(14.5)	(14.3)			
Diastema	13.4	11.9	12.5	12.2	12.8	12.8	12.1	11.2	12.3	10.9	(11.5)	(10.8)			
Height of rostrum	13.4	13.6	13.3	13.8	13.2	13.9	13.0	12.1	12.1	11.8	-	-			
For. incisivum, l x br	8.9x3.0	9.0x3.0	9.1x3.0	8.0x2.8	9.0x2.9	8.2x2.7	8.7x3.0	8.4x2.8	8.0x2.6	8.2x2.9	(7.4x2.5)	(7.2x2.5)			
Alveolar length m ¹ -m ³	7.5	8.1	7.9	7.6	7.2	7.5	7.4	7.7	7.4	7.5	(7.1)	(7.4)			
Length of mandible	26.1	26.0	24.4	25.4	24.7	25.0	23.6	23.7	24.4	22.9	(23.0)	(±22)			
Alveolar length m _j -m ₃	7.8	8.1	7.9	7.7	7.2	7.7	7.2	8.0	7.4	7.7	(7.3)	(7.1)			

of the rats, have already produced good results: "Since at Wageningen the clay of the dams was hard at the surface and moist and sticky at some depth below, the rats were not able to burrow deep. They concealed below the sward, in which connection the *Cynodon dactylon* planted on the dams offered them a favourable closed layer of vegetation. Many of these rats could be quite easily discovered though and knocked down by hand. Very good catches were occasionally made by rolling the sides of the dams with brush cutters. Some of the rats were crushed and others crept out behind the roller and were then clubbed to death by workmen who exhibited great skill in this respect (up to a hundred rats an hour were killed by one man). Colonies of thousands of rats were also caught by cleaning out old creeks which were filled up with timber remains. Finally, the fact that there were few dogs in the thinly populated area no doubt assisted the plague. We have often marvelled at the ceaseless energy with which a dog will bite to death one rat after another. The hundreds of dogs that roam about the native rice polders are certainly more useful than most people realize".

It also would be useful to encourage the settlement of the natural enemies of *Holochilus*. It is well known that owls feed on rodents, the Barn Owl, *Tyto alba hellmayri* Griscom & Greenway, 1937, being one of the most important species in this respect (see Haverschmidt, 1962; 1968: 156-158). During my visit in 1963 I observed in the rice fields at Wageningen some couples of the Barn Owl, and analyzed many pellets with skulls of the Marsh Rat. In pellets of the Great Horned Owl, *Bubo virginianus* (Gmelin, 1788), from a swamp north of Wageningen, I found two skull fragments of the Marsh Rat. In the stomach of *Elanus leucurus* (Vieillot, 1818), the White-tailed Kite, and *Circus buffoni* (Gmelin, 1788), the Long-winged Harrier, I also found skull remains of *Holochilus*. Of course many more species of birds do prey upon the Marsh Rat, but of these no records have so far been made known. Ir. E. W. van Brussel (in litt. 22 January 1966) also indicated the snake species 'Reditere', *Drymarchon corais corais* (Boie, 1827), as a predator of *Holochilus*.

It seems probable that old accounts of damage caused by rats to the crops in Suriname are partly or wholly referable to the Marsh Rat. So Von Sack (1821 (2):204) mentioned that "De ratten zijn in zonderheid voor de suiker-plantaadjes nadeelig, en alle moeite, om haar uitteroeijen, is te vergeefs" (the rats are particularly harmful to the sugar plantations, and all the efforts taken to eradicate them have been in vain). Von Sack did not distinguish between the murine rats and the cricetine field rats. Teenstra (1837 (2):401) did make this distinction, and after dealing with the Black Rat and the Brown Rat, he continued: "Veldratten en veldmuizen zijn hier mede tot groot nadeel der suikervelden zeer veelvuldig; echter schijnen de ratten in Cayenne nog veel meer schade te veroorzaken, dan in Suriname" (Field rats and field mice do occur here plentifully, causing great harm to the sugar fields; however, in Cayenne they seem to cause still more damage than in Suriname). The brothers Penard ("De Surinamer", 16 April 1905) remarked: "In de rietvelden richten de ratten groote schade aan. Zij graven er holen onder de wortels der rietstengels om er

zoo aan te kunnen knagen. Op elke betaallijst van suikerplantages komt dan ook een post voor betrekking hebbende op het dooden van ratten" (In the sugar cane fields the rats cause great damage. They dig holes in order to reach the roots of the sugar cane which they eat. Every payroll of the sugar plantations therefore contains a special entry for the killing of rats).

In the old accounts the damage done by rats to sugar plantations is usually stressed, while nothing is noted about any harm done to rice fields. This is possibly due to the fact that in the 18th and 19th centuries the cultivation of rice (although mentioned, e.g., by Stedman (1796 (2):319-320) and by Teenstra (1837 (1):430-433)), was insignificant as compared to that of the sugar. Only very recently, about 1949, large rice projects were started, viz., in the area around Wageningen and Nickerie.

It is doubtful whether or not the damage caused by field rats to sugar plantations as reported by previous authors was due to *Holochilus*. The Marsh Rat certainly is to be blamed for the great damage caused to rice fields. As, however, cane sugar is cultivated on dry ground and not in marshy areas as rice is, it is possible that the rats damaging the sugar cane belong to a different species. So far I have not received any material, neither *Holochilus* nor other rodents, collected in sugar plantations. In this connection it is interesting to note that Teenstra (1837 (1):202-203), when dealing with "ongedierte" (= vermin) in the sugar cane fields stated: "...; ook is men, vooral op de hooge landen, met eene soort van kleine grijze ratten en veldmuizen geplaagd, ..." (also, especially on the higher grounds, a species of small grey rats and field mice form a pest). As in the Wageningen rice polders *Holochilus* is usually found in the low marshy areas and *Zygodontomys brevicauda microtinus* (Thomas, 1894), the Cane Mouse, and *Oryzomys delicatus* J. A. Allen & Chapman, 1897, the Pygmy Rice Rat, often on the somewhat higher grounds, and, furthermore, as *Zygodontomys* and *Oryzomys delicatus* are smaller and of a more greyish colour than *Holochilus*, it is not quite unlikely that the rats and field mice referred to by Teenstra belong to the former two genera. However, this is pure speculation and the question can only be solved, if at all, by collecting in the sugar cane fields of Suriname.

The damage caused by the rats to rice and sugar fields fluctuated: e.g., in 1926 great damage was reported by Van Dijk (1928:28), while in 1928 damage was reported from the Saramacca District only (see Fernandes, 1931:47). Many more reports of damage caused by field rats in Suriname can be found in various agricultural and other publications.

In the Paramaribo newspaper "De West" of 13 August 1965 a note was published that near Kwatta, west of Paramaribo, a kind of "bosrat" (= bush-rat) caused much damage to the fields where beans, tomatoes, rice, string beans, cabbage and egg plants were cultivated. These rats, of which Ir. E. W. van Brussel sent me two specimens for identification, proved to be *Holochilus*. Ir. van Brussel informed me in a letter of 22 January 1966, that this species had never been as destructive as during the previous six months.

Externally *Holochilus brasiliensis nanus* can be easily confused with *Nectomys squamipes melanius* Thomas, 1910, the Guiana Water Rat. The differences between these two species are dealt with on p. 411.

Notwithstanding Hershkovitz's (1955a) revision of the genus *Holochilus*, the status of several of its subspecies is still dubious. Many of these were based on a single specimen or on very few; in some cases these specimens even were not full-grown; it is possible therefore, and my material supports this, that the variation of many characters is so great that several of the supposed subspecies cannot be maintained, but our present knowledge of the various populations is still too incomplete to enable us to give a more definite picture. Hershkovitz (1955a) recognised four subspecies of *Holochilus brasiliensis* (Desmarest, 1819) in the area along the north coast of South America: *H. brasiliensis venezuelae* J. A. Allen, 1904, in Venezuela; *H. brasiliensis berbicensis* Morrison-Scott, 1937, in British Guiana; *H. brasiliensis nanus* Thomas, 1897, near the mouth of the Amazon; *H. brasiliensis brasiliensis* (Desmarest, 1819), eastward from the mouth of the Amazon. Cabrera (1961: 504-506) united the first two subspecies under the name *H. brasiliensis venezuelae* J. A. Allen, and the last two under the name *H. brasiliensis brasiliensis* (Desmarest). These decisions are chiefly based on zoogeographical data, not on distinct taxonomic characters. For the time being I have followed Hershkovitz (1955a: 669), who stated: "The oldest available name for marsh rats of the Guianan region is *Holochilus brasiliensis nanus* Thomas", and remarked that the names *H. brasiliensis berbicensis* and *H. brasiliensis venezuelae* might be synonyms of *H. brasiliensis nanus*, a conclusion fully supported by my examination of the type material of *H. nanus* and *H. berbicensis*.

***Sigmodon alstoni savannarum* (Thomas, 1901)**

Text-figs. 42d (upper incisors), 43j (mandible), pl. 107 fig. 6 (hind foot), pl. 111 fig. 3 (tooth-rows), pl. 121 lower figures (skull), pl. D (animal)

Sigmomys savannarum Thomas, 1901, Annals Magazine Nat. Hist., (7) 8: 150-151.

Type locality. — "On Savannahs", near the base of the Kanuku Mountains, south-west British Guiana, at an altitude of "240 feet".

Synonymies. — Cabrera, 1961: 507-509.

Vernacular names. — (E) Cotton Rat.

Distribution. — The species *Sigmodon alstoni* (Thomas, 1880) is known from Venezuela, Guyana and Suriname. The subspecies *S. alstoni savannarum* occurs in Guyana and Suriname; it seems likely that it also occurs in the adjacent areas of northern Brazil.

Occurrence in Suriname. — Though the brothers Penard ("De Surinamer", 20 April 1905) mentioned the Cotton Rat from Suriname, it is not certain that they ever have seen a specimen from this country, especially because in a footnote at the end of their paper they mentioned the publication of Thomas (1901) dealing with the mammals of the Kanuku Mountains. On 21 February 1961, however, Dr. D. C. Geijskes

collected a semi-adult male (no. 17217, skin and skull) near Sipaliwini airstrip, south-western Suriname, in which the three molars are erupted and functional.

An adult male (no. 18295, skin and skull) was captured in underbrush at the edge of a forest near Sipaliwini airstrip by Dr. G. F. Mees on 12 February 1966.

In the stomachs of two specimens of the White-tailed Kite, *Elanus leucurus leucurus* (Vieillot), shot by Mr. F. Haverschmidt on 14 July 1963 and on 31 July 1966 in the savanna near Zanderij, about 45 km south of Paramaribo, I found a strongly damaged juvenile skull (no. 18498) and a nearly complete adult skull (no. 19620) of the Cotton Rat; these data have been published by Haverschmidt (1968: 47).

The Suriname localities mentioned here, together with the type locality of the present form, namely "on savannahs", make it acceptable that in Suriname it probably occurs only in the savanna zones.

Description. — The following description is based on an adult male (no. 18295) and a semi-adult male (no. 17217), both from Sipaliwini in south-west Suriname. The dorsal surface of head and body is uniformly blackish, heavily sprinkled with pale yellowish, giving the general impression of olive grey. The hairs are soft and either are entirely dark or have a broad pale yellowish ring just below the dark tip; the uniformly dark hairs being in the minority. The colour of the semi-adult specimen is darker than that of the adult, although of the same general hue. In the semi-adult specimen the head is slightly paler than the rest of the body; in the adult there is no such difference. In both a narrow pale yellow ring is present around the eyes. The tip of the snout is pale brown. The hairs of the ears are rather short. The ventral surface of the body is grey washed with white; the basal part of the hairs is greyish, the distal part is lighter, almost white. The throat and the chin are lighter, being whitish with some grey laterally. In the adult male the ventral surface is more white than in the semi-adult. The line of demarcation between the colours of the dorsal and ventral surfaces is rather distinct, in the adult more pronouncedly so than in the semi-adult. The outer surface of the legs has the same colour as the dorsal surface of the body, or is more whitish distally. The inner surface of the legs is coloured like the ventral surface of the body. The tail has the hairs appressed, the dorsal hairs are dark, the ventral whitish. For about 10 mm the base of the tail is covered by long hairs similar in colour and length to those of the dorsal surface.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The most striking character of the skull is the presence of a distinct longitudinal groove, which extends over the full length of the outside of each incisor. The molars are, in comparison to those of the other Suriname Oryzominae, very broad and robust. The foramen incisivum is quite long and reaches practically as far back as the first molars; it is about as long as the part of the palate behind it. The palate ends at the level of the last molars.

The external measurements of the adult (no. 18295) and the semi-adult (no. 17217) males from Sipaliwini are, respectively: head and body, 144, 95; tail, without tuft, 97, 78; tail, with tuft, 99, 79; hind foot, with nail, 29.5, 27; ear, 19, — mm; weight, 147, — gr. In Table 76 the skull measurements of three Suriname specimens are given.

TABLE 76

Skull measurements of three specimens of *Sigmodon alstoni savannarum* (Thomas) from Suriname in the Leiden Museum.

Reg. number	18295	19620	17217
Sex	♂	-	♂
Greatest length	35.4	33.9	29.4
Condylobasal length	33.7	32.3	27.8
Basal length	31.2	30.0	25.4
Palatal length	18.2	17.9	14.7
Nasals, l x br	12.1x4.0	13.0x3.8	10.5x3.4
Zygomatic breadth	21.0	19.7	17.8
Interorbital constriction	5.4	4.7	5.0
Breadth of braincase	14.3	14.3	13.5
Diastema	9.8	9.6	7.6
Height of rostrum	11.0	11.2	8.9
For. incisivum, l x br	7.8x2.2	8.0x2.0	6.4x1.9
Alveolar length m^1-m^3	6.0	5.9	5.8
Greatest breadth of first upper molars	2.3	2.4	2.3
Length of mandible	20.6	19.0	17.3
Alveolar length m_1-m_3	6.4	6.6	6.1

Remarks. — The species of *Sigmodon* with grooved upper incisors were brought by Thomas (1901: 150, footnote) to the distinct genus *Sigmomys*. Hershkovitz (1955a: 647; 1966: 735, 736) ranged *Sigmomys* as a synonym of *Sigmodon*, and even suggested that all species of the two genera should be synonymized so that only one species, *Sigmodon hispidus* Say & Ord, 1825, should be recognized. Cabrera (1961: 507-509) followed Hershkovitz in uniting *Sigmodon* and *Sigmomys*, but considered the type species of these two genera, namely *Sigmodon hispidus* Say & Ord, 1825, and *Sigmodon alstoni* (Thomas, 1880) to be valid species. The character of the presence or absence of grooves on the upper incisors seems to be so important that in my opinion the group of Cotton Rats with grooved upper incisors should be considered to be at least a subgenus (*Sigmomys*), distinct from the nominate subgenus *Sigmodon*, in which the upper incisors are not grooved.

According to Hershkovitz (1966: 743) the genus *Sigmodon* is "of undoubted South American origin".

FAMILY ECHIMYIDAE

Proechimys guyannensis guyannensis (E. Geoffroy, 1803)

Text-fig. 44a (mandible), pl. 109 fig. 2 (hind foot), pl. 122 upper figures (skull), pl. E (animal)

Mus guyannensis E. Geoffroy, 1803, Catalogue Mammifères Muséum national Hist. Nat. Paris: 194-195.

Type locality. — "Cayenne", French Guiana.

Synonymies: — Cabrera, 1961: 520; Moojen, 1948; Tate, 1939: 177-178.

Vernacular names. — (E) Spiny Rat; (N) Stekelrat, Bosrat; (S) Maka-alata.

Distribution. — *Proechimys guyannensis* (E. Geoffroy) has been reported from an extensive area in northern South America, ranging from north-eastern Colombia eastwards through Venezuela and the Guianas to Ceará (north-east Brazil) and southwards to central Bolivia and central Brazil, and probably to south-eastern Ecuador (see map of distribution: Moojen, 1948: 336, fig. 23). As most authors did not recognize *Proechimys warreni* Thomas, 1905, and allied forms (see pp. 436-438) as species distinct from *P. guyannensis*, it is possible that the range of the last mentioned species is smaller than currently thought. The nominate subspecies *P. guyannensis guyannensis* has been reported from eastern Venezuela and the Guianas; a new revision of the genus is needed to establish its true range.

Occurrence in Suriname. — The Spiny Rat is one of the most common rodents in Suriname, at least near human habitations. It is found in the coastal plain as well as in the interior; it prefers damp localities like the banks of rivers and forest creeks (see also Sanderson, 1949: 776-777, under *Proechimys warreni*).

It is very well possible that the "Rat de Marais" described by Fermin (1769 (2): 113) belongs to the present species. Fermin gave the following diagnosis: "Le troisieme [rat] est un *Rat de Marais* (gg), qui se tient aussi dans les bois. Toute la partie supérieure de son corps, & l'extérieur de ses jambes, sont d'un fauve clair; & la partie inférieure & l'intérieur des jambes sont blanches. Sa queue est fort longue, couverte de quelques poils fort clairsemés: & les oreilles sont comme celles du *Rat domestique*". In a footnote (gg) Fermin gave the following latin diagnosis of the species: "*Mus palustris hispidus, caudâ longissimâ, supra dilute fulvus, infra albicans*". Fermin's description of the habitat (marshes and woods), of the dorsal and the ventral colour, and of the long tail closely agrees with what is known of this species, while his remark in the latin diagnosis that the species is "hispidus" evidently refers to the spiny hairs. Although the description is too meagre for a definite identification of his material, it seems likely that Fermin's record is the first report of *Proechimys guyannensis* from Suriname.

Material from the following localities in Suriname was examined (unless stated otherwise, all specimens are represented by skins and skulls):

1. Lucie River, south of Mount Wilhelmina, Nickerie District, 1 juvenile male (no. 18068).
2. Coeroeni airstrip near Coeroeni River, Nickerie District, skull fragment (no. 18106).
3. Plantation "Clevia", north-east of Paramaribo on Suriname River, Suriname District, 8 males (nos. 17797, 17799, 17807, 18094, 18101, 18103-18105; all specimens except 18094 represented by skulls only), 3 females (nos. 18095, 18100, 18102; of the last two specimens skull only).
4. Plantation "Morgenstond", north-east of Paramaribo on Suriname River, 1 juvenile male (no. 17289).
5. Cultuurtuin (Agricultural Experimental Station), Paramaribo, 3 males (nos. 18088, 18089, 18091), 2 females (nos. 18090, 21939), 1 skull (no. 21940).
6. Lelydorp-plan, about 15 km south of Paramaribo, Suriname District, 1 male (no. 23930).
7. Republiek, about 35 km south of Paramaribo, Para District, 1 female (no. 17227), 1 skull (no. 16089).
8. Highway Paramaribo-Afobaka, 66 km south of Paramaribo, Brokopondo District, 1 juvenile male (no. 18098).
9. Mama Creek, about 17 km north of Afobaka on highway Paramaribo-Afobaka, 1 juvenile from stomach contents of *Bothrops atrox atrox* (Linnaeus) (ZMA no. 12690).

10. Brokopondo on Suriname River, 1 female (ZMA no. 10480).
 11. Brownsberg, west of Brokopondo Lake, Brokopondo District, 1 male (no. 23932), 2 females (nos. 23928, 23933), 1 damaged skull (no. 23934).
 12. In native dwelling at Gododrai, upper Commewijne River, Commewijne District, 1 female (no. 18096).
 13. In forest near Langamankondre, mouth of Marowijne River, Marowijne District, 1 male (no. 18093), 1 skull (no. 23929), one damaged skin (no. 16058).
 14. Suriname, probably in the neighbourhood of Paramaribo, collected between 1824 and 1836 by H. H. Dieperink, 1 mounted specimen without skull (Cat. Jentink, 1888: 100, no. c under *Echinomys anomalus*; = 18097), 1 mounted skeleton (Cat. Jentink, 1887: 229, no. b under *Loncheres cristata*; = no. 18099).

Description. — The following description is based on the material in RMNH with the exclusion of a few discoloured specimens (nos. 18068 and 18097). The colour of the dorsal surface is tawny, strongly lined with black. The black colour extends from between the eyes or from the back of the snout as far back as the rump, but it disappears on the sides. The tawny speckles are most distinct in the central median area of the back. The sides of the head and body, and the larger part of the rump and the outer surface of the basal parts of the legs are more uniformly tawny to rufous. The fur is glossy. The spines are flattened and rather wide, they are grooved and end in a long soft point, so that the fur feels bristly rather than spiny, in contrast to *Makalata armata armata* (see p. 445). The spines of the median dorsal area are greyish with a blackish distal part, farther to the sides they become paler, being almost whitish with grey distally. The hairs of the central dorsal part have the base grey, the distal half blackish with a tawny band of variable width at some distance below the tip. Farther to the sides of the body the tawny area widens and finally occupies the entire distal part of the hairs. The ears are oval, large and conspicuous, with some very thin and short hairs on the inner as well as the outer surface. A distinct naked area is present behind the ears. The ventral surface has the hairs bright white, sharply set off from the tawny colour of the sides; sometimes a very narrow and very pale rufous area separates these two differently coloured areas. In some individuals the throat also shows a slightly rufous tinge. The hairs are uniformly white, spines are not at all present. The underfur is dull, not glossy. The inner surface of the upper part of the frontlegs is white, that of the hind legs is white or slightly rufous with a dark brown stripe over the middle. A naked area is present on the inner surface of the thigh next to this dark stripe. The upper surface of the forefeet is only slightly lighter than the outer basal part of the leg, that of the hind feet is distinctly paler than the outer basal part, being pale brown to dirty white, the distal part of the toes being slightly darker than the rest of the foot. The tail has only an extremely small part of the dorsal surface of the base furry, the fur on the ventral surface extending even less far onto the tail. The tail is distinctly bicoloured, whitish below, dark above; it is rather densely haired with the hairs long, curved outwards and thereby not strongly appressed. The length of the tail is about 60 to 71 per cent of the combined length of head and body.

In my material one pair of very small inguinal mammae is visible, while there are

two pairs of large abdominal mammae placed high up on the sides of the body in the area of the brown fur. These abdominal mammae (lateral mammae would perhaps be a better term) are far more strongly developed than the inguinal mammae, they have a dark colour suggesting that these, and not the inguinal are functional.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. The foramen incisivum is short and narrow, oval in outline, with the greatest width in the anterior half; it ends before the tooth-rows. The posterior end of the palate is bluntly V-shaped, the tip of the V reaching forward to about the level of the middle of the last molar. The premaxillaries and the nasalia reach far forward, projecting distinctly beyond the incisors. The rostrum is strongly laterally compressed, its sides being parallel. The supraorbital carinae are more or less winged and continue on to the braincase as high ridges. The interparietal is large and in adult specimens it is surrounded by rather high ridges.

The number of cheek-teeth is four in the upper as well as in the lower jaw. The first of the teeth is here named premolar. All cheek-teeth normally have three outer folds and one inner; already in very young specimens these folds, through wear, become isolated islands. The first upper premolar has sometimes an additional island anteriorly.

The mandible has a strong ridge on the outer surface, extending from below the cheek-teeth to the end of the processus angularis; the inner surface bears two ridges, a short one extending from the processus angularis forward and another, of a more blunt shape, which starts at the processus condylicus and extends obliquely forwards and downwards, merging with the lower margin of the jaw. The processus coronoideus is short and narrowly triangular, ending in a rather long tip; the processus condylicus is large and broadly rounded, while the processus angularis is much smaller, narrower and pointed.

The alveolar length of the upper cheek-teeth varies in 18 specimens from 8.3 to 9.2 mm (mean: 8.7 mm).

In Table 77 the external and skull measurements of ten specimens from Suriname are noted. The condylo-incisive length as given there is the distance between the anterior margin of the alveolus of the incisor and the posterior margin of the condylicus occipitalis on the same side; the basal length and the palatal length are also measured from the anterior margin of the alveolus of the incisor. The condylo-basal length is measured in the usual way, viz., from the anterior margin of the premaxillaries to the posterior margin of the condylicus occipitalis.

Remarks. — Kappler (1887: 76) referred to the present species as *Loncheres brachyura*, and mentioned its occurrence on trees in high forests near the water; he surmised that it had its nests in hollow trees. The food of the species is described by Kappler as fruit and seeds; he remarked that the animals usually are quite fat and that they are highly esteemed as food by Amerindians and Bush-Negroes. But Kappler's account seems partly, if not entirely, based on the next species. Geijskes (1954: 76), under *Proechimys cayennensis* (Desmarest), more or less confirmed Kappler's remarks.

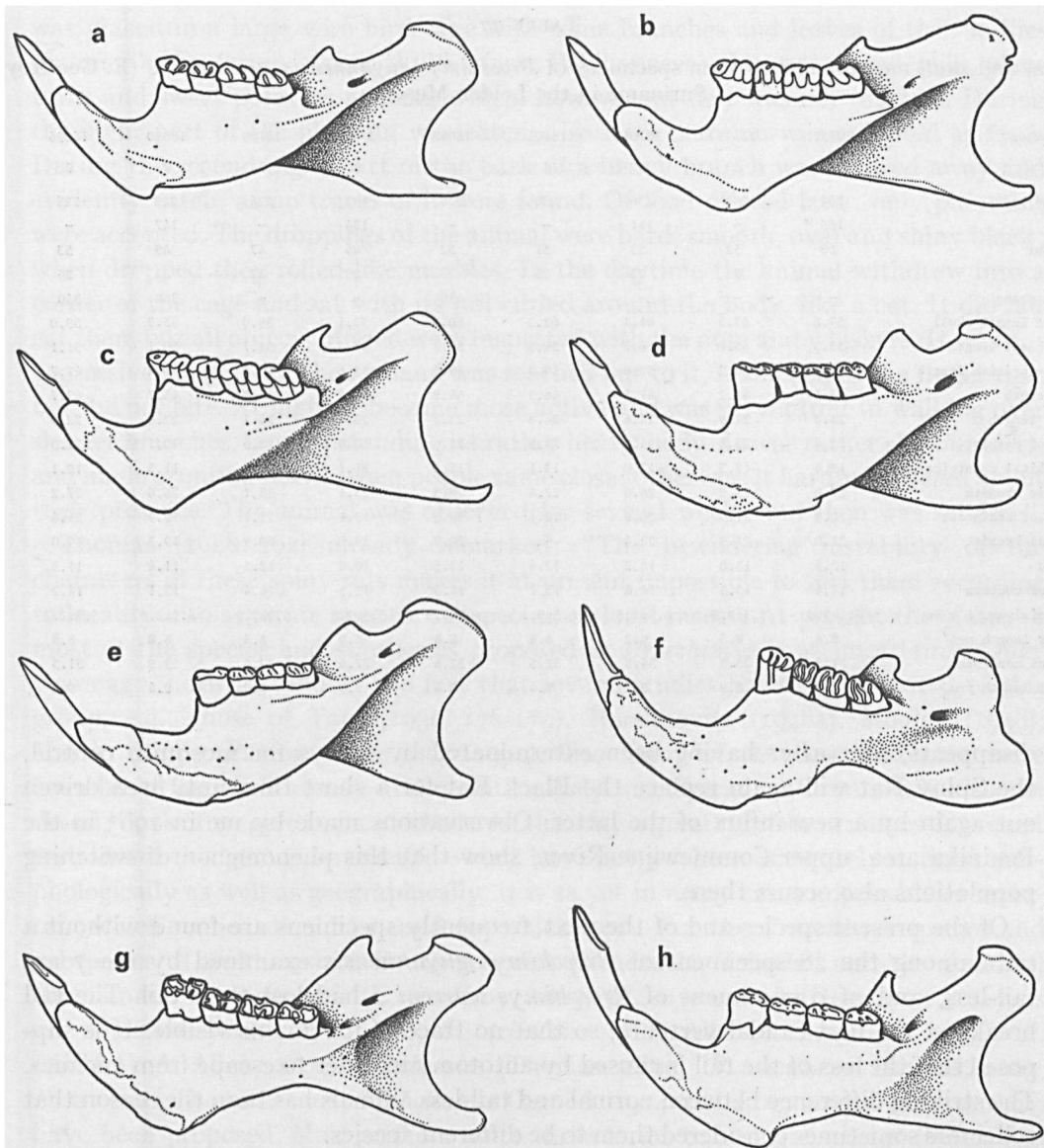


Fig. 44. Right half of mandible, inner view. a, *Proechimys guyannensis guyannensis* (E. Geoffroy); b, *Echimyus chrysurus chrysurus* (Zimmermann); c, *Makalata armata armata* (I. Geoffroy); d, *Dasyprocta leporina leporina* (Linnaeus); e, *Myoprocta exilis* (Wagler); f, *Agouti paca paca* (Linnaeus); g, *Coendou prehensilis prehensilis* (Linnaeus); h, *Sphiggurus insidiosus* (Lichtenstein).

Little is known about the reproduction of the Spiny Rat in Suriname. On 16 January 1963 Dr. P. van Doesburg found in the Agricultural Experimental Station at Paramaribo a female (no. 21939) carrying two embryos of about 60 mm length.

The Spiny Rat also occurs indoors in the native villages, where it gradually becomes replaced by the Black Rat, *Rattus rattus* (see p. 493). Where the Black Rat

TABLE 77

External and skull measurements of ten specimens of *Proechimys guyannensis guyannensis* (E. Geoffroy) from Suriname in the Leiden Museum.

Reg. number	17797	17799	18101	18104	18088	23933	18100	18090	18096	17227
Sex	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀
Head and body	234	252	236	250	236	192	226	222	225	174
Tail	155	-	111	-	-	134	-	147	-	127
Hind foot	50	52	53	51	52	44	47	49	53	47
Ear	23	23	25	25	23	20	22	24	26	-
Weight, grams	-	-	-	-	450	-	-	360	310	-
Greatest length skull	59.8	62.3	64.1	62.3	60.6	53.1	59.0	55.3	59.0	53.7
Condylbasal length	53.3	55.0	56.7	54.8	53.7	47.5	52.7	50.1	51.1	47.5
Condyllo-incisive length	48.4	50.2	52.0	50.3	49.8	43.6	48.4	46.4	47.7	44.1
Basal length	45.1	46.2	47.5	46.3	44.9	40.2	44.8	43.7	43.7	40.4
Palatal length	23.8	24.9	24.6	24.8	23.3	20.4	24.7	22.6	22.8	20.8
Length of nasals	22.6	23.8	24.6	24.0	22.6	18.8	22.5	20.1	22.3	19.5
Interorbital constriction	12.6	12.3	13.0	13.1	12.5	11.1	12.0	11.5	12.1	11.5
Zygomatic breadth	27.6	29.0	28.0	27.4	28.3	25.1	28.1	26.6	27.2	-
Breadth of braincase	20.9	21.9	20.6	22.1	20.5	19.1	21.1	19.9	21.4	20.5
Mastoidal breadth	21.0	21.9	22.4	-	20.9	19.0	20.9	19.3	19.0	19.5
Diastema	12.3	13.0	13.2	12.4	12.5	10.8	12.5	11.4	11.3	11.0
Height of rostrum	14.4	15.3	14.8	13.7	14.0	12.5	14.4	13.1	14.2	13.4
For. incisivum, l x br	6.1x3.0	5.3x2.5	6.3x2.5	6.5x3.3	6.7x3.5	5.5x2.8	6.0x2.9	6.1x2.8	5.8x2.7	5.8x2.8
Alveolar length p-m ³	8.4	8.5	9.2	8.6	8.8	8.9	8.3	8.8	8.8	8.8
Length of mandible	31.5	33.9	34.0	32.5	32.6	27.6	32.4	29.8	31.5	28.5
Alveolar length p-m ₂	8.9	8.9	9.2	9.4	9.4	9.3	8.9	9.4	9.4	8.8

disappears, e.g., after having been exterminated by sprays for mosquito control, the Spiny Rat will again replace the Black Rat for a short time until it is driven out again by a new influx of the latter. Observations made by me in 1963 in the Peninika area, upper Commewijne River, show that this phenomenon of switching populations also occurs there.

Of the present species and of the next, frequently specimens are found without a tail: among the 28 specimens of *Proechimys guyannensis* examined by me 7 are tail-less, and of 9 specimens of *Proechimys warreni* 2 had lost their tail. The tail breaks at the first caudal vertebra, so that no trace of it remains visible. It is supposed that the loss of the tail is caused by autotomy in order to escape from enemies. The striking difference between normal and tail-less animals has been the reason that collectors sometimes considered them to be different species.

Natural enemies of *Proechimys guyannensis* in Suriname are *Asio clamator clamator* (Vieillot, 1807), the Striped Owl (see Haverschmidt, 1968: 162), and the snake Fer-de-Lance, *Bothrops atrox atrox* (Linnaeus, 1758).

Dr. D. C. Geijskes provided me with the following interesting observations on a Suriname specimen of this species: "On 24 May 1939, on the premises of the Agricultural Experimental Station a "possentrie" (*Hura crepitans* L.; fam. Euphorbiaceae) was cut down. After the tree had fallen to the ground, a female of *Proechimys guyannensis* walked out of the mass of branches and leaves, and was captured. It moved not fast, but purposeful, and did not defend itself when taken. The animal

was placed in a large wire bird cage with some branches and leaves of the "koffie-mamma" (*Erythrina glauca* Willd.; fam. Papilionacea). It was offered milk, plantains and sweet potatoes as food, which, however, at first was not touched. During the night part of the plantain was eaten, also later plantain was accepted as food. During the second night part of the bark of a heavy branch was gnawed away and evidently eaten, as no traces of it were found. Of food offered later, only plantains were accepted. The droppings of the animal were hard, smooth, oval and shiny black; when dropped they rolled like marbles. In the daytime the animal withdrew into a corner of the cage and sat with its tail curled around the body, like a cat. It did not eat then, but all objects offered were inspected with the nose and whiskers. It was not aggressive at all, and when a hand was reached out to it, it smelled at the finger tips, but did not bite. At night it became more active and was very adroit in walking over slender branches, notwithstanding its rather heavy body. It was rather shy but alert, and made grunting noises when people came close; otherwise it hardly bothered about their presence. The animal was observed for several weeks and then was set free".

Thomas (1928: 262) already remarked: "The bewildering instability of the characters of these spiny rats makes it at present impossible to sort them according to locality into separate species, subspecies, or local races". At present the status of most of the species and subspecies proposed in *Proechimys* is as uncertain as fifty years ago, notwithstanding the fact that several studies have been devoted to this group, e.g., those of Tate (1939: 176-179), Hershkovitz (1948a), Moojen (1948), Martin (1970), Patton & Gardner (1972). Too many of the described taxa have been based on qualitatively and quantitatively insufficient material, while also the descriptions often give too few details. In this way a great number of names does exist for taxa of this genus, but as these taxa have not yet been accurately defined morphologically as well as geographically, it is as yet in many cases impossible to ascertain which names should be used for which taxa. For the *Proechimys* species and subspecies of north-eastern South America (Venezuela, Trinidad and the Guianas) the names *P. guyannensis* (E. Geoffroy, 1803) (*P. cayennensis* (Desmarest, 1817) is an objective junior synonym), *P. trinitatis* (J. A. Allen & Chapman, 1893), *P. urichi* (J. A. Allen, 1899), *P. cherriei* (Thomas, 1899), *P. vacillator* Thomas, 1903, *P. warreni* Thomas, 1905, *P. poliopus* Osgood, 1914 and *P. guairae* Thomas, 1901, have been proposed. Most authors unite these forms to a single species *Proechimys guyannensis*, in which they recognize a variable number of the above taxa as valid subspecies, synonymizing the rest.

In my *Proechimys* material from Suriname two perfectly distinct forms can be distinguished. These forms differ consistently in the length of the upper cheek-teeth, and show also a few other, but less distinct and less constant differences. In the first form (here indicated as Form A) the length of the upper cheek-teeth is large, varying from 8.3 to 9.1 mm, in the second form (Form B) this length ranges from 7.2 to 7.7 mm. As a rule the specimens of Form A are larger, and have the colour of the sides more rufous and less greyish, and the tail relatively shorter and its hairs

less appressed. The size of the holotype of *Mus guyannensis* is indicated by E. Geoffroy (1803: 195) as "0,^m20 (8 p.)" [20 cm = 8 inches], but Desmarest (1817: 59) remarked: "Sa longueur, mesurée depuis le but du nez jusqu'à l'origine de la queue, est d'un peu moins de six pouces, et la tête en a environ deux". According to Desmarest the length of head and body from the tip of the snout to the base of the tail is 150 mm; moreover, he noted that the tail itself is "mutilée". The here mentioned size would point to Form B, but on the other hand the description of the colour of the sides as being of a "plus claire" "brun-fauve" than the back (E. Geoffroy), or "roux" (Desmarest), fits Form A much better. As in Suriname Form A is the most common of the two forms, and as this is very likely also the case in French Guiana, it seems reasonable to assign the name *guyannensis* to Form A. Unfortunately the skull of the holotype has become lost and the skin is in a very poor condition (Rode, 1945: 295). For Form B I have adopted the name *Proechimys warreni* Thomas, 1905 (see below).

In the literature dealing with Suriname mammals the names *Loncheres cayennensis* (Desmarest, 1817), *Proechimys cayennensis* (Desmarest, 1817), and *Echimys cayennensis* Desmarest, 1817, are often used for the present species. According to Cabrera (1961: 533) the name *Loncheres brachyura*, used by Kappler (1886: 76), is a junior synonym of *Euryzygomatomys spinosus* (G. Fischer, 1814), a spiny rat from eastern and southern Brazil, Paraguay and north-eastern Argentina.

Proechimys warreni Thomas, 1905

Pl. 122 lower figures (skull)

Proechimys Warreni Thomas, 1905, Annals Magazine Nat. Hist., (7) 16: 312-313.

Type locality. — "Comackka, 80 miles up the Demerara River, British Guiana. Alt. 50 feet".

Distribution. — The species is known with certainty from British Guiana and Suriname. As *Proechimys warreni* has usually been synonymised with *P. guyannensis*, its exact range is not known.

Occurrence in Suriname. — The species has been found both in the coastal area and in the interior of Suriname. The following material has been examined:

1. Forest on the west side of Vier Gebroeders Mountains, Sipaliwini, south-eastern Nickerie District near the Brazilian border, 1 female (no. 23919, skin and skull).
2. Kaaimanston, west bank of Coppename River, at about 5°5'N, Saramacca District, 1 specimen (no. 17210, skin and skull).
3. Santo Boma, about 14 km south-west of Paramaribo, Suriname District, 1 skull (no. 23921).
4. Forest near Coropina Creek, near Zanderij, about 35 km south of Paramaribo, Para District, 2 males (nos. 18092, 22352, skins and skulls), 1 female (no. 18087, skin and skull).
5. Finisanti, Saramacca River near Loksiehatti, about 80 km south-west of Paramaribo, Brokopondo District, 1 semi-adult male (no. 23918, skin and skull).
6. Brownsberg, western shore of Brokopondo Lake, Brokopondo District, 1 male (no. 23920, skin and skull).
7. Oost-Westverbinding, highway between Paramaribo and Albina, Commewijne or Marowijne District, 1 male (no. 23917, skin and skull).

Description. — The following description is based on all the above mentioned Suriname specimens. The colour of the dorsal surface is almost identical with that of *Proechimys guyannensis*; only the sides are less rufous and more greyish.

As a rule the ventral surface has the white intense without a rufous tinge, some specimens are purely snow-white. The throat and the sides are also white. On the inside of the forelegs the white colour is restricted to a narrow longitudinal line, bordered on either side with brown. The length of the tail is about 79 to 91 per cent of the length of head and body combined, being on an average longer than in *P. guyannensis*. The hairs of the tail are shorter, straighter and more appressed than in the latter species. The juvenile has no tawny speckles on the dorsal surface, which is uniformly slate grey, the sides are lighter but of the same grey colour. The ventral surface is white.

In the only adult female examined by me one pair of small inguinal mammae are visible, and one pair of well developed abdominal mammae, high up on the sides somewhat behind the front legs.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. The skull, in all its dimensions, is smaller than that of *Proechimys guyannensis*. The length of the upper cheek-teeth in my Suriname material varies from 7.3 to 7.6 mm; when the type specimens (BMNH no. 5.11.1.14) and 6 other specimens from British Guiana are included, this length varies from 7.0 to 7.7 mm (the mean length of these 12 specimens being 7.4 mm).

In the present species the V-shaped incision in the posterior margin of the palate is much narrower than in *P. guyannensis* and often reaches to the line between the second and third molars. The supraorbital ridge, instead of continuing in a straight line to the braincase, curves down abruptly at a short distance behind the zygomatic arch; the ridge also is less strong than in *P. guyannensis* and not wing-like.

In Table 78 the external and skull measurements of the Suriname material are noted. In the first column the measurements of the holotype as measured by myself are added; most of these measurements are the same as noted by Thomas (1905: 312) in the original description of the species or differ very slightly. An exception is the length of the diastema, for which Thomas indicated 16.2 mm, while I found 11.2 mm; it seems likely that Thomas misread his callipers by 5 mm. The basal length and the palatal length in all cases were measured from the anterior face of one incisor at the alveolus, and not from the anteriormost point of the premaxillary.

Remarks. — As has already been discussed under *Proechimys guyannensis* (see p. 434), tailless specimens of the present species are often encountered.

Tate (1939: 178), when dealing with the Guiana *Proechimys*, arrived at the conclusion that *Proechimys guyannensis guyannensis* (E. Geoffroy, 1803), which he named *P. cayennensis cayennensis* (Desmarest, 1817), has as its synonyms *Echimys trinitatis* J. A. Allen & Chapman, 1899, *Echimys urichi* J. A. Allen, 1899, *Echimys cherriei* Thomas, 1899, *Proechimys vacillator* Thomas, 1903, and *Proechimys warreni* Thomas, 1905. Cabrera (1961: 520) also referred both *Echimys cherriei* Thomas, 1899, and *Proechimys warreni* Thomas, 1905, to the synonymy of *Proechimys*

TABLE 78

External and skull measurements of six specimens of *Proechimys warreni* Thomas from Suriname (last six columns) and of the holotype from Guyana (first column).

Museum	BMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH
Reg. number	5.11.1.14	23917	23920	18087	23919	17210	23921
Sex	♂	♂	♂	♀	♀	-	-
Head and body	228	200	168	175	168	-	-
Tail	184	-	163	138	162	-	-
Hind foot	38	47	44	40	43	-	-
Ear	25	21	19	-	19	-	-
Greatest length skull	50.8	54.1	48.6	46.5	48.5	52.0	48.7
Condylobasal length	-	48.7	43.5	40.7	43.6	46.2	45.0
Condylol-incisive length	42.6	44.3	40.1	37.5	40.0	42.1	40.9
Basal length	39.7	40.3	36.6	34.5	36.5	38.6	37.7
Palatal length	19.4	19.5	18.6	16.8	18.4	19.5	18.0
Length of nasals	19.3	21.2	17.7	16.3	17.9	20.2	17.3
Interorbital constriction	11.3	-	11.3	9.8	10.0	10.8	10.5
Zygomatic breadth	24.5	-	24.4	22.1	23.6	24.4	23.8
Breadth of braincase	19.6	-	18.6	17.8	18.5	18.6	18.6
Mastoidal breadth	-	19.3	19.2	18.5	18.0	18.3	18.8
Diastema	11.2	11.4	9.7	9.0	9.5	11.2	10.2
Height of rostrum	-	12.5	11.2	10.0	11.0	11.6	11.1
For. incisivum, l x br	5.0x2.6	4.9x2.6	4.9x2.4	4.2x2.4	4.5x2.6	5.1x2.3	4.7x2.4
Alveolar length p-m ³	7.0	7.2	7.6	7.5	7.7	7.4	7.6
Length of mandible	27.0	28.1	25.4	23.8	25.4	26.5	26.6
Alveolar length p-m ₃	7.0	7.3	8.1	7.7	7.7	7.5	7.7

guyannensis. Judging by the measurements given in the literature the smaller Suriname *Proechimys* is identical with either *P. cherriei* or *P. warreni*, or with both. In a previous paper I adopted the name *P. cherriei* Thomas, 1899, for the present species (Husson, 1973: 13), as this name is the older of the two. On second consideration, however, I am not quite convinced of the synonymy of *P. cherriei* and *P. warreni*. As, in my opinion, there is no doubt that the smaller Suriname *Proechimys* is conspecific with the type material of *P. warreni*, which I could examine, and as the type locality of that species is close to Suriname, I provisionally prefer to adopt the name *P. warreni* for the present species. It is up to later authors to decide whether or not *P. warreni* is a junior synonym of any previous name.

Mesomys stimulax Thomas, 1911

Pl. 123 (skull)

Mesomys stimulax Thomas, 1911a, Annals Magazine Nat. Hist., (8) 7: 607-608.

Type locality. — "Cametá, Lower Tocantins", Amazon estuary, northern Brazil.

Synonymies. — Cabrera, 1961: 536 (under *Mesomys hispidus stimulax*); Tate, 1939: 179; Ellerman, 1940: 126-127.

Distribution. — Tate (1939: 179) remarked concerning the species of the rare genus *Mesomys*: "The range of the genus *Mesomys* from west to east extends from

Ucayali and Huallaga Rivers in Peru as far east as the Tocantins River. Northward it appears not to extend beyond the portion of the upper Orinoco adjoining Mt. Duida. It has not been reported from the Caura region or from east Guiana. Southeast it apparently reached Bahia". According to Cabrera (1961: 536) *Mesomys stimulax* occurs in "Brasil, en el bajo Amazonas y sus afluentes". It is now for the first time recorded from Suriname.

Occurrence in Suriname. — So far the present species was not known from Suriname. In the collection of the Leiden Museum there is a single, adult, female specimen (no. 21728, skin and skull). It was collected on the western slope of the Vier Gebroeders Mountains near Sipaliwini in the extreme south-eastern part of Nickerie District by Dr. M. S. Hoogmoed on 23 September 1968. The animal was captured at night (about 21h30) on the ground in a camp in a small wooded area on the mountain slope.

Description. — The fur of the dorsal surface is heavily spiny. The spines are deeply grooved dorsally. The spines on the head are fine and slender, entirely obscured by the hairs; posteriorly the spines become more dense and stronger; in the rear end of the body they dominate entirely. The hairs are ferruginous brown, often with a darkish tip; the spines are dark greyish, their basal part somewhat lighter. In some of the spines there is a distinct pale band just below the dark extreme tip; such banded spines are especially numerous and distinct posteriorly and laterally, the fur thereby obtaining a speckled appearance. In other parts the fur is brown and dark grey by the intermixture of spines and hairs. The whiskers are very long and strong, the longest reaching back beyond the base of the forelegs. The ears are rounded, dark brown-blackish, with both short and very long, thin hairs. Long black whisker-like hairs are implanted behind the eyes. The ventral surface of head and body is creamy white washed with pale brownish red. This reddish colour is especially distinct laterally near the sharp line which separates the dorsal and ventral colours. The outside of the legs is pale greyish brown, the inside creamy white like the ventral surface of the body. The tail is uniformly brownish grey with short and thin hairs; it terminates in a short, not very conspicuous tuft. The forelegs have four toes, the hind legs five. The tail is shorter than head and body together.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. The tooth-rows are almost parallel and are situated in the anterior half of the skull. The rostrum is short: the distance from the anterior point of the nasals to that of the jugals is about one quarter of the length of the skull. The nasalia are wider anteriorly than posteriorly, the posterior halves of their lateral margins are almost parallel. A distinct, sharp, partly winged crest forms the upper margin of the orbit. The palate is triangularly incised between the tooth-rows, the tip of the triangle reaching anteriorly to about the middle of the second molar. The bullae are relatively large (pl. 123).

The external measurements of the Sipaliwini female specimen are: head and body, 129; tail, without tuft, 113; tail, with tuft, 118; hind foot, with nail, 28.5; ear, 11 mm. Of the holotype of the species, an old female, Thomas (1911a: 607) noted the following values: head and body, 158; tail, 122; hind foot, 29; ear, 13 mm. —

Skull: greatest length, 39.1; condylobasal length, 35.0; condylo-incisive length, 34.8; basal length, 31.5; palatal length, 15.4; palatilar length, 13.0; foramen incisivum, length \times breadth, 3.6 \times 1.3; length of nasals, 10.7; greatest breadth of nasals, 4.5; zygomatic breadth, 21.1; interorbital constriction, 9.0; breadth of braincase, 17.3; bullae, length \times breadth, 9.1 \times 6.9; diastema, 8.6; height of rostrum, 9.0; alveolar length of upper cheek-teeth, 6.5; alveolar length of the three upper molars combined, 4.6; greatest length of mandible, 21.6; alveolar length of lower cheek-teeth, 6.6 mm.

Remarks. — I have compared the Sipaliwini specimen with the holotype (so far the only known specimen) of the species, which is preserved in the British Museum (Nat. Hist.). My specimen, although adult, is somewhat smaller than the type. The colour of the type is more uniformly golden brown dorsally, less variegated than in my specimen. In the two specimens the ventral colour is very similar. In the type the ridges over the orbit are more strongly winged than in the Sipaliwini specimen, which may be due to difference in age. In the shape of the skull the Suriname specimen shows a close resemblance to the type of *Mesomys ferrugineus spicatus* Thomas, 1924, from Peru, but it differs from the Peruvian specimen in that the latter is much larger in all its dimensions, both of skin and skull. The Peruvian specimen has the fur speckled all over the dorsal surface, while the base of the tail is longer and more densely haired. As most of the species of the genus *Mesomys* are represented by a single specimen only, and as therefore the variation of the pertinent characters is hardly at all known, it is extremely difficult to determine the status of the Sipaliwini specimen. For the time being I identify it with *Mesomys stimulax*, as it closely resembles that species, which, of all species of the genus, has been found nearest to Suriname.

A revision of the genus *Mesomys* is badly needed, because at present there are different opinions concerning the systematic status of the described species and subspecies (see, e.g., Tate, 1939: 179; Ellerman, 1940: 127; Cabrera, 1961: 535-536).

***Echimys chrysurus chrysurus* (Zimmermann, 1780)**

Text-figs. 44b (mandible), 45 (cheek-teeth of upper and lower jaws), pl. 109 fig. 1 (hind foot), pl. 124 upper figures (skull), pl. 125 (animal)

Myoxus chrysurus Zimmermann, 1780, Geographische Geschichte des Menschen, und die vierfüssigen Thiere, 2: 352-353.

Type locality. — "Es kam aus Surinam" (Zimmermann, 1780: 353).

Synonymies. — Cabrera, 1961: 540-541; Waterhouse, 1848: 315-318, col. pl. 17 fig. 2 (under *Loncheres cristata*).

Vernacular names. — (E) White-crested Spiny Rat, White-faced Spiny Rat; (N) Surinaamse Goudrat; (S) Maka-alata.

Distribution. — The species *Echimys chrysurus* (Zimmermann) occurs in northern South America from the Guianas to north-eastern Brazil. The nominate subspecies *E. chrysurus chrysurus* is known only from the Guianas.

Occurrence in Suriname. — Although the species has been reported from Suriname as early as 1778 (Allamand, 1778: 164-166, pl. 67, as *Le Lérot à queue dorée*), it proves to be rather rare. In the literature the species either was only cited from "Surinam", without indication of a more precise locality (e.g., Allamand, 1778: 164-166; Lammens, 1844: 103; Waterhouse, 1848: 316; Jentink, 1887: 229; Jentink, 1888: 100), or the identification cannot be fully trusted (Walsh & Gannon, 1967: 73-74, 218; see under Remarks, p. 444). The material examined by me originates from the coastal area and the interior as far south as the Brokopondo area and the Kayserberg Airstrip (Nickerie District). I have examined the following specimens:

1. Groot Henarpolder south-east of Nieuw Nickerie, north-western Nickerie District, 1 male (no. 18112, skin).
2. Polder near Nieuw Nickerie, 1 unsexed specimen (no. 18117, skull).
3. Zuid River, near Kayserberg Airstrip, southern Nickerie District, 1 female (CNHM no. 93267, skin, skull and 2 embryos).
4. Plantation "Morgenstond", west bank of Suriname River, north-east of Paramaribo, Suriname District, 1 female (no. 18115, skull).
5. Agricultural Experimental Station (Cultuurtuin), Paramaribo, 1 female (no. 3962, skin and skull).
6. Near Paramaribo, Suriname District, 1 specimen (no. 18116, skull).
7. Republiek, about 35 km south of Paramaribo, Para District, 1 semi-adult female (no. 17947, skin and skull).
8. Republiek, Para District, skin fragments from stomach contents of the Spectacled Owl, *Pulsatrix perspicillata* (Latham) (no. 19690).
9. Bedoti, south of Gansee on west bank of Suriname River, locality now submerged by the Brokopondo Lake, Brokopondo District, 1 female (no. 8690, skin and skull).
10. Suriname, without more precise locality indications, but the majority probably from near Paramaribo, 1 male (no. 1418, skin and skull), 2 females (nos. 18111, 18113, skins and skulls), 1 skull (no. 18814).

Description. — The colour of the dorsal part of the body is dark rufous to greyish brown, darkest in the median line. The fur consists of two kinds of hairs (one type being thin and supple, the other broader, grooved and more bristly) and distinct broad spines. The hairs are uniformly reddish or greyish brown. The spines are wide (up to 2 mm), grooved and of a greyish colour; they end in a hair-like point, which is more brownish or even more yellowish than the rest. Especially in the rump part the light tips of the spines are distinct. On the back the spines are very numerous, broad and heavy. The dorsal surface of the head is several shades darker than the back, sometimes blackish; it has a striking white or light yellowish median longitudinal stripe running from the tip of the nose over the full length of the face to the neck somewhat behind the ears. The width of this band is variable; in some specimens it is very wide, occupying almost the full width between the eyes, in others it is a narrow band, but it is always very conspicuous. The cheeks are of the same colour as the sides of the body, and lighter than the top of the head, usually more brownish or greyish. The spines on the head are narrow and less conspicuous than those on the body; they lack completely in the white stripe. The whiskers are long and black or white, depending on whether they are implanted among brown or white hairs. The ears are rather small, covered with sparse thin hairs, which are rather long inside, shorter on the outside.

The ventral surface of the body is greyish brown to grey, distinctly paler and less rufous than the dorsal surface, no line of demarcation is noticeable, the ventral colour gradually passing into that of the sides. A conspicuous white spot extends over the chin and continues backward on the throat, narrowing posteriorly; usually the whole of the under surface of the lower jaw is white. The outer surface of the legs has the same colour as the sides; the inside of the legs is of about the same colour as the ventral surface. The feet are dorsally covered by dark hairs as far as the nails. The tail is very long, longer than head and body together. It is strikingly bicoloured by having the basal part (one-third to one-half) of the same colour as the dark dorsal part of the head, and the distal two-thirds or half of the tail strikingly white or pale yellowish (owing to this character the species was named *chrysurus*: golden tail). The hairs of the tail are coarse, quite long, somewhat appressed, those at the tip forming a distinct rather soft tuft.

Apart from a single pair of small (non-functional?) inguinal mammae, the adult females show three pairs of well developed abdominal mammae, which are placed high up on the sides between the front and hind legs, about at the line between the spiny and the non-spiny fur. Already Allamand (1778: 166) mentioned the presence of eight mammae in this species.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. The skull is far more robust than that of the species of *Proechimys*, it has the rostrum relatively much shorter and broader, reaching less far beyond the incisors. The nasalia reach as far as or less far forward

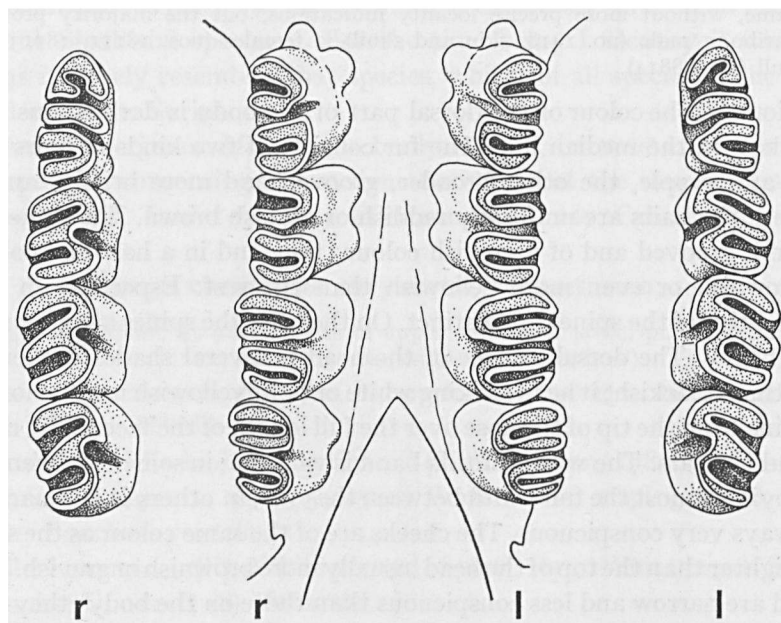


Fig. 45. *Echimys chrysurus chrysurus* (Zimmermann), female, no. 18115, upper and lower cheek-teeth. From left to right: right lower, right upper, left upper and left lower cheek-teeth. — Alveolar length of upper cheek-teeth, 14.1 mm.

than the premaxillary bone. In the present genus the interorbital area is flat and broad, much more pronouncedly than in *Proechimys*; the greatest width of the interorbital area is about two-thirds of the zygomatic breadth. The supraorbital ridges are winged and straight so that in lateral view the upper margin of the orbit appears to be flattened. The foramen incisivum is small, acute anteriorly, truncate posteriorly; it is situated far in front of the cheek-teeth. The palate has the posterior margin deep V-shapedly incised; the incision reaches to the line separating the second from the third molars. In 9 Suriname specimens the alveolar length of the upper cheek-teeth varies from 13.3 to 14.5 mm (mean: 14 mm); these values are larger than in any other species of Suriname Echimyidae. The structure of the crown of the upper molars is quite characteristic. Of the three folds of each upper molar the middle one traverses the full width of the tooth, the two others open on the buccal side, but usually do not reach the lingual side, so that two U-shaped figures, both directed the same way, are formed. In a few instances, in the third molar, the posterior fold traverses the entire width of the molar. In strongly worn molars the middle fold may be interrupted in its middle, while in very old and much worn teeth the other folds may change into islands, both of which then are situated near the outer margin of the molar. The pattern of the double U-shaped figures, which usually is most distinct in the second and third molars, is entirely different from that of the next species, *Makalata armata*; the noted characters may serve to separate the two genera, *Echimys* and *Makalata*, at a glance. No differences between the two genera could be found in the structure of the cheek-teeth of the lower jaw.

In Table 79 the external and skull measurements of the examined Suriname specimens are noted. The external measurements of nos. 18112 and 8690 were taken from the dried skins; those of the other specimen (no. 18115) were taken in the field. Specimen no. 17947 is a semi-adult female in which the third upper molar is non-functional, the tooth not yet having reached the height of the second molar; for this reason it is not dealt with here. The greatest length of the skull, the condylo-basal length, the basal length, and the palatal length as given in this table are measured from the anteriormost border of the premaxillary bone. Skull no. 18116 is the only full-grown one in my material: the basioccipital and the basisphenoid are completely fused and the suture between these bones is no longer visible.

Remarks. — A pregnant female collected on 2 September 1961 by H. A. Beatty near the Zuid River, at Kayserberg Airstrip, carried two embryos (CMNH no. 93267).

In Suriname one of the natural enemies of *Echimys chrysurus* is the Spectacled Owl, *Pulsatrix perspicillata perspicillata* (Latham, 1790); remnants of *Echimys chrysurus*, namely, were found in the stomach contents of a specimen of this owl, shot on 24 May 1964 near Republiek (see also Haverschmidt, 1968: 160).

The variation in the pale colour on the head and the tail, which ranges from whitish to yellowish, has been the reason that Lammens (1844: 103) distinguished between "Le rat à queue dorée" and "Le rat à queue argentée"; he distinguished the last mentioned as being larger than the former and noted: "Alles, was bey

TABLE 79

External and skull measurements of eight specimens of *Echimys chrysurus chrysurus* (Zimmermann) from Suriname in the Leiden Museum.

Reg. number	18112	1418	8690	18115	3962	18113	18116	18117
Sex	♂	♂	♀	♀	♀	♀	-	-
Head and body	270	-	250	285	-	-	-	-
Tail, with tuft	350	-	310	320	-	-	-	-
Tail, without tuft	320	-	270	290	-	-	-	-
Hind foot	47	-	-	51	-	-	-	-
Ear	-	-	-	-	-	-	-	-
Weight, grams	-	-	640	-	-	-	-	-
Greatest length skull	-	59.6	61.1	61.8	61.0	64.1	71.6	64.5
Condylobasal length	-	57.0	58.0	58.0	58.0	59.6	66.9	60.8
Basal length	-	53.0	54.2	53.5	54.6	55.3	62.4	56.2
Palatal length	-	30.5	30.0	31.2	29.7	31.6	34.5	33.3
Length of nasals	-	18.0	19.0	18.7	19.4	19.4	22.1	19.2
Interorbital constriction	-	16.0	16.5	14.8	17.0	17.3	16.7	18.6
Greatest width of interorbital area	-	21.2	22.3	20.4	20.8	21.2	21.0	22.3
Zygomatic breadth	-	31.2	31.0	30.0	32.2	32.1	33.9	33.0
Breadth of braincase	-	21.7	22.2	20.0	20.3	23.5	21.5	21.9
Diastema	-	13.4	14.1	13.8	14.4	15.3	16.8	15.1
Height of rostrum	-	16.0	16.7	15.3	18.3	17.5	18.6	18.1
For. incisivum, l x br	-	5.0x2.7	4.5x2.7	4.7x2.9	4.5x2.4	5.0x2.9	5.0x2.8	-
Alveolar length p-m ³	-	13.7	13.4	14.1	14.5	13.4	14.3	14.3
Length of mandible	-	34.3	35.6	34.5	38.5	37.3	39.6	37.4
Alveolar length p-m ₃	-	13.7	13.4	13.7	14.1	13.4	14.3	14.3

jenem gelb ist, ist bey diesem weiss". The variation in the extent of the white or yellowish colour on the tail and the head has been extensively dealt with by Waterhouse (1848: 315-318), who among the specimens examined by him also listed the one in the Leiden Museum collected by H. H. Dieperink (no. 18113).

The specimens listed above from "Suriname" (female no. 18113, and skull no. 18814) have already been mentioned by Jentink (1887: 229, 230; 1888: 100) as *Loncheres cristata* under the letters a and c respectively.

The brothers Penard do not mention the species, another sign of its rarity. Walsh & Gannon (1967: 73-74, 218) reported 104 specimens of "*Echimys chrysurus*" saved during the "Operation Gwamba", but, judging by their account, what they include under this name probably is a mixture of different species of Echimyidae, possibly including the present.

Echimys chrysurus is the type species of both the genus *Echimys* G. Cuvier, 1809 (by selection by Desmarest, 1817: 54) and of the genus *Loncheres* Illiger, 1811 (by monotypy). In the original description of *Loncheres*, Illiger (1811: 90) cited two species, *Loncheres paleacea* (a nomen nudum) and "*Hystrix chrysuroides* LinGmel.", the last-mentioned automatically becoming the type species of *Loncheres*.

In the older literature on Suriname mammals the present species is dealt with under the names *Echimys cristatus* Desmarest, 1817, and *Loncheres cristata* Wagner, 1843.

Makalata new genus

Diagnosis. — A spiny rat near *Echimys*, but differing from that genus in a number of characters. The spines are smaller and slenderer. The body is rather uniform in colour, lacking the black and white front as found in *Echimys chrysurus*. The tail is relatively short, being about as long as head and body combined; it is unicolourous with short appressed hairs over the greater part of its length and does not have a distinct tuft.

The cheek-teeth have three folds, the posterior of which opens lingually, the anterior buccally, the intermediate opening on both sides (in very little worn teeth the posterior fold also may open on both lingual and buccal side). When islands are formed, the middle (second) fold forms two, each of the other folds one island; the anterior islands is situated nearer to the buccal, the posterior closer to the lingual margin of the tooth. In *Echimys chrysurus*, on the contrary, both the anterior and posterior folds open buccally, and when islands are formed, the posterior and anterior both are placed nearer to the buccal than to the lingual margin of the tooth.

Remarks. — Most authors placed *Nelomys armatus* I. Geoffroy, 1838, as well as *Myoxus chrysurus* Zimmermann, 1780, in the genus *Echimys* G. Cuvier, 1809, of which *Myoxus chrysurus* is the type species. In my opinion the differences between these two species are of such a fundamental nature, that it is impossible to regard these taxa as belonging to a single genus. Already previous authors (e.g., Tate, 1935: 431-432; Ellerman, 1940: 109-113) placed the two in different groups of *Echimys*, but did not take the logical step to separate them generically. As no name is available for the genus containing *Nelomys armatus*, a new generic name is proposed here. Four synonyms of *Echimys* are usually cited, viz., *Loncheres* Illiger (1811), *Nelomys* G. Cuvier (1837), *Phyllomys* Lund (1841) and *Enchomys* Gloger (1841). *Loncheres* has *Myoxus chrysurus* as its type and thus is an objective synonym of *Echimys*. *Nelomys* G. Cuvier, 1837, has as its type *Nelomys blainvillei* G. Cuvier, 1837, which in my opinion is generically distinct from *N. armatus*. *Phyllomys* Lund, 1841, has as its type *Phyllomys braziliensis* Waterhouse, 1848, a species also generically distinct from *Nelomys armatus*. *Enchomys* Gloger, 1841, is a replacement name for *Echimys* G. Cuvier, 1809, and thus is an objective synonym of the latter.

Etymology. — The generic name *Makalata* is an arbitrary combination of letters, inspired by the Suriname native name Maka-alata for spiny rats. The name should be treated as being of the feminine gender.

Type species. — *Nelomys armatus* I. Geoffroy, 1838.

Makalata armata armata (I. Geoffroy, 1838)

Text-figs. 44c (mandible), 46 (cheek-teeth of upper and lower jaws), pl. 109 fig. 3 (hind foot), pl. 124, lower figures (skull), pl. F (animal)

Nelomys armatus I. Geoffroy, 1838, *Revue Zoologique, Société Cuvierienne*, 1: 101.

Type locality. — "Cayenne", French Guiana. This species was originally described and figured after a single specimen from Cayenne by Lichtenstein (1830: pl. 35), who

incorrectly identified it with *Echimys hispidus* (E. Geoffroy MS) Desmarest, 1817. All I. Geoffroy (1838) did, was to provide Lichtenstein's animal with a new name.

Synonymies. — Cabrera, 1961: 539; Tate, 1939: 179-181.

Vernacular names. — (E) Arboreal Spiny Rat.

Distribution. — The species *Makalata armata* has been reported from the northern part of South America: north-eastern Brazil, the Guianas, Venezuela, Colombia and Ecuador, and has also been found in Trinidad and Tobago. The nominate subspecies *M. armata armata* occurs in the Guianas and in southern Venezuela. According to Dr. C. O. Handley (in Goodwin, 1962: 3) the subspecies *M. armata castanea* (J. A. Allen & Chapman, 1893) from Trinidad and north Venezuela is indistinguishable from the nominate subspecies.

Occurrence in Suriname. — The only previously published record of the species from Suriname is the note by Sanderson (1939: 224; 1949: 778) dealing with four specimens "taken around Paramaribo on cultivated land and in secondary growth". It is possible that part of the material reported upon by Walsh & Gannon (1967: 73, 74, 218) under the name *Echimys chrysurus* consisted of the present species. The species evidently occurs throughout Suriname, from the coastal region to the southern border, but this arboreal and nocturnal species seems to be rather rare and is represented by only a few specimens in the various collections. I have examined the following Suriname material:

1. Forest near Sidonkroetoe Falls (4°25'27"N 56°32'4"W), about 40 km south-west of the Raleigh Falls, Coppename River, Saramacca District, 1 female (no. 23962, skin and skull).
2. Kwattaweg, west of Paramaribo, Suriname District, 1 specimen (no. 10441, skin).
3. Near Paramaribo, 1 male (no. 18109, head and skull).
4. Plantation "Morgenstond", north-east of Paramaribo, 1 female (no. 17244, skin and skull; 1 juvenile in spirit); 1 male (no. 17225, skin and skull).
5. Cultuurtuin (Agricultural Experimental Station) at Paramaribo, Suriname District, 4 males (nos. 3965 and 3973 (juveniles) and nos. 3972 and 18108, skins and skulls), 2 females (no. 3964, juv.; no. 3966, skin).
6. Zanderij, about 40 km south of Paramaribo, Para District, 1 male (no. 18245, skin and skull).
7. Gansee on Suriname River, now covered by Brokopondo Lake, about 100 km south of Paramaribo, Brokopondo District, 1 female (no. 18285, skin and skull).
8. Upper Litani River, Toemoek Hoemak Range, Marowijne District, south-eastern Suriname, 1 female (no. 7480, skin and skull).
9. Suriname, probably near Paramaribo, 1 male (no. 18110, skull).

Description. — The following description is based upon all the Suriname material in the collection of the Leiden Museum. The colour of the dorsal surface is dark yellowish brown, heavily lined with black. The posterior part of the back is conspicuously speckled with yellowish; this speckled area occupies one-third to more than half the length of the dorsal surface. The spines are pale grey at the base, becoming darker distally; and sometimes, namely in the speckled area of the body, they have a distinct pale yellowish subterminal band; occasionally spines may be found which are partially whitish. The spines end in a rather long flexible thin point. The hairs are rather stiff; they are greyish basally, dark brown distally, with a



Plate A — *Oryzomys bicolor bicolor* (Tomes).



Plate B — Left: *Zygodontomys brevicauda microtinius* (Thomas). Right: *Oryzomys delicatus* J. A. Allen & Chapman.



Plate C — *Holochilus brasiliensis nanus* Thomas.



Plate D — *Sigmodon alstoni savannarum* (Thomas).



Plate E — *Proechimys guyanensis guyanensis* (E. Geoffroy)



Plate F — *Makalata armata armata* (L. Geoffroy).



Plate G — Upper: *Rattus norvegicus* (Berkenhout). Lower: *Mus musculus* Linnaeus.



Plate H — Upper left: *Rattus rattus frugivorus* (Rafinesque) Middle: *Rattus rattus rattus* (Linnaeus). Upper right: *Rattus rattus alexandrinus* (E. Geoffroy).

yellow band below the tip. The width of this yellow band is quite variable, it may occupy the larger part of the distal half of the hair. The sides of the body are lighter, have less spines, and have the hairs often uniformly pale greyish brown tipped with dark brown. The head has the same colour as the back, except for the snout and the anterior part of the face, which are more russet. The cheeks are pale yellowish brown posteriorly, often more russet anteriorly. The spines of the head are narrower than those of the back. The ears are rather small and sparsely hairy inside and out. The outer basal part of the legs has the same colour as the sides of the body, the colour of the inner surface is like that of the ventral part of the body. The upper surface of the feet is greyish or yellowish brown, slightly paler than the outside of the legs. The hairs continue up to the toes, remaining of the same colour. The ventral surface of the body is rather pale yellowish or greyish brown, merging with the colour of the sides without a sharp line of demarcation. The fur of the ventral surface is shorter and softer than dorsally, and shows no spines. The fur of the body extends on the tail for about three cm. The rest of the tail has short appressed, widely spaced hairs; the ventral hairs are somewhat lighter than the dorsal. The tip of the tail does not end in a tuft of hairs.

The tail breaks easily, the fracture usually takes place across the centre of the fifth tail vertebra. The animal can lose its tail by autotomy. In my material 4 of 11 specimens are tailless. Sanderson (1939: 224) reported on four tailless specimens of this species and remarked: "Further inquiry among natives has extracted the information that this species is never seen with a tail, and it is true that, with all the specimens of it which we have collected, we have yet to see one with a tail". The situation concerning my own material is certainly not that dramatic.

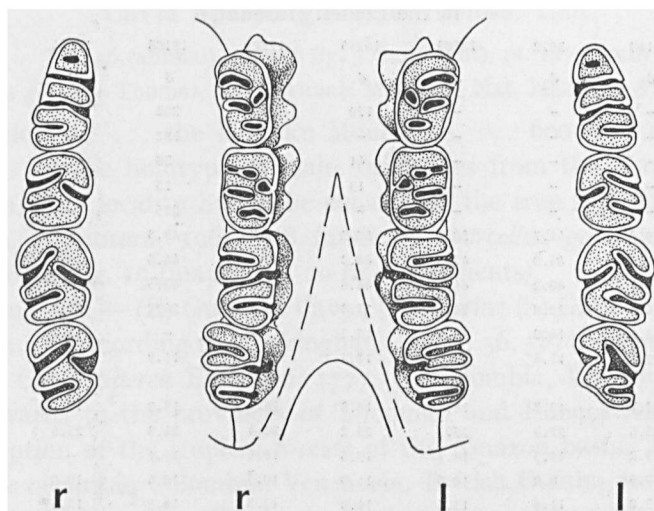


Fig. 46. *Makalata armata armata* (I. Geoffroy), female, no. 18285, upper and lower cheek-teeth. From left to right: right lower, right upper, left upper and left lower cheek-teeth. — Alveolar length of upper cheek-teeth, 11.3 mm.

The juveniles are very similar in colour to the adults, the ventral surface being of a slightly more russet colour.

In my material there are two pairs of well developed abdominal mammae, situated about at the line separating the sides from the ventral surface; furthermore, in some specimens there is a pair of inguinal mammae, which, however, are far less distinct than the abdominal, and possibly are not functional.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. The skull is similar to that of *Echimys chrysurus* (see pp. 442, 443), but smaller in all dimensions. In 10 specimens the alveolar length of the upper cheek-teeth varies from 10.9 to 11.3 mm (mean: 11.1 mm). In *Makalata armata* the interorbital area narrows more strongly anteriorly than in *Echimys chrysurus*. In the present species, the incision of the posterior margin of the palate is usually less deep, wider and blunter than in *Echimys chrysurus*, reaching to about the middle of the last molars. In all examined specimens the nasals reach slightly less far forward than the premaxillary, which clearly projects beyond the incisors, forming the anteriormost point of the skull. The pattern of the folds in the crown of the upper cheek-teeth is quite characteristic for the present species (text-fig. 46); its differences from that of *Echimys* (text-fig. 45) are fully discussed in the diagnosis of the genus *Makalata* (p. 445).

In Table 80 the external and skull measurements of ten specimens from Suriname are noted. The skull has been measured in the same way as that of *Echimys chrysurus* (see p. 443). Sanderson (1949: 778) gave the weight of a male as 147 g and that of females as 210 and 317 grams.

TABLE 80

External and skull measurements of ten specimens of *Makalata armata armata* (I. Geoffroy) from Suriname in the Leiden Museum.

Reg. number	18110	3972	18109	18245	17225	18108	17244	18285	7480	23962
Sex	♂	♂	♂	♂	♂	♂	♀	♀	♀	♀
Head and body	-	-	-	170	176	202	-	182	-	-
Tail	-	-	-	-	182	182	-	-	-	-
Hind foot	-	-	-	41	39	38	42.5	38	-	-
Ear	-	-	-	13	-	15	-	12	-	-
Weight, grams	-	-	-	-	-	225	-	-	-	-
Greatest length skull	49.8	47.7	50.7	52.2	49.8	49.3	-	52.5	49.9	50.4
Condylbasal length	46.3	44.0	47.8	48.3	45.5	46.5	-	48.5	46.7	46.7
Basal length	43.1	40.2	44.2	44.6	41.8	43.5	-	45.0	43.1	42.6
Palatal length	24.3	22.8	24.8	24.3	23.6	24.2	22.5	25.2	24.5	25.3
Length of nasals	14.5	14.0	15.5	15.2	15.4	-	14.2	15.0	14.8	14.6
Interorbital constriction	12.8	11.6	12.9	12.4	11.6	11.9	11.8	12.3	11.7	13.3
Greatest width of interorbital area	17.7	17.7	18.3	18.8	18.1	18.2	17.9	18.8	17.6	19.4
Zygomatic breadth	25.6	22.9	25.3	25.2	23.4	24.3	23.6	24.7	23.5	25.4
Breadth of braincase	19.2	19.5	18.7	19.5	18.6	19.1	-	20.0	19.3	20.4
Diastema	10.6	8.9	10.5	11.0	10.3	10.4	10.0	11.3	10.6	11.0
Height of rostrum	13.8	11.6	13.6	14.0	13.3	13.2	13.1	12.8	13.1	13.8
For. incisivum, l x br	-	3.5x1.5	3.8x1.9	3.4x1.9	3.0x1.8	4.1x1.4	3.5x2.2	4.2x1.8	3.4x2.0	3.7x2.2
Alveolar length p-m ³	11.1	11.3	11.0	11.1	11.3	11.0	11.0	11.3	10.9	11.3
Length of mandible	28.4	26.1	27.8	29.3	27.7	27.5	27.0	28.6	28.6	29.0
Alveolar length p-m ₃	11.1	11.3	11.0	10.8	11.0	10.6	10.4	10.7	11.0	10.8

Remarks. — A female with a newly born young was collected on 15 October 1958 at the Plantation Morgenstond (no. 17244).

According to Ir. E. W. van Brussel (in litt.), the present species is harmful to the culture of green bananas. At nightfall the rats climb the trees and eat the green fruit. In January 1966 they became a pest in the banana cultures near Kwatta, west of Paramaribo.

The brothers Penard ("De Surinamer", 20 April 1905) remarked that "*Loncheres guianae*" prefers overgrown river and creek banks, where they live in the trees; specimens are found especially in the areas where the parwa (*Avicennia nitida* Jacq.) grows. The animals make their nests between the roots of these trees. It cannot be ascertained now whether or not the identification by the brothers Penard is correct, the more so as they claim this species to be one of the most common of the Suriname rats.

One of the natural enemies of the present species in Suriname is the Spectacled Owl, *Pulsatrix perspicillata perspicillata* (Latham, 1790) (see Haverschmidt, 1968: 160).

The oldest known specimen of *Makalata armata* from Suriname in the Leiden Museum is the one (no. 23962) obtained by Mr. H. A. Boon on 8 September 1901 near the Sidonkroetoe Falls during the 1901 Coppename Expedition (for a narrative of this expedition see Bakhuis, 1902).

In some publications on Suriname mammals the name *Loncheres guianae* Thomas, 1888, has been used for the present species.

FAMILY CAVIIDAE

Cavia aperea guianae Thomas, 1901

Pl. 126 (animal), pl. 106 fig. 3 (hind foot), pl. 127 (skull)

Cavia porcellus guianae Thomas, 1901, Annals Magazine Nat. Hist., (7) 8: 152-153.

Type localities. — "... the Kanuku Mountains, ... 600 feet, and ... Berbice, on the coast". As the holotype, a male, originates from the Kanuku Mountains, British Guiana, that locality has to be considered the true type locality.

Synonymies. — Cabrera, 1961: 578 (under *C. porcellus guianae*); Hückinghaus, 1961: 34-40, 56-58, fig. 19 (map), tab. 10 (measurements).

Vernacular names. — (E) Guianan Cavy; (N) Cavia; (S) Ginipi.

Distribution. — According to Hückinghaus (1961: 56, 58) the range of distribution of the species *Cavia aperea* Erxleben, 1777, is: Colombia, Venezuela, the Guianas, Brazil, southwards to the provinces of Tucuman and Buenos Aires in Argentina, with the exception of the tropical forests of the Amazon basin. The subspecies *C. aperea guianae* occurs in Colombia, Venezuela, British Guiana and Suriname.

Occurrence in Suriname. — The present species seems to be quite rare in Suriname. So far it has not been reported from this country by any previous author; the only Suriname specimen known to me is a pregnant female collected by Dr. J. P. Schulz

on 12 Februari 1970 near the Sipaliwini airstrip in the extreme south-eastern part of Nickerie District near the Brazilian border; it was found at the foot of a large tree. The specimen is now in the Leiden Museum (no. 21618, skin and skull; embryo preserved in spirit).

Description. — The following description is based on the single female specimen from Suriname at my disposal. The dorsal surface is uniformly olivaceous grizzled with black. The hairs are greyish or blackish with the distal part yellowish, the tip itself usually being again black. On the head the olivaceous yellow colour is slightly more pronounced than on the back. Around the rhinarium there is a narrow zone of short, almost entirely whitish or light yellowish hairs. A small patch of short whitish hairs is present in the lower basal part of the inner surface of the ear. The outside of the legs is of the same colour as the back. The ventral surface of the body is dirty white, having whitish hairs with greyish bases. This colour extends on the insides of all four legs, and is distinctly separated from the colour of the back and the throat. Over the throat there is a broad transverse band of the same olivaceous grizzled colour as the dorsal surface. Before this band the lower surface of the head shows the same light colour as the belly, except for a distinct, more or less triangular patch of a dark greyish brown colour in the middle of the lower lip. The ears are round and well developed, they project distinctly through the fur. No trace of a tail is visible. The forelegs have four toes each, the hind legs three.

The specimen has two pairs of inguinal mammae.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. The most striking feature of the skull is that the upper tooth-rows strongly converge anteriorly: the left and right premolars almost touch each other in the median line of the skull, while the distance between the last molars is about twice the width of each molar (pl. 127). The surface of the teeth is strongly folded, the folds being sharply angular lingually in the upper jaw and buccally in the lower. Posteriorly the upper incisors show a distinct notch. The foramen incisivum is rather small. The palate ends at the level between the second and third molar. In the lower jaw the processus angularis is posteriorly very strongly produced; the processus condylicus is quite erect and forms an angular tooth in its upper anterior part. The processus coronoideus is absent. A strong ridge runs outside of and parallel to the tooth-row; it is separated from the tooth-row by a deep and wide groove.

External measurements of the Sipaliwini specimen are: head and body, 253; hind foot, with nail, 48; ear, 22 mm. — Skull: greatest length, 62.5; condylobasal length, 58.0; condylo-incisive length, 55.4; basal length, 53.9; palatal length, 33.6; foramen incisivum, length \times breadth, 5.4×2.0 ; diastema, 17.7; height of rostrum, 17.7; nasals, length \times breadth, 21.8×9.2 ; zygomatic breadth, 34.9; interorbital constriction, 12.6; breadth of braincase, 23.5; bulla, length \times breadth, 11.9×8.6 ; alveolar length upper cheek-teeth, 15.0; alveolar length upper molars (m^1 - m^3), 10.9; length of mandible (to processus condylicus), 41.7; length of mandible (to processus angularis), 53.7; alveolar length of lower cheek-teeth, 14.8 mm. The length of the bullae

was "measured from the notch in front of the paroccipital process directly forwards, parallel with the axis of the skull, not to the antero-internal angle, which ends in an irregular point" (Thomas, 1917: 153, footnote).

Remarks. — I could compare the present Suriname specimen with the type series of *Cavia porcellus guianae* Thomas, 1901, in the British Museum (Nat. Hist.). The holotype, a male, from the Kanuku Mountains, British Guiana, differs from my specimen in that the ventral surface is much lighter, being almost white, but other specimens of the type series were indistinguishable in colour from the Suriname specimen.

The domesticated *Cavia* with its several colour variations is well-known as a pet and as a laboratory animal; it is, e.g., used in the Paramaribo hospitals. The oldest scientific name for the domestic Guinea pig is *Cavia porcellus* (Linnaeus, 1758). Since the relationship between the wild and the domestic forms (the domesticated form existed already in South America in precolumbian times) is not quite clear, I prefer to reserve the name *Cavia porcellus* (Linnaeus, 1758) for the domestic form, and to treat the wild forms as a distinct species.

In the original description of the present taxon Thomas (1901: 152) considered it to be a subspecies of *Cavia porcellus*, but in his 1917 revision of the genus *Cavia* he gave it the rank of a full species. I follow here Hückinghaus (1961: 58), who considered the Guianan form to be a subspecies of *Cavia aperea* Erxleben, 1777.

FAMILY HYDROCHAERIDAE

Hydrochaeris hydrochaeris hydrochaeris (Linnaeus, 1766)

Text-fig. 47 (skull), pl. 106 upper figure 4 (hind foot), pl. 128 (animal)

Sus Hydrochaeris Linnaeus, 1766, Systema Naturae, (ed. 12) 1: 103.

Type locality. — "Habitat in Surinamo". Per definition a type locality is the locality (or localities) from where the type specimen originates, regardless of what the author states to be the locality. As Linnaeus included in his original description of *Sus hydrochaeris* a reference to Marcgraf (1648: 230), the locality "region of Pernambuco, Brazil" has to be added to Suriname as a type locality. There is not the slightest ground for Tate's (1935: 354) supposition that the indication "in Surinamo" by Linnaeus is erroneous, the fact that Linnaeus saw material ("pusillum tantum vidi") makes it very likely that this material actually came from Suriname. Therefore both Suriname and Brazil are type localities, and the type locality can only be definitely restricted by a lectotype selection, which to my knowledge has not been done so far. To end the controversy I select the juvenile from Suriname mentioned by Linnaeus to be the lectotype of *Sus hydrochaeris* Linnaeus, 1766. By this action the type locality is now definitely restricted to Suriname.

Synonymies. — Cabrera, 1961: 583.

Vernacular names. — (E) Capybara, Water Pig, Giant Water Cavy; (N) Capibara, Cabiari, Waterzwijn, Watervarken, Waterhaas; (S) Kapoewa.

Distribution. — The species *Hydrochaeris hydrochaeris* (Linnaeus, 1766) ranges from Panama in the north-west to Paraguay, north-eastern Argentina and Uruguay in the south. The nominate subspecies, *H. hydrochaeris hydrochaeris*, occurs in Venezuela, the Guianas, Brazil, Colombia and Peru.

Occurrence in Suriname. — In many publications on Suriname (scientific and popular accounts as well as narratives and official reports) this conspicuous, large and easily recognizable species has been mentioned. The earliest Suriname record of the species known to me is Warren's (1667: 11) statement: "Of the Hogs, there are three kinds, one lives like an *Otter*, for the most part in the water, and is much commended". The published and unpublished data at my disposal show that in Suriname the Capybara is rather common along the river banks in the coastal plain and in the whole of the interior. It is found wherever a succulent vegetation is present, like in swamps, marshes and creeks near open rivers. Most authors did not cite exact localities. So Jentink (1887: 235; 1888: 108), under the name *Hydrochoerus capybara* listed the present species from "Surinam"; Jentink's specimens a and g of 1887 are those listed below as nos. 19692 and 19693, while his specimens a and b of 1888 are listed below as no. 19691 and 19692 respectively. The first more exact Suriname record of the species is the one by Stedman (1796 (2):135), who observed the species on 14 July 1775 near the post Jeruzalem on the Coermotibo River (near the confluence with the upper Cottica River, northern Marowijne District). Sanderson (1949: 778) noted that "the Capybara is very common along the Wayumbo creek and congregates in the Coronie swamp in great numbers in the dry season", and continued "numbers were seen on the banks of the Coppename River immediately above the Wayumbo creek" (Saramacca District). More or less exact localities can also be found in the reports of various expeditions (see Holthuis, 1959: 35-41), in which occasionally the discovery of foot imprints of the species is mentioned; e.g., Bakhuis (1902: 796-799) reported that many Capybaras were observed in the swampy areas along the right bank of the Coppename south of the Raleigh Falls in the early part of October 1901. During the "Operation Gwamba" in the Brokopondo region only one specimen was saved (Walsh & Gannon, 1967: 219). In the beginning of 1971 an expedition was undertaken to the area of the Oelemari, upper Loe and Upper Litani Rivers in the extreme south-eastern part of Suriname; in the narrative of this expedition Findlay (1971a) at several instances mentioned the occurrence of the Capybara.

Notwithstanding the fact that the Capybara is very common, it is represented by relatively very few specimens in the collection of the Leiden Museum. This probably is due to the fact that the animal is rather large and difficult to handle, while also its being greatly appreciated as food makes it difficult to obtain specimens for scientific purposes.

The following material has been examined by me:

1. Near Wageningen, lower Nickerie River, northern Nickerie District, 2 females (nos. 21932, 21933, skins and skulls).
2. Sipaliwini, extreme south-eastern part of Nickerie District, near Brazilian border, 1 skull (no. 21860).
3. Kwatta, west of Paramaribo, Suriname District, 1 skull (no. 21861).
4. Suriname, probably near Paramaribo, 1 male (no. 19691, skin and skull), 1 female (no. 19692, skin and skull).
5. Suriname, without more precise locality indication, 1 male (no. 2276, skin and skull), 1 skull (no. 19693).

Description. — The following description is based on three adult specimens in the Leiden Museum. The colour of the dorsal surface is greyish brown all over. The intensity of the colour is variable, ranging from pale, almost yellowish brown to a darker brown. The hairs are coarse and of two kinds. There are very short thin, sparse, dark hairs, overlaid by long heavier bristle-like hairs of a pale greyish brown colour, ending in a dark tip. The length of the dark distal part determines the intensity of the general colour. The tips of the hairs are slender and narrow. The blunt and truncate head is dorsally of about the same colour as the back, but the snout is darker, more blackish and with shorter hairs. Around the eyes there is a narrow ring of black hairs, surrounded by a wider area which is somewhat paler than the rest of the head. Long whiskers are present on the snout and around the eyes. The ears are not very large, but conspicuous and rounded. The inside and outside of the ears have soft hairs, which are irregularly arranged, leaving distinct naked spots. The sides are of the same colour as the dorsal surface. The ventral surface is somewhat lighter; here the hairs are shorter, far less dense, unicolorous pale brownish or yellowish grey. There is no sharp demarcation between the colour of the lateral and ventral surfaces. The fur of the ventral surface of the head may be like that of the ventral surface of the body, sometimes the entire throat and lower head show a pubescence similar to that of the sides. The chin is darker than the rest of the ventral surface of the head. The outside of the basal part of the legs has the same type of hairs as the dorsal surface of the body, but on the hind legs the hairs are less dense than on the forelegs. The pubescence of the inside of the basal part of the legs is similar to that of the ventral surface of the body; here too the hairs of the hind legs are shorter and more sparse than those of the front legs, the latter are even longer than those of the ventral part of the body and form long fringes along the posterior margin of the sole.

The forefeet have four, the hind feet only three toes. The toes are webbed; the webs of the hind feet reach the base of the nails. The tail is very short, usually entirely hidden by the hairs of the rump.

In my material two pectoral, four abdominal and one inguinal mammae could be seen on either side, so that the total number of mammae is fourteen.

Dental formula: $I \frac{1}{1}, C \frac{0}{0}, P \frac{1}{1}, M \frac{3}{3}$. Both the upper and lower incisors are white and grooved. The upper tooth-rows distinctly converge anteriorly, the distance between the premolars being about eight times smaller than that between the last molars. The last upper molar is longer than the first two molars and the premolar combined;

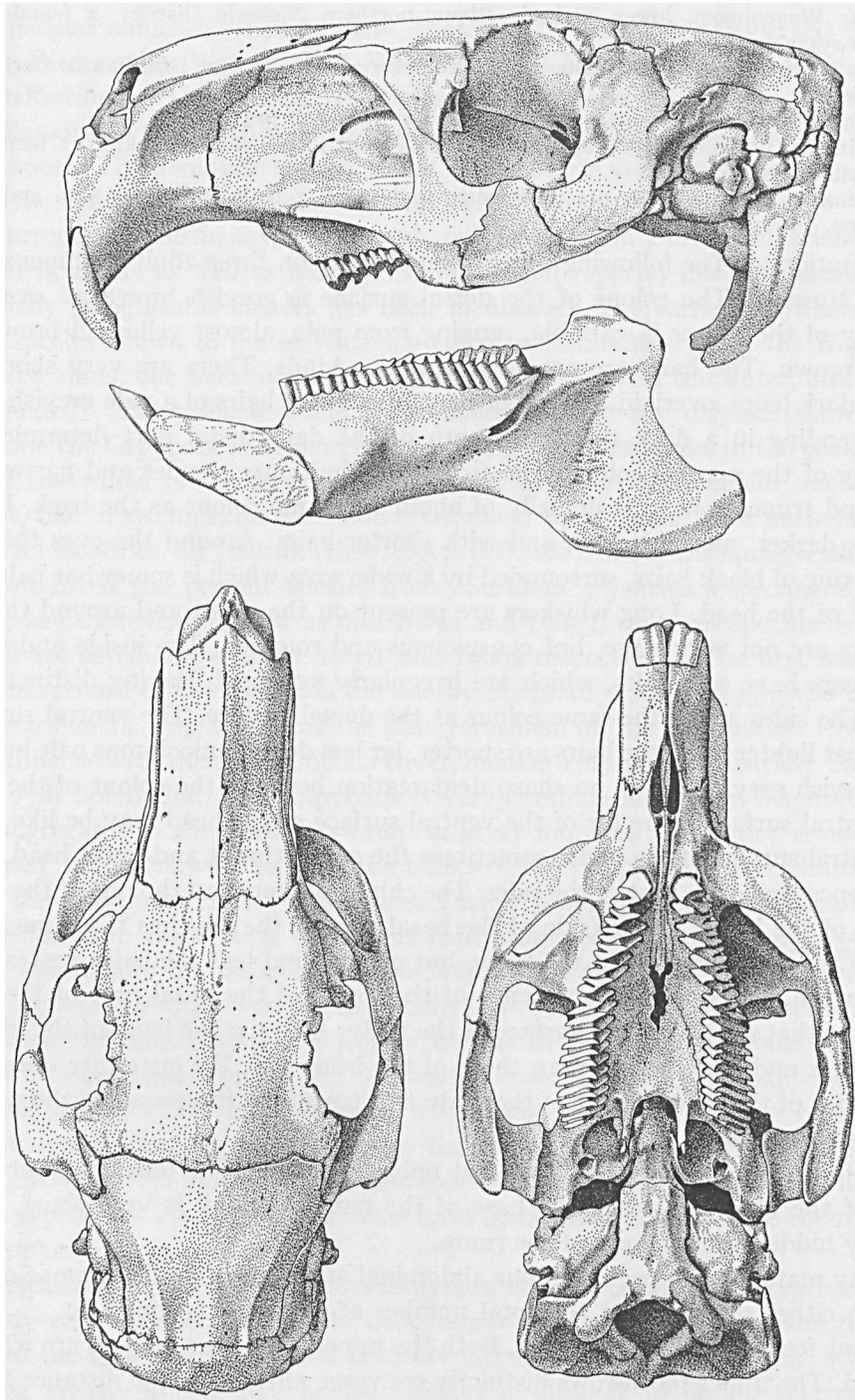


Fig. 47. *Hydrochaeris hydrochaeris hydrochaeris* (Linnaeus), skull, female, Suriname, no. 2215. — Zygomatic breadth, 105 mm.

it shows about ten parallel vertical lamellae with sharp outer edges. In the lower jaw the premolar and the three molars are all four of about the same length. The foramen incisivum is long and narrowly obcordate with the widest part posteriorly. Ventrally the paroccipital processes are very strongly produced. In the mandible the processus coronoideus is small, directed outward before the end of the last lower molar. The processus angularis is strongly produced backward. Furthermore the large dimension of the skull distinguishes the species at a glance from those of all other Suriname rodents. The cheek-teeth are evergrowing, the alveolar length of the upper cheek-teeth varies in 8 specimens from Suriname from 55 to 83.5 mm. In Table 81 the skull measurements of 8 specimens are noted. The greatest length of the skull, the condylobasal length, the basal length, and the palatal length were all measured from the anteriormost point of the premaxilla. With length of the mandible is meant the distance between the anteriormost point of the alveolus of the incisors to the posteriormost point of the processus angularis. Exact external measurements of the *Capybara* from Suriname are not available; the combined length of head and body is about 1 metre.

Remarks. — In the Game Decree 1970 (see p. xxxii) the *Capybara* is listed as game under the names: "Waterhaas of kapoewa (*Hydrochaeris hydrochaeris*)". It seems that for the present there is no danger that the *Capybara* soon will be threatened with extinction in Suriname. In the literature I found no Suriname data on the reproduction of the species, but Walker (1964 (2): 1021) remarked that "a single litter of 2 to 8 offspring is born once a year, after a gestation period of 15 to 18 weeks". Dr. Geijskes informed me that he saw juvenile *Capybaras* in Suriname during the month of October, each female having two young.

TABLE 81

Skull measurements of eight specimens of *Hydrochaeris hydrochaeris hydrochaeris* (Linnaeus) from Suriname in the Leiden Museum.

Reg. number	21932	2276	2215	21933	21861	19693	21860	19692
Sex	♂	♂	♀	♀	-	-	-	♀
Greatest length	220	225	205	185	246	239	224	154
Condylobasal length	202	214	190	173	234	228	209	146
Basal length	186	204	179	162	220	216	199	136
Palatal length	133.5	145.5	126	112	157	155	142	97
Nasals, length x breadth	76x42.7	88x44.0	71x38.2	63.5x37.4	96x45.2	85x50.5	76x48	55x32
Interorbital constriction	64.8	58.5	50	52	66.5	62.5	63	46.5
Zygomatic breadth	123	122	105	110	138	137	128	91
Breadth of braincase	64.7	61.5	60.0	59.5	67.8	63	67.5	56
Diastema	63.1	66.2	56.1	50.5	67.8	73	63.5	41.5
Height of rostrum	67.8	67.8	61.8	55.5	71.5	70.5	65	45.5
For. incisivum, l x br	28.5x7.2	31.5x9.5	25x8.1	27x8.2	33.5x8	34x8	27x8.7	23.5x6.7
Alveolar length p ^m ₃	68.5	77.5	70	61.5	83.5	83.5	80.5	55
Alveolar length m ³	38.4	37.0	37.1	29.5	44.5	43.5	45	28
Length of mandible	174	177	163	151	195	205	186	115
Alveolar length p ^m ₃	67.4	79.6	66.8	61.0	79.5	82	75	56
Alveolar length m ₃	21.0	22.0	20.0	21.5	22.5	24	21.5	15.5

The meat of the Capybara is eaten by the Amerindians and the Bush-Negroes, who prefer the young animals, because the meat of the adults has a peculiar musky taste (Geijskes, 1954: 76).

In Suriname the Capybara may cause some damage to corn, and sometimes also to sugar cane, grown in the native gardens of the coastal area.

Apart from man the natural enemies of the species are the Puma, *Puma concolor discolor* (Schreber, 1775), the Jaguar, *Panthera onca onca* (Linnaeus, 1758), and the Anaconda, *Eunectes murinus* (Linnaeus, 1758).

The Capybara lives in troops (up to 20 individuals) or in family groups; it is active in the daytime as well as during the night. The food of the animals is vegetable, consisting of aquatic plants, roots, bark, etc. Older reports (e.g., Barrère, 1741: 160-161; Hartsinck, 1770: 22; Von Sack, 1821 (2): 193) that they eat fish, need confirmation. Already Quandt (1803: 204, footnote) doubted the correctness of the stories of the fish eating habits of the species. These stories probably originated from the peculiar fishy taste of the meat (see Teenstra, 1835 (2): 412-413) combined with the aquatic habits of the species.

The Capybara is easily kept in captivity; in Suriname some people keep this animal on their private property.

Kappler (1887: 73-74) noted that in Suriname the species lives in groups of up to 20 animals and searches for food at night. Its droppings resemble "in Größe, Form und Farbe den Oliven". He gave the weight of the animal as "über 100 Pfund". The brothers Penard ("De Surinamer", 30 April 1905) stressed the semi-aquatic life of the species, mentioned already by several early authors, and remarked that the Capybara is an excellent swimmer and also progresses by walking under water over the bottom of lakes and rivers. Moreover, the brothers Penard noted that the animals love to roll in the mud and that on the land they are less agile than in the water.

The Capybara is a conspicuous animal and cannot easily be confused with any other Suriname mammal. It is the largest living rodent; full-grown specimens have a total length of one metre or even more. The Capybara has relatively late been recognized as belonging to the Rodentia. It was generally considered to be a kind of pig, as is indicated by the vernacular names Hog, Water Pig, Watervarken, Cochon d'eau, etc., and by the latin name *Hydrochaeris*. Even Linnaeus (1766: 103) placed it in the genus *Sus*. However, one year later, Pallas (1767: 18) correctly placed the species in the order Glires (= Rodentia) and mentioned it in the genus *Cavia*.

A profound lack of uniformity still exists in the spelling of the family name, genus name and species name of the Capybara; even in modern literature one finds the names Hydrochoeridae and *Hydrochoeris hydrochoeris*. As Linnaeus (1766: 103) clearly gives the species name as *Sus Hydrochaeris*, and Brünnich (1772: 44) the generic name as *Hydrochaeris*, the names Hydrochoeridae, *Hydrochaeris* and *hydrochaeris* have to be used, while Hydrochoeridae, *Hydrochoeris* and *hydrochoeris* must be considered erroneous spellings. Part of this confusion is caused by the fact that

some authors accepted the generic name *Hydrochoerus* Brisson (1762: 80) as a valid name. As, however, Brisson's 1762 work is nothing but a new edition of his pre-Linnaean (1756) *Regnum Animale*, and moreover is not consistently binominal, it cannot be used for nomenclatural purposes and the names in this work are not available.

The vernacular name Capybara is the name used by Marcgraf (1648: 230, as Capybara), the animal being so called by the natives near Pernambuco, Brazil. In Suriname the vernacular name Cabiai is given to the species by some Amerindian tribes, while the Negro-English (the Sranan-Tongo) name is Kapoewa.

In the literature on Suriname mammals the scientific names *Hydrochoerus capybara*, *Hydrochoerus hydrochaeris*, and *Cavia capibara* are often used to indicate the present species.

FAMILY DASYPROCTIDAE

Dasyprocta leporina leporina (Linnaeus, 1758)

Text-fig. 44d (mandible), pl. 106 upper figure 1 (hind foot), pl. 129 (animal), pl. 130 (animal, after Catesby, 1754), pl. 131 (skull)

Mus leporinus Linnaeus, 1758, *Systema Naturae*, (ed. 10) 1: 59.

Type locality. — "Habitat in Java, Sumatra". Corrected here to a forest near the boarding-school Peninika, near the confluence of the Peninika Creek and the upper Commewijne River, Suriname (see further under Remarks).

Synonymies. — Cabrera, 1961: 585-586 (under *Dasyprocta aguti*); Krumbiegel, 1941 (under *Dasyprocta aguti*).

Vernacular names. — (E) Orange-rumped Agouti, Red-rumped Agouti; (N) Goudhaas, Agoeti, Surinaams Konijn; (S) Konkoni.

Distribution. — According to Cabrera (1961: 585-586), who used the name *Dasyprocta aguti* (Linnaeus, 1766) for the species, it occurs in Venezuela, Trinidad, the Guianas, northern and eastern Brazil. The nominate subspecies *Dasyprocta leporina leporina*, for which Cabrera used the name *D. aguti cayana* (Lacépède, 1802), is found in the Guianas, Trinidad, and northern Venezuela.

Occurrence in Suriname. — The Agouti is a common and very well known species in Suriname and it is therefore not surprising that it has been mentioned by practically all authors dealing with the Suriname fauna. The first of these, to my knowledge is Warren (1667: 11) who stated: "The Conies are red, not so good meat, and less than the Hares [= *Agouti paca paca*, see p. 475], but not differing in Shape". The species is found in cultivated areas, in dry forests (especially near the native gardens) and in the wooded parts of the savannas. During the "Operation Gwamba" in the Brokopondo region 226 specimens were saved (Walsh & Gannon, 1967: 218, under *Dasyprocta aguti*). Apart from 9 specimens labelled only "Suriname" I have examined the following Suriname material of the Agouti:

1. Forest Service Camp Wakay on the Corantijn River, about 80 km south of Nieuw Nickerie, Nickerie District, 1 male (no. 23957, skull), 1 female (no. 23942, skin and skull).
2. Koffiemaka near Wageningen, lower Nickerie River, 2 males (nos. 20754, 20755, skins and skulls), 2 females (nos. 20753, 20756, skins and skulls).
3. Stondansi Falls, upper Nickerie River, about 75 km south of Wageningen, 1 juvenile male (no. 22547, skin and skull).
4. Lombok Falls, upper Nickerie River, about 50 km above Stondansi Falls, 1 male (no. 23959, skull).
5. Blanche Marie Falls, upper Nickerie River, about 40 km above Lombok Falls, 1 female (no. 23958, skull).
6. Near Sipaliwini airstrip, upper Sipaliwini River near Brazilian border, 1 female (no. 20750, skin and skull), 1 skull (no. 20751).
7. Remnant forest on west flank of Vier Gebroeders Mountains, near Sipaliwini airstrip, extreme south-eastern Nickerie District, 1 female (no. 23944, skin and skull).
8. Brasil, village on Saramacca River, 50.5 km west of Paramaribo, Saramacca District, 1 male (no. 17804, skin and skull).
9. In forest north-east of Matta, about 12 km due west of Zanderij airport, Saramacca District, 1 juvenile female (no. 20748, skin and skull).
10. Plantation "Clevia", west bank of Suriname River north-east of Paramaribo, Suriname District, 1 female (no. 17776, skin and skull), 1 skull (no. 20770).
11. Plantation "Morgenstond", west bank of Suriname River, just south of "Clevia", 1 male (no. 20771, skull), 1 female (no. 20773, skull).
12. Surroundings of Paramaribo, 9 skulls (nos. 17742, 17748, 21862-21868).
13. Pad van Wanica, south of Paramaribo, in the direction of Lelydorp, 1 female (no. 17800, skin and skull).
14. Domburg, west bank of Suriname River, about 15 km south of Paramaribo, 1 male (no. 23943, skin and skull).
15. About 10 km east of Jodensavanne, east bank of Suriname River, Suriname District, 1 skull (no. 23976).
16. Sectie O on railroad 70 km south of Paramaribo, between Zanderij and Kwakoegeon, Brokopondo District, 1 skull (no. 20772).
17. Near Brokopondo, west bank of Suriname River north of Brokopondo Lake, 2 females (nos. 18234, 18235, skulls).
18. Sara Creek, about 15 km south of Dam, Brokopondo District, 1 skull (ZMA no. 9849).
19. Commewijne River between Commewijne and Morico Creeks, Commewijne District, two skulls (nos. 20746, 20747).
20. Forest near Peninika boarding-school near the confluence of the Peninika Creek and the upper Commewijne River, 1 female (no. 20752, skin and skull). Neotype of *Mus leporinus* Linnaeus, 1758.
21. Forest near Gododrai on Mapane Creek, upper Commewijne basin, Commewijne District, 1 skull (no. 17752).
22. Forest on shell ridge between Moengotapoe and coast near Wiawia Bank, about 15 km south of the coast line, Marowijne District, 2 females (nos. 21874, 21875) and 2 juveniles (no. 21873).
23. Forest near Langamankondre, mouth of the Marowijne River, Marowijne District, 1 male (no. 20749, skin and skull).

Description. — The following description is based on the neotype (RMNH no. 20752) of *Dasyprocta leporina*. The hairs are coarse and somewhat glossy, those of the rump are greatly lengthened, often obscuring the base or the greater part of the short tail. The hairs in the median area of the neck are somewhat longer than those of the sides and form an indistinct crest. The dorsal surface of the head is olivaceous grey speckled with yellowish, showing the same colour as the back; the cheeks are sparsely haired, the underfur becoming more conspicuous than the actual hairs. The

rhinarium is covered with short grey hairs, the posterior of which have a yellow band just below the tip. A few whiskers are present in the distal part of the snout and over the eyes. The ears are conspicuous, rounded, having both in- and outside sparsely provided with short, uniformly dark hairs. The anterior part of the dorsal surface of the body including the neck is olivaceous grey speckled with yellowish, while in the median area the grey colour is somewhat darker than at the sides. The rump is conspicuously rufous. The hairs of the anterior part of the body are dark greyish brown, annulated with yellowish white, the brown and yellowish bands being of about the same width. The tips of the hairs are dark; in the median area of the back the brown bands are wider and the yellowish colour is darker, more brownish. The long hairs of the rump usually are rufous all over, but some, especially in the anterior region, in their distal parts show brown annulations. The olivaceous grey colour of the back gradually merges with the rufous colour of the rump. Anteriorly the sides are of a similar colour as the lateral dorsal part of the body; at the level of the rump, however, they are not rufous at all, but similar in colour to the anterior part. The ventral surface has the hairs like those of the sides, but far more sparse, not fully covering the skin; the rather bare areas are especially distinct posteriorly, at the bases of the legs, and on the posterior ventral surface of the head. The hairs of the legs extend down to the bases of the nails, they are dark blackish brown, and only in the proximal part of the legs they are annulated with yellowish brown. The legs thereby acquire a much darker colour than the body. The inside of the legs is somewhat more sparsely haired than the outside. The forefeet have four toes, the outer of which is very short, but has a nail. Of the three remaining toes the middle is the longest, the two others are shorter and of equal length. The hind feet have three toes, the middle of which is the longest, the outer the shortest. The naked sole is conspicuously elongate. The tail is very short and naked.

There are one pair of pectoral, two pairs of abdominal, and one pair of inguinal mammae.

Dental formula: $I \frac{1}{1}, C \frac{0}{0}, P \frac{1}{1}, M \frac{3}{3}$. All incisors have the anterior face reddish brown. The premolars are very similar to the molars, but are slightly larger; the molars are of about equal size. The foramen incisivum is elongate, situated slightly behind the incisors; it is almost closed and posteriorly it ends slightly before the suture of the premaxilla and the maxilla, this suture occurring at about halfway the incisors and the premolars. The posterior margin of the palate is deeply incised, U-shaped; the incision has a rounded top, which reaches to the anterior margin of the last molar. The outline of the skull, when regarded in dorsal view, is elongate. The nasalia are long, slightly widening anteriorly, the anterior margin of the two bones together is broadly triangularly produced medially, the tip being shallowly incised in the middle. The length of the nasalia is less than that of the sutura frontalis. In lateral view the upper margin of the nasalia is convex anteriorly, straight or slightly concave posteriorly. There is a slight median depression in the basal area of the nasalia and in the distal area of the frontalia. The premaxilla is distinctly produced forward beyond the

incisors, but does not reach beyond the level of the end of the nasals. The mandible has a large processus condylicus; the processus coronoideus is wide, short and triangular, while the processus angularis is narrow and reaches about as far back as the processus condylicus. The foramen mandibulare is distinct, it is situated at the base of the ridge enclosing the basal half of the molars.

Variation. In our rather large material several of the characters mentioned above for the neotype show considerable variation. The colour of the anterior part of the dorsal surface in some specimens is darker than in others, but the range is slight. In some specimens the darker median area is more clearly marked than in others. The variation in the rufous colour of the rump is greater, although in all specimens the rufous colour is quite well noticeable. In some animals the rufous colour is very bright, almost orange (e.g., nos. 23943, 23944) and hardly mixed with blackish, in others it is dark and more reddish brown (no. 17776). In one specimen (no. 20754) the rufous area is rather small and dark, being quite dull. All intergradations between these extremes occur. The ventral surface also shows variation in the colour and in the density of the hairs. In some specimens the hairs of the ventral surface are practically as dense as those of the sides, and are of the same colour (e.g., no. 21875). In others the hairs are more sparse; in some animals (nos. 17776, 23944, 23942, 17804) the median area of the ventral surface of the body is distinctly rufous, in others (nos. 20753, 22547, 23943) it is white. In the two juveniles (no. 21873) the colour is like that of the adults, but the hairs are relatively short.

In Table 82 the external and skull measurements of 12 specimens from Suriname are given. The total length of the skull as noted here is the length measured from the anterior margin of the nasalia to the posteriormost point of the exoccipital crest. In 31 skulls of the present species from Suriname the length of the upper cheek-teeth varies from 16.9 to 22.8 mm (mean: 20.0 mm).

Remarks. — In the Game Ordinance of 1954, as revised in 1970, the Agouti is listed as game under the names: "Konijn of koni-koni of agoeti (*Dasyprocta cayanus*)".

The Agouti produces two to four young per litter. This fact has already been mentioned by Stedman (1796 (2):153) and later by the brothers Penard ("De Surinamer", 4 May 1905). When visiting Suriname in 1963, I obtained the same information from hunters. The only juveniles of this species seen by me are two of a total length of 19 cm, collected on 24 October 1948 near Moengo (no. 21873).

The Agouti is a very popular game animal in Suriname. The animals are often hunted with dogs, which will follow them in their holes. Sometimes they are obtained by smoking them out of their burrows. Many authors dealing with the Suriname Agouti comment on the quality of its meat as food. Bancroft (1769: 141-142) stated: "... their flesh composes near one half of the animal food of the Natives, as they are most numerous, and easily taken, of any other animal, whose flesh is equally palatable". Numerous later authors mentioned the good taste of the meat although it is usually said not to be of the high quality of that of the Paca, *Agouti paca paca*

TABLE 82
External and skull measurements of twelve specimens of *Dasyprocta leporina* (Linnaeus) from Suriname in the Leiden Museum.

Reg. number	20752	17776	23942	17800	20756	20753.	23959	17804	20749	20754	23957	18235
Sex	♀	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂	♀
Head and body	565	538	522	505	495	450	597	540	502	481	-	-
Tail	30	13	21	20	18	27	20	28	26	13	-	-
Hind foot, without nail	140	127	128	123	127	126	148	126	127	118	-	-
Ear	46	44	47	40	44	44	42	45	42	40	-	-
Weight, grams	4500	3750	5200	3250	3250	3000	5000	-	2750	2500	-	-
Greatest length skull	123.5	110.8	113.5	103.7	107.5	106.5	123.5	113.5	106.5	106.5	116.3	129.5
Condylabasal length	112.7	100.8	104.2	95.4	97.5	95.8	110.8	101.8	98.4	94.8	104.2	119.0
Basal length	106.3	95.0	97.6	90.0	91.8	89.0	104.1	96.0	91.5	89.2	98.5	111.7
Palatal length	60.3	55.2	57.5	53.3	53.0	51.2	61.0	56.3	51.8	51.0	58.5	67.3
Nasals, 1 x br	44.6x19.3	37.3x18.1	40.5x17.5	36.7x15.0	40.0x17.3	40.3x17.0	44.0x20.5	40.4x16.5	35.6x17.2	38.7x17.0	40.1x18.8	49.5x22.8
Length sutura frontalis	48.5	45.5	47.0	42.5	42.5	43.0	50.5	43.7	44.0	41.5	48.0	54.0
Interorbital constriction	32.0	30.7	31.3	29.2	29.8	25.8	35.0	29.5	26.6	26.5	27.7	34.6
Zygomatic breadth	52.2	-	48.9	47.7	55.2	48.8	54.5	48.7	45.7	48.6	50.3	54.1
Breadth of braincase	39.4	38.1	36.3	35.5	34.8	34.6	40.0	34.7	34.1	35.3	36.4	38.3
Diastema	30.5	26.7	29.0	26.4	27.7	26.5	31.0	27.6	24.4	27.4	28.7	34.4
Height of rostrum	32.6	33.6	33.4	30.0	30.6	31.4	36.7	31.0	33.0	30.0	32.5	38.0
For. incisivum, 1 x br	8.7x3.8	7.5x4.3	8.7x3.6	5.2x3.0	8.7x3.4	4.5x3.5	6.3x4.0	3.9x3.0	5.0x3.4	4.0x3.3	5.6x3.8	5.4x4.0
Alveolar length P-m ³	21.5	20.4	20.2	19.0	19.3	19.6	22.0	20.5	20.0	16.9	20.3	22.2
Breadth of m ²	5.3	4.3	4.9	5.2	5.0	5.3	5.5	5.0	4.0	4.9	4.9	5.5
Length of mandible	71.1	65.0	68.4	63.4	64.2	63.3	74.0	64.4	62.4	60.6	64.5	78.4
Alveolar length P-m ₃	22.8	23.1	21.4	20.8	21.0	22.2	23.6	22.0	21.5	18.6	21.6	22.8

(see pp. 474, 475). Some authors stated the meat to be white (e.g., Hartsinck, 1770: 94), others (e.g., the brothers Penard, "De Surinamer", 4 May 1905) described it as of a dark colour and stringy.

The Suriname Agoutis are said to prefer dry places, and not to like water, although they are able to cross rather wide creeks (the brothers Penard, "De Surinamer", 30 April 1905). The animals are rarely seen in the daytime; then they usually stay in their burrows, which according to some authors they dig among the roots of large trees, while others (Stedman, 1796 (2):153; Von Sack, 1821 (1):241; Kappler, 1887: 74-75) stated that they live in hollow trees, and do not dig burrows themselves. They leave their shelter in the early morning and at nightfall to search for food. They are vegetarians and feed on roots and fruit, chiefly on berries and nuts, and may cause some damage to native gardens by eating cassave and peanuts.

The Agoutis can run very fast and jump quite well. When excited or enraged they thump their feet and erect the long hairs of the rump. Their voice is a high whistle; when they are surprised they may emit a grunting sound, which (cf. the brothers Penard, "De Surinamer", 30 April 1905), when they are alarmed, may become a "qwê qwê" sound. Their hearing and sight are well developed.

The young Agoutis are easily tamed, but rather difficult to keep as pets, because of their habit to gnaw on everything.

In the literature the present species is generally indicated with the name *Dasyprocta aguti* (Linnaeus, 1776). However, the name *Mus leporinus* Linnaeus, 1758, based on the description and coloured figure of *Lepus javensis* of Catesby (1754: 18, pl. 18; reproduced here in black and white as pl. 100), is older and therefore has priority. Several authors accepted this synonymy, but others rejected it because *Mus leporinus* was stated by Linnaeus to originate from Java and Sumatra, a statement clearly based on Catesby's remark: "They are natives of Java and Sumatra". Already Pennant (1781: 366) realized that the locality of *Mus leporinus* was incorrect and remarked about the "Javan Cavy": "Inhabits Surinam and the hotter parts of South America, where it is a common food: the flesh is white, but dry. It is not found in Java or Sumatra, as Catesby asserts. Governor Loten assures me, that he made the most diligent enquiry after it in most parts of Java, but could never find the least traces of any such animal". Shaw (1801: 26) also stated that the species "is a native of Surinam, and other parts of South America. It is altogether an American animal, and notwithstanding its common title of the Java Hare, is not found either in that island or Sumatra, as erroneously supposed by some". Shaw correctly regarded *Mus leporinus* as an Agouti and treated it as a variety of *Dasyprocta aguti*. Gray (1843: 124) incorrectly identified *Mus leporinus* with the Acushi (*Myoprocta acouchi* (Erxleben, 1777)), and used the name *Dasyprocta leporina* for that species. Waterhouse (1848: 391, footnote 1) corrected Gray's remarks and stated that *Mus leporinus* doubtless is the Agouti, but he did not use the name *leporina* for the species. Thomas (1911: 146 and Tate (1935: 329, 331) also assigned *Mus leporinus* to the genus *Dasyprocta*, but both authors considered the species unidentifiable;

Tate suggested that it possibly belongs to the Central American Agoutis. Finally Hershkovitz (1969: 23) definitely adopted the name *Dasyprocta leporina* for the present species. Most authors, who recognized the identity of the two species, mention Suriname as the probable country of origin of Catesby's specimen. This specimen was kept, evidently in the living state, by the Duke of Richmond. That its origin was given as Java or Sumatra makes it likely that the Duke obtained it from Holland as at that time Java and Sumatra were Dutch colonies, and the trade with these islands was monopolized by the Dutch. Since at that time Suriname was the only colony of Holland in which the Agouti was found, and many animals from Suriname were imported into Holland, the likelihood that the type of *Mus leporinus* indeed came from Suriname seems rather great.

In order to avoid difficulties and to stabilize the nomenclature of the present species, it seems best to select a neotype for *Mus leporinus* as Catesby's specimen is no longer extant. The female specimen (RMNH, no. 20752, skin and skull), labelled "Forest near the Peninika boarding-school near the confluence of the Peninika Creek and the upper Commewijne River, collected on 6 May 1963 by A. M. Husson and P. Staffeleu", is now selected as the neotype of *Mus leporinus* Linnaeus, 1758. Here-with the above locality becomes the corrected type locality of this species.

The taxonomy of the Agouti at the species level is still very controversial. Sanderson (1949: 779) reported upon a specimen from Donderberg (Donderbariberg), about 30 km north-west of Brokopondo on the Suriname River, which he considered specifically distinct from *Dasyprocta leporina* and which he described as follows: "It was small, dark nigger brown with black limbs and a deep orange median-dorsal stripe extending from the base of the tail forward to half-way along the back. The iris was a pale golden chestnut". This specimen was shot but subsequently became lost. Geijskes (1954: 75) definitely stated that a second species occurs in the interior (free translation from the Dutch): 'In the Upper Tapanahoni area near the Magneetrots [= magnetic rock] I saw a large species which, like the common Agouti, was reddish brown in colour, but with almost 1.5 times the size of the latter. The Bush-Negroes state that this species only occurs in the high interior'. Geijskes suggested though incorrectly, that this form might be *Dasyprocta fuliginosa* Wagler, 1832. I have not seen any specimen agreeing with either Sanderson's or Geijskes's descriptions and it would be interesting if some special attention to these forms could be given by collectors in Suriname.

The Leiden Museum possesses two specimens, which are said to originate from Suriname and which differ conspicuously from all my material of *Dasyprocta leporina*. These are discussed under the next two species.

In the literature on Suriname mammals the names *Dasyprocta aguti* (Linnaeus, 1766), *Dasyprocta cayana* (Lacépède, 1802), *Dasyprocta aguti cayana* (Lacépède, 1802), and *Dasyprocta rubrata* Thomas, 1898, have also been used for the present species.

***Dasyprocta cristata* (E. Geoffroy, 1803)**

Pl. 132 (skull)

Cavia cristata E. Geoffroy, 1803, Catalogue Mammifères Muséum National Hist. nat. Paris: 165-166.

Type locality. — "Patrie. Surinam". The underside of the board on which the holotype is mounted bears the following notation: "Il aurait vécu à la Menagerie et serait originaire de Surinam". Rode (1945: 298) gave a slightly different version of this inscription.

Synonymies. — Cabrera, 1961: 587.

Vernacular names. — (E) Crested Agouti.

Distribution. — As the status of the present species is rather uncertain, its exact range cannot be given. Cabrera (1961: 587) mentioned the range as "Guayanas". It is possible that the range is wider and that specimens belonging to this species have been reported upon under different names. Also the possibility exists that *Dasyprocta cristata* is only an extreme variant of *D. leporina* (see under Remarks).

Occurrence in Suriname. — Although Suriname is the type locality of the present species, nothing can be said about its occurrence there, as apart from the type and a "young" mentioned by Gray (1843: 124), that the British Museum (Natural History) obtained from the Leiden Museum, no Suriname specimens have been reported upon in the literature. Moreover, in the collection of the Leiden Museum there is only one specimen, a male, which was received from the Rotterdam Zoo in 1931 and was stated to originate from Suriname. Neither Kappler nor the brothers Penard or any other author well acquainted with the Suriname fauna did mention specimens that could be assigned to this species.

Description. — The following description is based on the holotype preserved in the Paris Museum, and on the adult male of the Leiden Museum (no. 1933). The hairs of the dorsal surface are coarse and glossy, becoming longer posteriorly; those of the rump are especially long, but do not obscure the tail. The hairs of the dorsal surface of the neck are longer than the lateral ones and form a distinct crest. The entire body, with the exception of the rump, gives the general impression of grizzled olivaceous grey. The rump and the posteromedian area of the back are black. In the hairs of the dorsal crest of the neck the distal blackish part is very long, in most other hairs of the anterior part of the body the yellow rings may be dominant over the black tips. On the head there are purely yellowish short and purely black long hairs as well as black hairs with a yellowish ring and yellowish hairs with a black tip. The hairs on the body are blackish brown, all have a single subterminal band, yellowish in the anterior part, or more rufous in the posterior part; the width of this band determines the general colour impression of the fur. The tip of each hair is always black. Only the hairs in the posterior median dorsal area, the long hairs of the rump and those of the back of the thighs are entirely blackish brown, although there are a few with a narrow light band somewhat below the tip. In contrast to *Dasyprocta leporina* the present species gives the impression of a blackish animal

sprinkled with olive anteriorly and laterally, and with a black rump. No trace of the reddish colour as occurs in all of my specimens of *D. leporina* is to be found in *D. cristata*. The ventral surface of the head (including the lower point of the snout) is whitish grey. The hairs of the throat are similar to those of the dorsal surface, being only much lighter. The hairs of the ventral surface of the body are slightly darker than those of the throat, but are conspicuously lighter than those of the back. The colour of the ventral surface of the body, including the throat, merges imperceptibly in that of the sides and the back; only on the head there is a rather sharp line of demarcation. The ears are rounded, conspicuous and almost naked. The snout bears a few long dark whiskers, while also some longer and shorter whisker-like hairs are found on the rest of the head.

The outside of the front legs in its basal part shows the same grizzled colour as the dorsal surface of the body; the distal part, however, is purely black. A very conspicuous large oval whitish spot (seemingly bare) is present on the distal inner surface of the front legs; the proximal inner surface of these legs is grizzled like the ventral surface of the body. This grizzled area is separated from the dorsal margin of the whitish spot by a dark triangle pointing inwards from the dark outside of the leg. The hind legs are practically all black outside, except for the anterior part of the thighs, which just as the inner proximal part is grizzled like the ventral surface of the body; the entire distal part of both the inside and the outside of the legs is black. The tail is short but distinct, about 3 cm long, and naked.

The front legs have four toes with distinct nails, the inner three are directed forward, the fourth is smaller and is directed laterally. The hind feet have only three well developed toes with nails.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. Only two skulls of the present species (namely those of no. 1933 and no. 23981) could be examined, the skull of the type being still within the mounted specimen. The skull of *Dasyprocta cristata* (pl. 132) differs from that of *D. leporina* (pl. 131) by being distinctly less slender. In all specimens of *Dasyprocta leporina* examined by me the nasals are distinctly shorter than the sutura frontalis (see Table 82); in the two specimens of *D. cristata* of which the skulls could be studied, the nasals are considerably longer than the sutura frontalis (see below). In *D. cristata* the upper margins of the nasals in lateral view are more strongly arched than in *D. leporina*. In *D. leporina* the premaxillae end posteriorly in a wide rounded lobe against the frontals, in *D. cristata* they are posteriorly more narrowly, triangularly produced and hardly touch the frontals. Tate (1939: 183) remarked "that in the gray agutis a considerable portion of the margin of the ante-orbital canal is formed by the lacrimal bone, whereas in the eastern [= reddish] group the lacrimal is excluded from the margin of the canal by the maxilla". In our specimens this character, especially when sutures are obscure, is not always distinct. Tate also observed that the "western agutis have heavier molars with fewer enamel lakes than the eastern [= reddish], larger skulls, and proportionally broader basi-occipital bones separating the bullae". In one of my specimens of *D. cristata* (no.

23981) the molars indeed are more heavy than in *D. leporina*, but in the second specimen (no. 1933) they are not; also the number of enamel islands is variable in the two forms and no distinct differences could be observed here. Also no distinct difference in the width of the basioccipital bones could be found, the width in our specimens of *D. cristata* being intermediate between that of the specimens of *D. leporina* with the widest and with the narrowest basioccipital. The measurements of the two skulls of *D. cristata* (no. 1933 and no. 23981, respectively) are as follows: greatest length, 101.8, 114.2; condylobasal length, 95.0, 111.0; basal length, 90.0, 105.0; palatal length, 50.5, 59.8; nasals, length \times breadth, 40.3 \times 22.5, 45.4 \times 23.0; length of sutura frontalis, 36.1, 39.5; interorbital constriction, 26.8, 30.0; zygomatic breadth, 45.8, 54.5; breadth of braincase, 36.0, 37.1; diastema, 26.3, 30.0; height of rostrum, 32.5, 36.0; foramen incisivum, length \times breadth, —, 7.7 \times 4.2; alveolar length of upper cheek-teeth, 20.7, 22.3; breadth of second upper molar, 4.3, 5.6; length of mandible, 61.0, 68.5; alveolar length of lower cheek-teeth, 22.8, 24.5 mm.

Remarks. — Besides the holotype and the Leiden specimen no. 1933, I have examined a specimen of this species in the Leiden collection (no. 23981) from unknown locality (obtained in 1867 from the dealer G. A. Frank at Amsterdam), which agrees in all respects with the above description.

The status of the present species is rather uncertain. In our collection the specimens of *D. leporina* and *D. cristata* can be easily distinguished on characters of both skin and skull, while no intermediate forms are found; also authors like Tate (1935: 331; 1939: 183) distinguished the "red-rumped" and the "gray" agutis as two distinct groups within the genus *Dasyprocta*. Hershkovitz (1972: 329), however, appeared to be inclined to minimize the value of the distinguishing colour characters and to consider the various forms as belonging to a single species (see also Hershkovitz, 1968). With the data at hand I prefer not to follow Hershkovitz, but I do realize that when more abundant material becomes available, intermediate forms may be found and a continuous series of variants between the two extremes may make it necessary for me to revise my present standpoint.

Waterhouse (1848: 383) published a good description of *Dasyprocta cristata*, based on three specimens, accepting thereby its specific status. Tate (1935: 331) listed the species with a question mark among the "Dark grey agoutis". Cabrera (1961: 587) accepted the species as valid.

Nothing is known about occurrence, biology and ecology of the Suriname representatives of this species.

***Dasyprocta fuliginosa fuliginosa* Wagler, 1832**

Dasyprocta fuliginosa Wagler, 1832, Isis (von Oken), 25: 1220-1221.

Type locality. — "Habitat in *Brasilia* versus flumen Amazonum". Restricted by J. A. Allen (1915b: 626) to "Amazon River, Borba on the lower Rio Madeira", Brazil.

Synonymies. — Cabrera, 1961: 588.

Distribution. — The species *Dasyprocta fuliginosa* occurs in northern South

America from northern Peru and Colombia to Venezuela, northern Brazil (Amazon region) and, evidently, Suriname. The nominate subspecies, *D. fuliginosa fuliginosa*, is known from southern Venezuela (upper Orinoco basin), Suriname, and northern Brazil (Amazon basin and Rio Negro).

Occurrence in Suriname. — The species is represented in the collection of the Leiden Museum by a single semi-adult female from Suriname without a more precise locality. This specimen has been reported upon in the earlier literature (Waterhouse, 1848: 389-391; Jentink, 1887: 234, no. a, fragmentary skull; Jentink, 1888: 106, no. b, mounted specimen) always under the name *Dasyprocta caudata* Lund, 1841. As far as I know no other records of the species from Suriname have been published, neither do I know of any other specimens from Suriname.

Description. — The only Suriname specimen examined (no. 23963) shows the following characters. The hairs of the dorsal surface are coarse and rather glossy. Like in the previous species the hairs on the head are shortest, those on the rump are longest. However, the hairs of the rump are relatively much shorter than in *Dasyprocta leporina* or *D. cristata*. On the neck there is no distinct crest, although the median hairs are here somewhat longer than the others. The body is of a uniform dark brown colour, strongly grizzled with pale yellowish brown, the last mentioned colour dominates, especially in the posterior half of the body. The colour of the rump is grizzled brown and yellowish like the rest of the body, and is not conspicuously different like in the previous two species. The hairs of the dorsal surface of the body are dark blackish brown with two distinct yellowish or straw coloured bands; usually the tips of the hairs are black. The longer the hairs the more yellowish they show; in the long hairs of the rump there may be up to six pale rings. The hairs on the head, the shortest of the dorsal surface, often have only one ring, which is usually more orange coloured than the hairs on the back. The head thereby obtains a darker colour than the body. The cheeks are of about the same colour as the back. Around the eyes there are short, almost uniformly orange hairs. The species resembles *Dasyprocta cristata*, and differs from *D. leporina* in that it does not show a trace of rufous colour on the rump; the difference from *D. cristata* is that the rump is not black, but of exactly the same colour as the rest of the dorsal surface. The ventral surface of the body, in contrast to the previous two species, is sharply separated from the colour of the sides; the hairs in the broad median ventral area are uniformly whitish or yellowish, rarely somewhat orangish, quite distinct from the blackish grizzled colour of the sides. The pale median area of the ventral part of the body and that of the ventral part of the head are separated by a broad dark grizzled band across the throat, which is of the same colour as the dorsal part of the body. The outside of the proximal part of the legs is of a similar grizzled brown colour as the dorsal surface; this colour extends to the base of the feet. The whitish colour of the ventral surface of the body extends somewhat over the basal part of the inside of the legs, the distal part of the inside being of a dark grizzled colour, like the outside, or slightly paler. The upper surface of the feet, including the toes, is black. Like in

the previous species, there is a grey oval spot on the inside of the front leg. In the present specimen the tail is not discernible, it may have become broken off. In the shape of the ears and the feet there is no obvious difference from the previous species.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. Unfortunately only skull fragments of my single specimen are present. The nasals agree better with those of *Dasyprocta leporina* than with those of *D. cristata*; the rostrum, however, is short like in the last mentioned species. Though all cheek-teeth are functional the skull is not full-grown: all sutures are still open and distinct. The following measurements could be taken: nasals, length \times breadth, 36.5×21 ; length of sutura frontalis, 42.5; palatal length, 48.0; diastema, 23.4; alveolar length of upper cheek-teeth, 19.6; breadth of second upper molar, 4.6; length of right mandible, 58; alveolar length of lower cheek-teeth, 21.0 mm.

Remarks. — Like that of *Dasyprocta cristata*, the status of the present species is still under discussion. The data at hand indicate that it is a good species, distinct from *D. leporina* and *D. cristata*, but since my material is very scanty, additional abundant material may prove that my conception of the three forms is erroneous (see also under the previous species).

Wagler's original description of *Dasyprocta fuliginosa* distinctly fits for the present specimen. In the synonymy of *Dasyprocta caudata*, Waterhouse (1848: 389) mentioned *Dasyprocta pallida* "of the Leyden Museum", and on pp. 390 and 391 he gave a description and measurements of two specimens. These two specimens obviously are those that were listed by Jentink (1888: 106, nos. a and b) under *Dasyprocta caudata*, the one specimen (no. a) originating from "Amérique australe", the second (no. b) from Suriname. The last mentioned is the specimen of *D. fuliginosa* (no. 23963) described above. The other specimen, labelled South America, is very similar. As far as I know, the name *Dasyprocta pallida* has not been used by any author for this or any other species of the genus *Dasyprocta*, and Waterhouse seems to be the first author to use it in print; it may have been a manuscript name of Temminck's. According to Article 11 (d) of the International Code of Zoological Nomenclature, the name *Dasyprocta pallida*, being published in synonymy, is not an available name.

Since the above mentioned Suriname specimen was already present in the collection of the Leiden Museum before 1848, it seems likely that the Museum obtained it from H. H. Dieperink, who from 1824 to 1836 was very active in collecting Suriname animals for the Museum.

Myoprocta exilis (Wagler, 1831)

Text-fig. 44e (mandible), pl. 106 upper fig. 2 (hind foot), pl. 133 (animal), pl. 134 (skull)

Dasyprocta exilis Wagler, 1831, Isis (von Oken), 24: 621.

Type locality. — "Habitat in Brasilia ad flumen Amazonum". Restricted by J. A. Allen (1916: 568) to "near the mouth of the Rio Negro", Brazil.

Synonymies. — Tate, 1935: 331-335; Tate, 1939: 181-182.

Vernacular names. — (E) Reddish Acushi, Wood Rat; (N) Acoechi; (S) Maboela.

Distribution. — The genus *Myoprocta* occurs in eastern Ecuador, northern Peru, southern Colombia, and from southern Venezuela and the Guianas southward to the Amazon basin. The species *Myoprocta exilis* has the same range.

Occurrence in Suriname. — The range of the Acushi in Suriname includes the entire interior; only very rarely it has been found in the coastal plain area. The only specimen from the coastal plain that I have examined is the one which in 1961 was obtained by Mr. P. Bolwerk from the sand ridges between Alliance and the Mot Creek, lower Commewijne River. Stedman (1796 (2):40, pl. 46, upper fig.) mentioned and figured this species under the name Taibo, Wood Rat, from Patamacca, south of Moengo (northern Marowijne District), also in the coastal plain; Stedman's account and especially his illustration leave not the least doubt as to the identity of his specimen. During the "Operation Gwamba" 247 specimens of the Acushi were saved in the Brokopondo region (Walsh & Gannon, 1967: 218).

I have examined material from the following localities:

1. Forest service camp near Matapi on the lower Corantijn River, about 90 km south of Nieuw Nickerie, Nickerie District, north-west Suriname, 1 female (no. 23946, skin and skull).
2. Wonotobo Falls, Corantijn River, about 200 km south of Nieuw Nickerie, 1 skin (no. 17824).
3. Camp on Lucie River, Corantijn basin, 1 male (no. 20745, skin).
4. Sipaliwini, area near airstrip, about 2°N 56°12'W, near Brazilian border, south-west Suriname, in forest, 1 male (no. 20734, skin and skull), 3 females (nos. 20735, 20738, 24088, skins and skulls), 2 skulls (nos. 20736, 20737).
5. Lombok Falls, upper Nickerie River, about 125 km south of Wageningen, 1 female (no. 22549, skin and skull).
6. Blanche Marie Falls, upper Nickerie River, about 40 km above Lombok Falls, Nickerie District, 1 female (no. 22548, skin and skull).
7. Forest near Voltzberg and Raleigh Falls in Coppename River, about 4°40'N 56°15'W, Saramacca District, 1 male (no. 20739, skin and skull).
8. Summit of Mazaroni Mountain near Brownsweeg, about 115 km south of Paramaribo, Brokopondo District, 1 female (no. 20732, skin and skull).
9. Ganiakondre on Suriname River (at present covered by Brokopondo Lake), Brokopondo District, 1 male (no. 20731, skin and skull).
10. Between Alliance and Mot Creek, lower Commewijne River, about 30 km east of Paramaribo, Commewijne District, 1 skull (no. 20733).
11. Forest near Peninika boarding-school near the confluence of upper Commewijne River and Peninika Creek, about 5°25'N 54°37'W, two females (nos. 20740, 20742, skins and skulls).
12. Forest near branch of Mapane Creek, upper Commewijne River, south-west of Peninika, Commewijne District, 1 juvenile male (no. 20741, skin and skull).
13. Nassau Mountains, 6 km west of Marowijne River, Marowijne District, 1 juvenile female (no. 21876, skin and skull).
14. Suriname, without further data, 2 males (nos. 369, 1020, skins and skulls), 3 females (nos. 256, 370, 953, skins and skulls).

Description. — The general colour of the dorsal surface, from the muzzle backward and on the sides, is yellowish to dark rufous-brown, heavily lined or sprinkled with black. In the middle of the back the blackish brown colour dominates, gradually passing into the almost pure blackish of the rump. The hairs of the dorsal surface are glossy, those of the anterior part are short, those of the rump are much longer. Most hairs of the back are dark brown annulated with yellowish or rufous-brown. The

long hairs on the rump are almost entirely black. The dorsal surface of the head is evenly yellowish brown, sprinkled with black. A more or less conspicuous orange patch is visible behind the ears. The ears are large, rounded, with thin, rather long, sparse hairs inside and out. On the head the shorter hairs are annulated with black and yellowish, the extent of these colours is variable. Long dark whiskers are present on the snout and also above and behind the eyes. On the throat there usually are a few stiff whisker-like hairs, which are shorter and thinner than the true whiskers. The sides are distinctly lighter than the back, the hairs becoming more rufous and showing less distinct dark rings. The colour gradually merges with the uniformly pale to bright orange brown of the ventral surface, where the dark rings are entirely lacking. In all specimens examined the ventral surface of the body is of a clear orange to reddish brown, somewhat paler on the chin than on the rest of the body. The outside of the bases of the legs proximally shows the same colour as the back, the distal part is dark rufous, this colour extending as far as the end of the toes. The inside of the forelegs, as well as the inside of the thighs, is of the same dark rufous colour, the colour of the thighs sometimes contrasting with the lighter colour of the venter. The soles are black. The forelegs have four toes, the outer of which is the shortest; of the three others the middle one is the longest. The hind legs have three long toes. The tail is distinct (up to about 90 mm long in adults, tuft included) with short appressed hairs; the basal part of the hairs is brownish or blackish, sometimes followed by a rufous area, their tips are white. The extent of the various colours varies, the rufous area may be absent. On the whole the ventral aspect of the tail usually is lighter than the upper; the tail ends in a short white tuft.

There are one pair of pectoral, two pairs of abdominal and one pair of inguinal mammae.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. The skull of *Myoprocta* resembles that of *Dasyprocta*, but is much smaller in all its measurements. Furthermore the snout is relatively shorter and more strongly constricted anteriorly. Dorsally the frontal is rather evenly curved, it hardly or not at all shows the transverse depression seen in *Dasyprocta leporina*.

In Table 83 the external and skull measurements of 10 specimens from Suriname are noted. The skulls are measured in the same way as those of *Dasyprocta leporina* (see p. 460). In 14 specimens the alveolar length of the upper cheek-teeth varies from 12.0 to 14.2 mm (mean: 13.5 mm).

Remarks. — The present species was not mentioned as game in the Suriname Game Decree 1970, evidently because it is too small to be of interest to hunters (see also Geijskes, 1954: 76). However, the species is sometimes taken, as its meat is quite tasty, as already testified by Hartsinck (1770: 94) and Stedman (1796 (2): 40).

In Suriname the Acushi is definitely rarer than the Agouti, *Dasyprocta leporina* (see p. 457). It lives in dry parts of the forests and near the banks of rivers and creeks. It feeds on fruit (e.g., berries and nuts), roots, palm seeds and other vegetable matter. It may cause damage to the native gardens, but hardly ever becomes a pest. The

TABLE 83

External and skull measurements of ten specimens of *Myoprocta exilis* (Wagler) from Suriname in the Leiden Museum.

Reg. number	20735	23946	20742	20738	20732	22548	20739	20731	24088	20733
Sex	♀	♀	♀	♀	♀	♀	♂	♂	♀	-
Head and body	392	381	372	370	353	323	388	373	-	-
Tail, without tuft	51	78	59	-	66	70	53	60	-	-
Tail, with tuft	54	88	62	-	73	80	63	68	-	-
Hind foot, with nail	99	102	94	-	101	90	104	97	-	-
Ear	34	34	34	37	-	33	40	-	-	-
Weight, grams	1200	1750	1250	1100	-	1500	1200	-	-	-
Greatest length skull	84.5	85.3	81.9	-	-	85.6	85.0	83.2	79.6	80.7
Condylobasal length	77.3	79.3	76.0	74.8	76.7	79.0	78.2	76.3	75.4	73.6
Basal length	71.7	75.0	71.5	69.9	70.8	73.8	-	71.4	70.6	68.1
Palatal length	41.8	41.3	40.4	38.9	40.9	41.8	41.5	40.0	38.7	37.3
Nasals, 1 x br	30.4x13.3	27.5x11.8	26.0x12.5	26.5x11.4	-x11.0	26.6x12.3	27.5x12.5	27.1x12.4	25.6x11.4	24.9x13.3
Interorbital constriction	22.0	21.2	22.0	19.7	21.9	22.1	25.5	21.9	21.2	21.5
Zygomatic breadth	38.8	39.5	39.8	36.8	38.3	36.7	41.0	39.7	36.2	37.7
Breadth of braincase	29.8	29.5	28.5	28.3	28.1	28.5	29.5	29.0	28.4	29.2
Diastema	21.4	22.3	20.7	21.1	21.0	22.0	22.8	21.1	21.0	20.0
Height of rostrum	23.8	23.5	23.2	22.3	23.0	23.4	24.8	23.0	21.8	23.4
For. incisivum, 1 x br	4.5x2.5	4.5x2.2	3.5x3.1	4.7x2.2	4.0x2.5	4.0x2.3	4.7x2.6	5.2x2.0	4.8x2.8	5.2x2.4
Alveolar length p-m ³	13.2	14.1	13.6	13.0	14.0	14.2	13.1	13.8	13.5	14.2
Length of mandible	46.8	49.1	47.8	45.3	48.5	49.0	49.6	47.0	46.0	46.7
Alveolar length p-m ₃	14.5	15.3	14.2	14.1	15.0	15.5	14.3	15.1	13.9	15.5

specimens collected by Mr. P. Staffeleu and myself in 1963 were all obtained either at dawn or at dusk.

The systematics of the described forms of *Myoprocta* are not quite clear. All authors agree that there are two main groups: "greenish acushis" and "reddish acushis", but there is no common opinion whether these are colour variations of one species only, or that they form two different valid species. Pending a revision of the genus *Myoprocta* I accept the latter opinion. All the Suriname specimens examined by me belong to the "reddish acushis". The oldest name for these animals is *Dasyprocta exilis* Wagler, 1831. Thomas (1903a: 464; see also Thomas, 1903: 241) placed this species in his new genus *Myoprocta* erected by him on account of the fact that in this genus the tail is well-developed and the cheek-teeth are conspicuously smaller than in the genus *Dasyprocta*. Since I did not have the opportunity to examine the type material of the described subspecies of *Myoprocta exilis* I prefer, at least for the present, not to give a subspecies name to the Suriname Reddish Acushis, which might belong to *M. exilis demararae*, described by Tate (1939: 182) from "Bonasica, Essequibo River", British Guiana.

In his "Systema regni animalis", Erxleben (1777: 354) described as *Cavia acouchy* an animal that definitely was a "greenish acushi". Erxleben noted as its range "in Guiana reliquaue America australi", and described it as "Cavia caudata, corpore oliuaceo". He referred to four previous authors dealing with the animal, the most important of these evidently being Barrère (1741: 153), who dealt with the species in two lines: "Cuniculus minor, caudatus, olivaceus. *Akouchy*". Buffon (1767: 158),

also cited by Erxleben, referred to Barrère's Akouchy and did not add new information. Pennant (1771: 246), also cited by Erxleben, like Buffon did not give new information and based himself entirely on Barrère (1741) and on Desmarchais (1730 (3): 287), the fourth author cited by Erxleben. I have not seen Desmarchais's account. As Barrère's description was practically literally cited by Erxleben, we may consider Barrère's specimen to be the lectotype of this species. The type locality thereby becomes Cayenne, French Guiana. The specific name *acouchy* thus becomes the correct name for the "greenish acushi", even though there are as yet no definite records of a greenish Acushi from the Guianas. The oldest name for a reddish Acushi is *Dasyprocta exilis* Wagler, 1831, which is the name adopted here.

It would be of great interest to know whether or not greenish Acushis are found in Suriname, since they evidently do occur in French Guiana. If it should prove that the greenish and reddish Acushis are only colour variations of a single species, the correct name for the Suriname Acushi would become *Myoprocta acouchy* (Erxleben, 1777).

Cabrera (1961: 591), who distinguished the reddish and the greenish Acushis as different species, used the specific name *Myoprocta acoushy* for the red Guiana species and the name *Myoprocta pratti* Pocock, 1913, for the greenish species. In Cabrera's opinion Erxleben's *Cavia acouchy* was based on a reddish Acushi, notwithstanding Erxleben's statement that the colour of the species is olivaceous. Cabrera evidently considered Erxleben's type locality to be more important than his colour description, and doubted that greenish Acushis occur in the Guianas. Only a better knowledge of the Mammal fauna of the Guianas will ultimately solve this problem.

In the literature on Suriname mammals the scientific names *Cavia acouchy*, *Dasyprocta acouchy* and *Myoprocta acouchy* are often used for the present species.

FAMILY AGOUTIDAE

Agouti paca paca (Linnaeus, 1766)

Text-fig. 44f (mandible), pl. 107 fig. 1 (hind foot), pl. 135 (animal), p. 136 (skull)

Mus Paca Linnaeus, 1766, *Systema Naturae*, (ed. 12) 1: 81.

Type locality. — "Habitat in Brasilia, Guiana". Restricted by Tate (1935: 315) to "French Guiana".

Synonymies. — Cabrera, 1961: 594-595; Krumbiegel, 1940c; Tate, 1935: 309-316; 1939: 183-184 (under *Cuniculus*).

Vernacular names. — (E) Spotted Cavy, Paca, Aquatic Hare; (N) Surinaamse Haas, Paca, Water Haas, Water Konijn; (S) E (generally written as Hei or Hee).

Distribution. — The species *Agouti paca* (Linnaeus, 1766) occurs from central Mexico southward to Paraguay (Hall & Kelson, 1959 (2): 787-788, map 435; Cabrera, 1961: 594-595). The nominate subspecies *A. paca paca* ranges from Venezuela and the Guianas southward to central Brazil and Paraguay.

Occurrence in Suriname. — In Suriname the Paca is one of the common mammals in wet and swampy forests, especially along rivers and creeks, from the coastal plain to the Brazilian border. I have examined material from the following localities:

1. Base camp near Lucie River, eastern tributary of Corantijn River, Nickerie District, 1 male (no. 18017, skin and skull), 1 female (no. 18013, skin and skull).
2. South Sipaliwini, near Brazilian border, 1 adult female (no. 23960, skull).
3. About 4 km east of Sipaliwini airstrip, extreme south-eastern part of Nickerie District, near Brazilian border, 1 skull (no. 20537).
4. Along Coppename River near mouth of Tibiti River, northern Saramacca District, 1 skull (no. 23902).
5. Tibiti River, eastern tributary of Coppename River, 1 male (no. 23893, skin and skull).
6. Bitagron, east bank of Coppename River, about 5°8'N, in bush-negro dwelling, 1 skull (no. 21890).
7. Matta, about 12 km west of Zanderij airport, Saramacca District, in Amerindian dwelling, 2 skulls (nos. 21891, 21892).
8. Brokopondo, west bank of Suriname River, north of Brokopondo Lake, Brokopondo District, 1 juvenile male (ZMA no. 9210, skull), 1 adult male (no. 18233, skull).
9. Gododrai on Sara Creek, western tributary of upper Commewijne River, Commewijne District, in bush-negro dwelling, 2 skulls (nos. 17756, 21889).

Further I examined the material listed by Jentink (1887: 234; 1888: 106) and some other skulls, all from Suriname without exact localities. Sanderson (1949: 778-779) mentioned eight specimens from Suriname, but omitted to note the localities from which his specimens were obtained. During the "Operation Gwamba" 147 specimens were saved in the Brokopondo region (Walsh & Gannon, 1967: 218).

Description. — The following description is based on three specimens from Suriname, viz., a male from Tibiti (no. 23893), and a female and a male from the Lucie River (nos. 18013 and 18017 respectively). The general coat colour of the dorsal surface is uniformly chestnut to mummy brown with a striking pattern of white or light yellowish spots and lines on the sides of the body. These spots are arranged in about four longitudinal rows on either side, at least the two middle ones extending all the way from the neck to the rump. In these two rows the spots in the middle part are fused to an uninterrupted stripe. The lower of the rows of spots is only visible in the extreme anterior and posterior parts, the middle part is fused with the white ventral surface of the body. The one or two upper rows of spots are shorter than the other rows, they are visible only in the posterior half of the body. The hairs are stiff and shiny. The dark brownish hairs show a lighter median line. The dorsal surface of the head is of the same colour as the back, but on the whole the hairs are shorter and less stiff. On the snout there are long stiff whiskers, the upper are blackish while the lower are white, the colour difference being quite striking (these whiskers have about the same colour as the hairs among which they are implanted). Similar stiff whisker-like hairs, but fewer, are implanted below and slightly in front of the ears; here too the upper hairs are blackish brown, the lower white. The ears are relatively large; a tuft of blackish and yellowish longer hairs occurs before the opening of the ear. The throat and the cheeks are uniformly cream-coloured, as is also the entire ventral surface of the body. The line of demarcation between the

dark dorsal and the whitish ventral colour is distinctly marked. The outside of the legs is of the same brown colour as the dorsal surface of the body; the inside of the legs is yellowish white basally, brown or brownish distally. The tail is very short, often hardly noticeable. All the legs have five toes with nails; in the front legs the nail of the thumb is very small, the others are well developed and of equal size. In the hind feet, the three middle nails are large and of about the same size, while the nails of the inner and the outer toes are markedly smaller and implanted higher, the inner nail being again somewhat smaller than the outer.

In the female there is on each side one pectoral mamma, at about the level of the bases of the front legs.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. The skull of the adults of this species is immediately characterized by that the zygomatic arch has grown out to an enormously swollen bony plate, which is about two-thirds as long as the palate; this plate is strongly produced downwards, in lateral view obscuring the teeth and the basal part of the mandible (pl. 136). Anteriorly this plate encloses a deep and very large cavity at each side of the very narrow palate in front of the tooth-rows. In comparison to those of other rodents the teeth are placed far backward. The palate ends at the line between the last and the penultimate molars. The infra-orbital opening has become a narrow canal almost entirely enclosed by bone. The outer surface of the bony structure of the zygomatic arch is covered with a honey-comb of irregular bony ridges, resulting in a strongly rugose appearance. These rugosities extend also on the larger parts of the nasals, frontals and parietals; in full-grown specimens the sutures between these bones are not or only partly visible. Even in new-born and juvenile specimens the zygomatic arch is relatively high, but still smooth. Hershkovitz (1955b) discussed the function of the expanded zygomatic arch and its cavities; he came to the conclusion that they have nothing to do with the storage of food, but serve "for the amplification and reverberation of sound".

The external measurements of the three specimens on which the description is based, a male from Tibiti, a female and a male from the Lucie River area, are: head and body, 650, 676, 662; tail, 18, 17, 19; hind foot, with nail, 119, 117, 113; ear, 46, 41, 48 mm; weight, 9200, 9100, and 9500 grams respectively. In Table 84 the skull measurements of eight specimens from Suriname are given. With "height of zygomatic arch" the greatest height is meant; with breadth of the braincase, the width of the skull at the level just above the external auditory meatus. Also the total length of the zygomatic arch is noted: the distance between the extreme anterior and the posterior borders. The length of the mandible was measured from the processus angularis.

Remarks. — In the Game Ordinance 1954, revised in 1970, the present species is listed as game under the names: "Haas of hé (Agouti paca)".

All authors dealing with the fauna of Suriname are unanimous in their praise of the taste of the meat of the Paca; the animals are highly esteemed as game by the inhabitants; their meat, which is white and tender, forms an important source of

TABLE 84

Skull measurements of eight specimens of *Agouti paca paca* (Linnaeus) from Suriname in the Leiden Museum.

Reg. number	23902	18233	17756	21889	21891	21892	18013	18017
Sex	-	♂	-	-	-	-	♀	♂
Greatest length	138.7	142.9	149.0	142.2	147.5	147.6	136.2	141.0
Condylbasal length	128.5	137.7	144.0	135.7	144.5	139.1	128.0	136.8
Basal length	123.2	131.1	135.5	128.3	138.1	132.8	120.5	129.4
Palatal length	76.7	82.0	86.4	81.5	85.7	84.8	75.1	82.4
Length of nasals	44.8	(fused)	55.7	43.7	49.7	47.2	46.0	49.5
Zygomatic breadth	91.5	96.4	104.0	86.6	100.0	94.5	-	92.0
Height zygomatic arch	45.5	50.3	59.5	39.4	56.1	46.8	37.3	47.2
Length zygomatic arch	80.1	86.9	101.8	80.4	97.5	85.6	71.6	82.1
Interorbital constriction	44.6	42.0	44.3	39.6	45.2	45.0	37.4	39.8
Breadth braincase	45.4	43.2	47.0	45.3	48.9	45.6	43.8	43.2
Mastoid breadth	60.5	56.6	64.5	60.4	65.0	61.8	58.5	54.6
Bullae, length x breadth	20x15	18x14	18x16.5	21x17	17x13.7	20x18	19.5x13.5	19x16.5
Height of rostrum	39.0	40.3	42.0	39.0	41.3	42.0	37.3	39.6
Diastema	43.9	47.5	51.1	46.4	51.1	49.8	42.0	46.4
Alveolar length p-m ³	27.5	30.3	29.1	28.3	32.0	28.3	29.0	29.6
Breadth of m ²	7.1	7.2	7.9	8.0	7.4	7.3	7.0	7.6
Length of mandible	96.8	86.9	102.6	-	-	-	92.8	95.6
Alveolar length p-m ₃	29.8	30.7	31.5	-	-	-	31.2	32.5
Breadth of m ₃	7.5	6.8	8.5	-	-	-	7.2	8.0

proteins. Perhaps for this reason the early authors paid more attention to the Paca than to the other mammals of Suriname, and their descriptions are such that confusion with other Suriname mammals is impossible. Also about the habits of the Paca they gave many interesting, and usually correct, informations. The works of some of these authors are dealt with below.

Warren (1667: 11) remarked: "The *Hares* more resemble a Pig, than any other Creature that I know, they are Brown, Smooth-haired, Spotted with white, and are far bigger than an *English-Hare*, which beside the mouth, they have no part like: They are excellent good meat, much better than any Four-footed Game in England".

Herlein (1718: 170) remarked that the taste of the meat is delicious and resembles that of veal.

Pistorius (1763: 57) noted already that the Paca has its hiding-place in hollow trees; it always carefully makes two entrances to its burrow, so that it usually can escape when hunted by dogs. He also remarked that it, when pursued by dogs, frequently takes refuge in the water, totally submerging with the exception of its nostrils, which break the surface of the water, allowing it to breathe without making any movement. If a hunter discovers the animal in this position, it can be shot with arrows or with a gun, as Pistorius himself frequently did.

Fermin (1765: 17) noted: "La chair de cet animal en est des plus excellente; mais à la verité un peu fade; elle excède, en blancheur, celle du poulet". In 1769 (on page 125) Fermin dealt with the nature of the Paca: "Cet animal habite, ordinairement, les bois les plus éloignés de la Ville, & fouille la terre, comme le cochon, pour trouver

sa subsistance. Sa chair est très-bonne à manger. Les Indiens lui font continuellement la guerre: mais ils ont de la peine à le prendre vivant; car, quand on le surprend dans son terrier, qu'on découvre par devant comme par derrière, il se défend alors avec autant d'acharnement que de vivacité, & cherche à mordre ceux qui veulent s'en saisir".

Bancroft (1769: 128-130), who used the vernacular name Laubba, remarked that the Paca is amphibious, and after a description of the animal he remarked: "These animals feed on herbage, grains, and fruit: When pursued, they usually retire to the creeks, and will swim a great distance under water, though they seldom dive so far from the surface as to be invisible to the *Indians*, who commonly shoot them with arrows while under water. Their flesh is extremely delicate and tender, and is by the *Europeans* preferred to all other kinds of meat, even the venison of the Wirrebo-cerra [= *Mazama americana*, see p. 361] not excepted".

The Paca, which also bears the vernacular names Aquatic Hare and Aquatic Rabbit (Water Haas and Water Konijn), lives close to rivers and creeks and when in danger enters the water to escape its terrestrial enemies (see the above quotation from Pistorius). The Dutch vernacular name Water Haas was already used by Hartsinck (1770(1):94); this name was corrected by him (Hartsinck, 1770(2):15) to Water Konijn (= Water Rabbit).

Stedman (1796(2):152-153) gave the following account based on specimens seen by him in the region between the Perica and Cottica Rivers: "At this time a small quadruped running through the camp with incredible swiftness, it was cut down by one of the rangers with his sabre. This proved to be the *Paca* or *Spotted Cavey*, called in Suriname the *Aquatic Hare*. This animal is the size of a sucking pig, and extremely fat. The under jaw is short, the nostrils large, the eyes black, and the ears small and naked. It has five toes on each foot, a tail like the first joint of a man's thumb, and whiskers like a cat; the colour is an earthen brown, with longitudinal rows of buff-coloured spots; the belly is a dirty white, the hair all over coarse and short. The Paca is an amphibious animal. On land it digs up the earth like a hog in quest of food, and when in danger flies to the water for its safety; notwithstanding this animal is so very plump and heavy, it runs swifter than most other animals of its size in South America, We had this animal dressed for supper, and found him even more delicious than the wood-rat [= *Myoprocta exilis*, see p. 468], or even the warra-bosena [= *Mazama americana*, see p. 361]: indeed, nothing can be better eating than the Paca or spotted Cavy". Further Stedman stated that "the Paca is capable of being tamed".

Quandt (1807: 202-203) described the method of hunting the Paca by the Amerindians: "Der Haase, ind. Labba, ist schwarz und sehr weissfleckig, hat kurzes Haar und kurze Ohren, und ein angenehmes weisses Fleisch, er ist aber den hiesigen Haasen wenig ähnlich. Sie halten sich viel im Wasser auf und haben daher an den Hinterbeinen Schwimmfüsse. Wenn der Indianer Haasen jagen will, setzt er den Hund aufs Land aus, und fährt in seinem Corjar längst dem Ufer des Flusses hin. Sobald

der Hund einen Haasen findet, so schlägt er an, und der Haase sucht sich ins Wasser zu retten, wo der Indianer auf ihn wartet, und ihn, weil er langsam schwimmt, leicht mit einem Pfeil schiessen kann".

In the Dutch version of his book Von Sack (1821 (1):240-241) did not add much to our knowledge of the species; he repeated the facts that the animals live in burrows near the water, are nocturnal and vegetarian, and can move with great speed. Also the good taste of the meat was of course mentioned by him.

Kappler's (1887: 74) account on the biology of the Paca is as follows: "Der Paca ist ein Nachttier, das sich von Gras, Früchten und Wurzeln nährt und oft in die Kostäcker kommt, um süsse Bataten und andere Knollengewächse auszugraben. Es kann bei 18 Pfund schwer werden und lebt in Höhlen unter dem Boden, die er sich selbst gräbt und die zwei Ausgänge haben. Wird es gejagt und kann es diese Höhlen nicht mehr erreichen, so springt es ins Wasser, wo es untertaucht und so lange bleibt, bis sein Verfolger sich entfernt hat. Vermutlich schwimmt es unter dem Wasser weiter. Die Indianer jagen es mit kleinen Hunden, die, wie oben gesagt, auch auf Agutis, Gürteltiere und Schildkröten abgerichtet sind. Die Pacas werden zahm, sind aber wie das Cabiai [*Hydrochaeris hydrochaeris*, p. 451] langweilige Tiere". Kappler also mentioned the excellent taste of the meat of the Paca: "Das Fleisch ist weiss und fett, und übertrifft alle mir bekannten Fleischarten an Wohlgeschmack". Concerning the zygomatic arch Kappler remarked: "Der Schädel des Paca hat ausserordentlich breite Jochbögen, so dass dadurch eine ungemein grosse Erweiterung der Mundhöhle entsteht, die wie eine Backetasche gebraucht werden kann".

The brothers Penard ("De Surinamer", 30 April 1905) confirmed that the Paca is nocturnal and stated that in the daytime it can be found in hollow trees or in its burrows which it digs itself in loose earth in the immediate vicinity of the water. Sometimes several of these burrows are interconnected. According to the Penards the food of the Paca is wholly vegetable (although they cited a case of a Paca eating its own young). When eating they sit on their haunches and hold the food with their forelegs. They also clean themselves in this position with their front paws like cats. They have one litter of one or two young per year, and can be easily kept in captivity.

As to the use that can be made of the fur of the Paca, Fermin (1769 (2): 125) stated: "Sa peau, qui est superbe, à cause des taches blanches qu'elle a, pourroit bien servir à faire une belle fourrure". Kappler (1887: 74), on the contrary, remarked: "Der Fell ist so schwammig, dass man es, ohne es zu zerreißen, kaum abziehen kann; es wird deshalb wie eine Schwarte des Schweines gegessen". During my visit to Suriname in 1963, I never saw the skin of the Paca used as clothing. Several persons in Suriname, who are familiar with the customs of the inhabitants, affirmed me that they never saw the skin of a Paca used for such a purpose. Concerning the observation by Kappler I must remark that there is no difficulty in preparing the skin of the Paca, but most mammals used as food by the inhabitants of Suriname are eaten with the skin after removing the hairs by boiling the animals in water; this has nothing to do with the quality of the skin.

At present the Paca still is so common in Suriname, especially along fresh water creeks, that there is no danger of extinction of the species in this country, notwithstanding the fact that the animal is frequently hunted and that it gives birth to only one or two young per year.

In Suriname the Paca is considered a pest, as it causes damage to the native gardens by eating various tuberous plants. Already Hartsinck (1770 (1):92) stated that the Paca often made havoc of the sugar fields, while Teenstra (1835 (2):413) remarked that Pacas are very destructive. The same remark was also made by Geijskes (1954: 76).

Kappler remarked that the Paca is usually hunted with dogs trained for this purpose. Geijskes (1954: 75-76) reported that the animals sometimes are obtained by smoking them out of their burrows and that gun-traps are used in hunting the species. Geijskes (pers. comm.) also mentioned that the species is hunted in a special way during the period that the mango fruits are ripe. The Pacas are especially fond of this fruit and are attracted by the ripe fallen fruit under the mango trees. In moon-lit nights the hunters climb the mango trees and shoot the Pacas when these come to eat the fruit. The hunting for Paca on the whole is less easy than that for Aguti.

The formidable teeth and enormous masticatory muscles of the Paca enable it to break open the hardest fruit and nuts, even those that are left alone by other animals.

In contrast to the Aguti, the Paca digs burrows.

In many publications on Suriname mammals the generic names *Cuniculus* and *Coelogenys* instead of *Agouti* are used for the present species. *Cuniculus* Brisson (1762: 98), although older than *Agouti* Lacépède (1799: 9), cannot be used as Brisson's (1762) paper is invalid for nomenclatural purposes, because it is nothing but a reprint of Brisson's (1756) pre-Linnaean work, and furthermore is not consistently binominal (see also under *Hydrochaeris*, p. 457). *Coelogenys* [recte *Coelogenus*] F. Cuvier, 1807, is a junior synonym of *Agouti* Lacépède, 1799.

FAMILY ERETHIZONTIDAE

Coendou prehensilis prehensilis (Linnaeus, 1758)

Text-fig. 44g (mandible), pl. 109 fig. 4 (hind foot), pl. 137 (animal), pl. 139 upper figures (skull)

Hystrix prehensilis Linnaeus, 1758, *Systema Naturae*, (ed. 10) 1: 57.

Type locality. — "Habitat in Asia, America meridionali". Restricted by Thomas (1911: 145) to "Pernambuco" (= Recife, Pernambuco State, north-east Brazil).

Synonymies. — Cabrera, 1961: 600; Ellerman, 1940: 182-189, figs. 49-52.

Vernacular names. — (E) South American Tree Porcupine, Brazilian Porcupine; (N) Boomstekelvarken; (S) Djiendjamaka, Indjimaka.

Distribution. — The species *Coendou prehensilis* (Linnaeus, 1758) is known from eastern Venezuela, the Guianas, Bolivia and Brazil. According to Cabrera the nominate

subspecies *C. prehensilis prehensilis* occurs in eastern Venezuela, the Guianas and eastern Brazil (see also under Remarks).

Occurrence in Suriname. — The Suriname Tree Porcupine lives in forested areas, in both the coastal plain and the interior. The first record of this species from Suriname probable is that by Warren (1667: 13) who described it as follows: "There are also *Porcupines* shap'd almost like our English Hedg-hogs, but larger, and Arm'd all over with Black and White Quills about two handfuls long, and sharp as Needles, which Nature has taught them too shoot from their sides, with admirable Dexterity against a Coming Enemy". Also many later authors mention the species from this country (e.g., Pistorius, 1763: 57; Bancroft, 1769: 142-143; Fermin, 1765: 24; Fermin, 1769 (2): 119; Hartsinck, 1770: 91; Stedman, 1796 (1): 223-224, pl. 24 upper fig.; Quandt, 1807: 207; Von Sack, 1821 (2): 193; Teenstra, 1835: 414; Lammens, 1844: 103-104), but add very little new information on this conspicuous and easily recognizable animal. Kappler (1887: 75-76) and the brothers Penard ("De Surinamer", 20 April 1905) provided many interesting data on the biology (see under Remarks). During the "Operation Gwamba" 927 specimens were rescued in the Brokopondo area, forming about 10 per cent of the total of the animals saved.

I have examined only a few specimens, which originate from the following localities:

1. Plantation "Clevia", north-east of Paramaribo, Suriname District, 1 female (no. 18299, skin and skull).
2. Cultuurtuin (Agricultural Experimental Station) at Paramaribo, 1 female (no. 21902, skin and skull).
3. Environments of Paramaribo, 3 skulls (nos. 18297, 21900, 21901).
4. Lelydorp, south of Paramaribo on highway to Zanderij airport, Suriname District, 1 skull (no. 18298).
5. Langamankondre at the mouth of the Marowijne River, Marowijne District, north-east Suriname, 1 juvenile female (no. 18217, skin and skull).
6. Oelemari, in forest 25 km east of Oelemari airstrip, Marowijne District, south-east Suriname, approximately 3°N 54°24'W, 1 skull (no. 18296).
7. Suriname, without further details of localities, 2 male skulls (nos. 351, 1978), 7 females (nos. 778, 985, 1104, 1430, 19642 (lectotype of *Hystrix brandtii* Jentink), 19643 (paratype of *Hystrix brandtii* Jentink), skins and skulls; no. 2299, skin), 2 skulls (nos. 21898, 21899).

Description. — The following description is based on all the Suriname material mentioned above. The entire dorsal surface of the body, from the base of the nose to about the middle of the tail, is covered with densely arranged strong spines of varying length and thickness. In the anterior half of the body no hairs are visible between the spines. The spines in the anterior part of the head are shortest, sometimes only a few mm long and rather thin. Posteriorly the spines become longer and thicker; on the top of the head the spines are about 40 mm long, while the longest, those of the rump, may reach a size of over 100 mm. Posteriorly of the rump the spines decrease again in size, becoming very short on the middle of the tail. Some of the spines are distinctly curved, others are practically straight. All spines show the same colour pattern: at the base they are pure white or light yellowish, the tips are always white, the area in between is dark brown. The extent of the brown area is slightly variable, all my specimens giving the impression of dark brown animals

heavily speckled with white. In the posterior part of the rump and on the basal part of the tail there are very slender bicolorous spines, lacking the white tips; these spines are scattered among the much heavier trizonally coloured normal spines. Here too some very thin inconspicuous twisted hairs are present. The snout is swollen and truncate, definitely pig-like; it is sparsely covered with very short, stiff hairs, thereby giving the impression of being naked. Long black whiskers are present on the snout, a few are implanted over and behind the eyes. The external part of the ear is short and wide, often giving the impression of a high ridge. It is almost naked with a few very short spines. There is also a naked area around the ear opening. The sides show the same spination as the back. The ventral surface has the spines finer, shorter and very much thinner than the dorsal spines. There is a rather indistinct demarcation between the spination of the ventral and the lateral surfaces. On the posterior part of the throat the coarse spination of the sides continues over the ventral part, so that a broad transverse band of strong spines separates the finer spines of the breast from those of the chin and the anterior part of the throat. The basal part of the legs shows the same spination as the adjoining parts of the body. Distally the spines gradually become thinner and those on the upper surface of the feet can be defined as strong hairs or bristles. The hairs on the feet are tricolorous like the spines, but those on the toes are uniformly brownish. Some long black, white-topped whisker-like bristles are scattered among the spines of the belly and the legs. The proximal half of the upper surface of the tail has the same kind of spines and hairs as the upper surface of the rump, viz., the strong tricolorous spines, the slender bicolorous spines and the twisted hairs. Posteriorly the spines become thinner and shorter, the white tip becoming more transparent, finally disappearing altogether. The anterior portion of the distal half of the tail on its upper surface is covered by greyish brown appressed bristles, the posterior portion (about $\frac{1}{4}$ of the tail) is almost naked. The proximal ventral surface of the tail shows, starting slightly behind the anus, a narrow median area of short, very slender, densely placed bristle-like tricolorous spines; these are rather sharply separated from the longer spines on the sides of the basal part of the tail. The bristle-like spines gradually pass into the bristles of the distal half of the tail, which on the ventral surface are quite similar to those of the dorsal surface. These distal bristles differ from the proximal in that their tips are not white but transparent or brown. The area of the bristles on the ventral surface reaches to the tip of the tail or nearly so. The fact that the dorsal part of the tip of the tail is naked and sole-like, while the ventral part is haired, gives a peculiar impression, but it shows that, when the tail is used as a prehensile organ, it is curved up, so that the naked distal part can hold on to branches, etc. In some monkeys, in which the prehensile tail curves down such a naked sole-like area is found on the ventral part of the tip.

The front and the hind legs each have four toes with well developed nails. On the inner side of the feet of the hind legs, there is, moreover, a nail-less rudiment of a fifth toe.

In my material two pairs of abdominal mammae could be found.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. The skull is characterized by that the posterior part of the nasals and the anteriomedian part of the frontals are highly vaulted, forming a large swollen hump over the eyes. The anterior part of the nasals, in sharp contrast, is almost horizontal, while the part of the skull behind the hump gradually slopes down to the processus supraoccipitalis. The presence of this hump accentuates the thick-set shape of the skull. In lateral view the rostrum is much higher than long. The foramen incisivum is short, posteriorly ending at the suture between the premaxillary and the maxillary. From the anterior end of each tooth-row a low ridge extends in the direction of the foramen incisivum; these ridges enclose a longitudinal median concave area. The anterior margin of the nasals lies distinctly behind the incisors. The nasal opening is very large, heart-shaped, its lateral margin being distinctly convex. The cheek-teeth are almost quadrangular and of about the same size. The anterior margin of the upper cheek-teeth lies at the posterior margin of the zygomatic arch or before this margin. The posterior margin of the palatinum is broad-triangularly incised, the incision reaches about to the line separating the last two molars.

In Table 85 external and skull measurements of eight specimens of *Coendou prehensilis* from Suriname are noted. The height of the skull is measured in the median line from the level of the palatine to the highest point of the skull directly above it. In 13 specimens from Suriname the length of the upper cheek-teeth varies from 18.9 to 21.8 mm (mean: 20.7 mm).

Remarks. — The species is not mentioned in the Suriname Game Ordinance and therefore is fully protected.

TABLE 85

External and skull measurements of eight specimens of *Coendou prehensilis prehensilis* (Linnaeus) from Suriname in the Leiden Museum.

Reg. number	18299	21902	19642	19643	18298	18296	18297	21901
Sex	♀	♀	♀	♀	—	—	—	—
Head and body	487	460	—	—	—	—	—	—
Tail	471	480	—	—	—	—	—	—
Hind foot, without nail	88	90	—	—	—	—	—	—
Ear	—	20	—	—	—	—	—	—
Weight, grams	4750	—	—	—	—	—	—	—
Condylbasal length skull	91.3	83.2	82.2	87.5	88.7	101.2	94.2	87.0
Basal length	83.3	77.1	74.4	80.3	81.3	96.3	85.0	78.5
Palatal length	43.9	39.2	40.0	42.0	43.0	52.5	45.3	42.2
Nasals, l x br	33.2x24.8	31.3x24.0	28.1x26.8	39.2x25.5	28.9x23.1	33.5x26.0	34.3x26.6	29.0x21.3
Interorbital constriction	35.5	35.4	34.5	34.7	34.0	40.4	37.1	33.7
Zygomatic breadth	57.4	52.0	52.5	53.3	51.3	59.0	55.6	54.0
Greatest breadth of frontals	41.9	45.5	42.6	41.5	42.0	54.3	45.0	41.6
Breadth of braincase	41.9	38.8	38.2	39.5	39.9	40.5	39.2	40.0
Diastema	22.9	20.4	22.4	23.3	21.8	30.3	25.3	22.1
Height of skull	45.6	44.8	40.6	44.4	41.0	46.0	46.5	41.5
For. incisivum, l x br	7.0x3.8	7.5x4.5	9.5x5.0	8.5x3.5	7.6x4.3	7.0x5.0	8.7x4.5	9.9x3.8
Alveolar length p-m ³	20.3	20.3	19.1	20.5	20.5	21.8	20.5	20.8
Length of mandible	62.5	56.6	57.7	61.6	61.0	73.5	65.0	59.5
Alveolar length p-m ₃	22.2	22.5	22.5	22.6	22.8	24.0	23.6	23.4

The meat of the Suriname *Coendou* according to Fermin (1769 (2):119) is white and tasty and sought after by the Amerindians. However, the brothers Penard ("De Surinamer", 20 April 1905) described it as dark and unappetizing, although, when well prepared, of a not unpleasant taste. Geijskes (1954: 76) remarked that the meat is tasty and fat, and esteemed by the Bush-Negroes.

According to Kappler (1887: 75) the Tree Porcupine is a vegetarian and lives mainly on fruit. The brothers Penard mentioned as its diet leaves, roots, tubers, and also insects, while small reptiles too seem not to be despised. Geijskes (1954) mentioned fruit, buds and leaves to be eaten by the animals. To obtain tubers the Tree Porcupine digs these out like a rabbit (brothers Penard). The animals live solitary or in pairs, but never in groups. They prefer dry localities and seldom are found near water; they have never been seen to enter the water. They are nocturnal, and are rarely seen in the daytime when they usually stay in the forests hidden among the dense foliage. Very seldom are they observed on the ground. Their sense of smell seems to be well developed, in contrast to their hearing and vision (see also Kappler, 1887: 75). Their voice somewhat resembles the grunting of a pig and they may also produce a spitting or sneezing sound (brothers Penard); according to Sanderson (1949: 77) the "call is a plaintive cry like that of a small infant". When walking their spines make a rattling sound. The above (under Occurrence in Suriname) cited story by Warren (also quoted by Hartsinck, 1770: 91) that they can shoot their spines towards an enemy, is regarded as doubtful by the brothers Penard who, however, once, when shooting a Tree Porcupine, saw that one of the bystanders got hurt in the arm by a spine supposed to be shot from the animal.

Teenstra (1835 (2):414) remarked that the Suriname Tree Porcupines have a most repelling smell which causes headache to man and is even supposed to kill monkeys. Lammens (1844: 104) repeated this statement, which is evidently incorrect, so that subsequent authors as Kappler and the brothers Penard completely ignored it.

Of the natural enemies, Kappler (1887: 75) mentioned the Jaguar: "Es wird vom Jaguar gefressen, der es beim Schwanz packt und mehrere Male um einen Baum schlägt, um sich der Stacheln zu entledigen". The brothers Penard, however, stated that by rolling itself into a ball the Tree Porcupine can escape and defend itself against predators. It is supposed to hurl itself against enemies in this rolled up condition, and the Penards state that 'even the Jaguar does not dare to attack it, out of fear for the spines'.

In the general literature (e.g., Walker, 1964 (2):1012) it is stated that the species usually produces only a single young per litter. The brothers Penard stated that, according to Suriname hunters, the species has not more than two or three young a year.

Hystrix prehensilis Linnaeus (1758: 57) is a composite species. Linnaeus (1758) referred to the 9th edition of his *Systema Naturae* (1756: 9), to Bontius (in Piso, 1658 (3): 54, fig.), to Marcgraf (1648: 233, fig.), to Piso (1658 (1): 99, fig.), to Ray (1693: 208), and to Hernandez (1651: 322). In the 9th edition he only gave a reference

to Ray, and no new details. Marcgraf (1648), Piso (1658), and Ray (1693) all referred to the Brazilian form first described and figured by Marcgraf as "Cuandu Brasilien-sibus" from the area of Recife, Pernambuco State, north-east Brazil. Bontius (1658) dealt with a Porcupine from Java, obviously *Hystrix brachyura* Linnaeus, 1758, although his figure is evidently a copy of that of the Brazilian Porcupine published by Marcgraf, as has already been pointed out by Buffon (1764, Hist. nat., 12: 419). Hernandez's (1651: 322) "Hoitztlacuatzin" from Mexico is *Coendou mexicanus* (Kerr, 1792); in the original description of *Hystrix mexicana*, Kerr (1792: 214) actually referred to Hernandez's account.

Hystrix prehensilis Linnaeus, 1758, thus is based on three species: *Hystrix brachyura*, *Coendou prehensilis*, and *Coendou mexicanus* of modern authors. As far as I know no lectotype has ever been selected for *Hystrix prehensilis*, and in order to prevent nomenclatorial confusion, I select here the specimen figured by Marcgraf (1648: 233) as the lectotype of *Hystrix prehensilis* Linnaeus, 1758. The type locality of the species hereby becomes Recife, Pernambuco State, Brazil, to which Thomas (1911: 145) had already restricted the original type locality: "Habitat in Asia, America meridionali".

Cabrera (1961: 600) considered the specimens of this species from the Guianas to belong to the nominate subspecies. If, however, they would prove to be distinct, then the name *Coendou prehensilis longicaudatus* Daudin, 1802, should be used, as pointed out by Cabrera. The type locality of *Coendou longicaudatus* is "Cayenne". The author's name of *Coendou longicaudatus* is often incorrectly cited as Lacépède, but as is clearly shown by the title page of the Tableau des divisions etc. (1802), it is Daudin and not Lacépède who is responsible for the text dealing with the species. Sherborn (1927: 3641) already correctly indicated Daudin as the author of the specific epithet *longicaudatus*. Although the date 1799 is printed on the title-page of vol. 14 of the Didot edition of Buffon's Histoire naturelle, this volume was actually published in 1802 (see Sherborn).

In 1879 Jentink described a new Tree Porcupine under the name *Hystrix Brandtii*. Jentink based his new species on (1) a specimen collected by G. H. Langsdorff and figured by Brandt (1835: pl. 9 figs. 5-9) under the name *Hystrix prehensilis* Linnaeus, (2) a female specimen from unknown locality received by the Leiden Museum from the Rotterdam Zoo in September 1877, and (3) a female specimen from Suriname, probably from the Paramaribo region, where it was collected in 1835 by the military apothecary H. H. Dieperink. Jentink did not examine Brandt's specimen himself but based his conclusions solely on the description and the figure of the skull provided by Brandt. Brandt did not mention the locality in which Von Langsdorff collected the animal, but Thomas (1903: 240) surmised that it might have been obtained in the Mato Grosso as Von Langsdorff had collected in this region. This led later authors, like Cabrera (1961: 599), to consider *Hystrix brandtii* Jentink, 1879, a junior synonym of *Coendou prehensilis platycentrotus* (Brandt, 1835) from the Mato Grosso. It is, however, not at all certain that all of Von Langsdorff's material came from the Mato Grosso, for he also visited other localities in Brazil.

Jentink's third specimen, viz., the one from Suriname, in every respect resembles the Suriname specimens of *Coendou prehensilis prehensilis* and I cannot find any good reason to consider it different from that subspecies. The second of Jentink's specimens, the one from an unknown locality, obtained from the Rotterdam Zoo, is different from my eleven Suriname specimens of *C. p. prehensilis* in the relatively narrower braincase and the much longer nasals: in my eleven specimens the length of the nasals varies from 28 to 35 mm, while in the specimen from the Rotterdam Zoo it is 39 mm. It might represent a different subspecies, but my material is not sufficient for a definite conclusion.

As far as I know no lectotype has ever been selected for *Hystrix brandtii* Jentink and in view of the fact that the type material of this species probably is heterogeneous, such a selection is quite urgently needed. If Brandt's specimen were chosen as the lectotype and if that specimen proved to be the Mato Grosso form, the name *brandtii* would become a junior synonym and would not do any harm. However, the identity and the locality of Brandt's specimen are dubious, while it is not even certain that the specimen still exists, so that its identification might have to be based on Brandt's figures and description only. Although Brandt's specimen is usually treated as if it were the lectotype (e.g., by Cabrera), even though not officially selected as such, it seems that owing to the uncertain identity of Brandt's specimen, this would be a poor choice. The specimen from the Rotterdam Zoo likewise would be a poor choice as its exact locality is unknown. Therefore I now select as lectotype of *Hystrix brandtii* Jentink, 1879, the female specimen from Suriname collected by H. H. Dieperink in 1835, Cat. Jentink 1887: *Cercolabes brandtii*, no. b (skull); Cat. Jentink 1888: *Cercolabes brandtii*, no. b (mounted specimen); new reg. no. 19642 (skin and skull), which is still extant and consists of an excellent skin and a complete skull. By this action the specific name *brandtii* Jentink, 1879, becomes a junior synonym of *prehensilis* Linnaeus, 1758, or if the Guiana form is a subspecies distinct from the nominate form, a junior synonym of *Coendou longicaudatus* Daudin, 1802.

The present species and the next were often placed in the genus *Cercolabes*. The name *Cercolabes* was given by Brandt (1835: 391) as a replacement name for *Coendou* Lacépède (1799: 11), which Brandt rejected on the (incorrect) grounds that the latter is a barbaric name (see Brandt's footnote). *Cercolabes* thus becomes an objective junior synonym of *Coendou* and has to be rejected in favour of the latter name.

***Sphiggurus insidiosus* (Lichtenstein, 1818)**

Text-fig. 44h (mandible), pl. 109 fig. 5 (hind foot), pl. 138 (animal), pl. 139 lower figures (skull)

H.[ystrix] insidiosa Lichtenstein, 1818, Das Zoologische Museum der Universität zu Berlin: 18-19.

Type locality. — Salvador, Bahia State, Brazil (see further under Remarks).

Synonymies. — Cabrera, 1961: 601 (under *Coendou insidiosus melanurus*); Ellerman, 1940: 187-188 (under subgenus *Sphiggurus*); Waterhouse, 1848: 425-427 (under *Cercolabes melanurus*). Fermin (1765: 16; 1769 (2): 118) used the Latin name

"*Erinaceus Surinamensis*" for what probably is this species. Fermin's names, however, are not available nomenclaturally, because in his works he did not consistently adopt the binominal nomenclature; therefore the name *Erinaceus surinamensis* does not invalidate *Hystrix insidiosus*.

Vernacular names. — (E) Black-tailed Tree Porcupine, Bristly Porcupine; (N) Listig Stekelvarken, Borstelig Stekelvarken; (S) Djiendjamaka.

Distribution. — The exact range of *Sphiggurus insidiosus* is unknown. It has been reported from Suriname and from (northern) Brazil (Manaus and Bahia).

Occurrence in Suriname. — Fermin (1765: 16; 1769 (2): 118) mentioned both a Porcupine (Porc-épic) and a Hedgehog (Hérisson) from Suriname. The first unquestionably is *Coendou prehensilis*, the second might be *Sphiggurus insidiosus*. Fermin's description of the Hérisson (to which he gave the name *Erinaceus surinamensis*) does not contain reliable characters for a definite identification: he described the tail, namely, as not very long, and did not mention the presence of hairs on the back. As, however, besides the two species mentioned above, no other hystricid is known from Suriname, we may provisionally identify Fermin's *Erinaceus surinamensis* with *Sphiggurus insidiosus*. In 1835 H. H. Dieperink, a military apothecary at Paramaribo, sent to the Leiden Museum a specimen of *Sphiggurus insidiosus* (see Jentink, 1888: 102, no. a under *Sphiggurus melanurus*); this specimen was dealt with by Waterhouse (1848: 425-427). Most of the popular authors did not mention the species, only the brothers Penard ("De Surinamer", 20 and 30 April 1905) briefly stated that a second species of Porcupine, next to *Coendou prehensilis*, exists in Suriname; they gave a short description and stated that the biology and the distribution of the species is similar to what is known in this respect of *Coendou prehensilis*, adding that the present species is much rarer. The species thus was usually considered to be rare in Suriname, but that this is only seemingly so is proven by that during the "Operation Gwamba" no less than 518 specimens were saved in the Brokopondo region alone (Walsh & Gannon, 1967: 98, 218, under *Coendou insidiosus*). Evidently the habits of this species cause that it is usually overlooked, and neither the records in the literature nor the material examined give a good picture of the range of the species in Suriname. I have examined the following material:

1. Environment of Paramaribo, Suriname District, 1 female (Cat. Jentink, 1888: 102, no. a, mounted specimen; new reg. no. 23982), 1 young male (no. 328, mounted specimen and skull).
2. Area of Brokopondo Lake, Brokopondo District, 1 male (ZMA no. 9076, skin and skull).
3. Afobaka at Brokopondo Lake, Brokopondo District, 1 male (no. 18218, skin and skull).
4. Suriname, without more precise locality indication, 1 male (no. 1157, skin and skull), 1 female (no. 346, skin and skull); 1 skull (no. 2288).

Description. — The following description is based on the material mentioned above. The most characteristic feature of the present species is the presence of long hairs, which, especially in the median dorsal part, cover and conceal the spines. There are two kinds of hairs: long and thin ones, which are dark with a small whitish tip, and very long thicker hairs in which a much larger distal part (up to one-third

of the total length of the hair) is white, the middle third being blackish brown. The basal third of all the hairs usually is pale. The hairs are densest on the back and less dense on the sides. On the anterior half of the head (from between the eyes forward) there are no long hairs. On the bases of the legs the hairs, although of the same types as those on the back, are shorter and coarser; in the distal part of the legs and on the upper surface of the feet the hairs are unicolorous blackish brown. On the base of the tail the hairs are similar to those on the back; they occupy about one-third to one-fourth of the length of the tail. The spines on the body are rather short, up to 25 mm long, the longest being those on the sides. The spines are pale sulphur yellow to whitish yellow with a very short brown tip. The spines of the head are shortest and densest, in the middle they almost reach the base of the large blunt nose while they also cover the cheeks; sometimes the eyes are encircled by spines, but usually no spines are present in front of the eyes. The nose is swollen and naked except for very long black whiskers; a few long whiskers are also present over and behind the eye. The external ear is short and rounded; it is so inconspicuous and hidden, that older authors remarked that there is no ear, but only an ear opening. The external part of the ear is sparsely covered with thin hairs and may also bear a very few short spines. The basal part of the outer surface of the legs has the spines longer than those on the head but shorter than those of the body. Often the spines are concentrated here in the anterior half. The distal half of the outside of the legs is without spines. In the upper basal part of the tail the spines are similar to those of the back or somewhat more slender. The ventral surface of the body has no spines at all, the hairs are short compared to those on the dorsal surface. They are dark brown with a pale base and usually have whitish tips, although in some specimens these are entirely lacking. The insides of the legs have their hairs similar to those of the ventral surface. The distal one-fourth or one-fifth of the tail is naked. The rest of the tail, except for the basal dorsal part, is densely beset with stiff blackish brown hairs, the extreme tip of which may be paler and more transparent. The hairs are rather appressed but by their density make the tail look much broader than it is. Distally, towards the naked tip, the hairs become more sparse. The blackish colour of the tail strikingly contrasts with the greyish fur and the yellowish spines of the body. The front legs have four toes, each with a large nail. The hind legs also have four toes with large nails, but in addition show a fifth, inner, rudimentary toe, which has no nail.

Mammae are visible both in the males and in the females. In my material there are either two or three pairs of abdominal mammae.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{1}{1}$, $M \frac{3}{3}$. The upper surface of the skull is almost flat, only slightly convex in its posterior part; it lacks the high dorsal hump which characterizes the previous species, *Coendou prehensilis*. In all respects the skull of the present species is more slender than that of *C. prehensilis*; this is especially distinct in the rostrum, which is about as long as high, while in *C. prehensilis* it is far higher than long. In anterior view the nasal opening is more triangular than heart-shaped,

the lateral margin being straight rather than convex. The diastema is relatively longer than the row of cheek-teeth. The crowns of the cheek-teeth themselves resemble those of *Coendou prehensilis*.

In Table 86 external and skull measurements of 5 specimens of *Sphiggurus insidiosus* from Suriname are noted. The length of the upper cheek-teeth varies from 16.0 to 18.4 mm (mean: 17 mm).

TABLE 86

External and skull measurements of five specimens of *Sphiggurus insidiosus* (Lichtenstein) from Suriname.

Museum	RMNH	ZMA	RMNH	RMNH	RMNH
Reg. number	18218	9076	1157	2288	346
Sex	♂	♂	♂	—	♀
Head and body	380	363	—	—	—
Tail	370	375	—	—	—
Hind foot, without nail	75	62	—	—	—
Ear	24	24	—	—	—
Weight, grams	1150	1340	—	—	—
Condylbasal length skull	79.4	73.2	77.2	73.4	73.2
Basal length	73.8	68.7	72.0	68.1	69.2
Palatal length	40.8	37.0	38.6	38.2	38.1
Nasals, 1 x br	26.9x18.6	—x18.9	21.5x17.3	21.6x16.8	23.3x17.3
Interorbital constriction	30.4	28.0	25.7	27.5	26.2
Zygomatic breadth	46.0	43.6	40.8	44.4	42.9
Breadth of braincase	33.7	33.6	32.6	32.8	33.5
Diastema	24.7	20.5	22.0	20.3	18.4
Height of skull	30.2	28.8	26.7	27.0	27.0
For. incisivum, 1 x br	4.9x3.8	4.3x3.8	4.2x3.3	6.4x4.5	4.8x3.7
Alveolar length p-m ³	16.0	16.3	16.6	17.5	18.4
Length of mandible	51.9	48.1	48.8	49.0	47.3
Alveolar length p-m ₃	18.0	17.4	18.1	19.6	19.4

Remarks. — Fermin (1769: 119) remarked that the meat of his "Erinaceus Surinamensis" is very white and that it is highly esteemed as food by the Amerindians, in his opinion not surprising because the animals, according to him, feed on fruit, ant-pupae, vegetables and roots. Dr. D. C. Geijskes informed me that a specimen of this species, kept in captivity by him in 1965, not only ate bananas and the fruits of the Awarra and Maripa palms but also accepted brown bread and milk.

Because of its nocturnal and arboreal habits (the species usually lives in high trees) the animal is seldom observed or collected.

F. Cuvier (1825: 256) erected a new genus, *Sphiggurus*, for the species of Porcupines in which the spines of the dorsal surface are hidden by the long hairs of the fur. By later authors this genus usually is considered either a subjective junior synonym or a subgenus of *Coendou* Lacépède, 1799. The type species of *Sphiggurus* F. Cuvier, 1825, is *Hystrix spinosa* F. Cuvier, 1822, by subsequent designation by F. Cuvier (1826: 533); the type species of *Coendou* Lacépède, 1799, (by monotypy)

is *Hystrix prehensilis* Linnaeus, 1758. In the present publication I follow F. Cuvier in considering *Sphiggurus* to be a genus distinct from *Coendou*, as these two taxa differ so strongly both in external and in skull characters, that their separation seems fully justified.

The specific name *insidiosus* is usually ascribed to Kuhl (1820: 71), who published it as "*Hystrix insidiosa* Lichtenst."; it was assumed by subsequent authors that the name *insidiosus* was a manuscript name of Lichtenstein. However, Lichtenstein (1818: 19) actually did publish the name in his guide to the collections of the Zoological Museum of Berlin, in which (on pp. 18 and 19) he wrote: "Die Stachel-schweine, und zwar nur brasilische: Das Cuandu, (*Hystrix prehensilis*), nebst drei neuen Arten, worunter eine, deren Stacheln zwischen dem wolligen Haar versteckt liegen (*H. insidiosa*)". This description, although short, is sufficient to make the name *H. insidiosa* available. At the same time the type locality, not given by Kuhl, is now known, viz., Brazil.

In the species *Coendou insidiosus*, Cabrera (1961: 600) recognized two subspecies, viz., *C. insidiosus insidiosus* (Kuhl, 1820) from eastern Brazil and *C. insidiosus melanurus* (Wagner, 1842) from Amazonia, Brazil. In the Leiden Museum there are 9 specimens of what Cabrera considered to be *C. insidiosus*, viz., 6 from Suriname, 2 from "Brazil" and 1 from "Porto Real, Rio de Janeiro, Brazil". A comparison of this material shows that actually two species are involved: the specimens from Suriname both in skin and skull characters differ so strongly from the other three that I prefer to treat them as specifically distinct. The differences between the two taxa are as follows:

(1). In the Suriname animals all the spines are bicoloured: yellowish with a short dark brown or blackish tip, none shows any orange colour. The Brazilian specimens have the spines of the head and the anterior part of the back tricoloured: the basal part is yellowish, like in the Suriname specimens, but the tip is orange with a black band separating it from the yellowish colour of the base; more posteriorly there are spines similar to those of the Suriname specimens mixed with the tricoloured ones, the relative number of bicoloured spines increasing posteriorly.

(2). In the Suriname specimens the spines are shorter (the longest are about 25 mm) than in the Brazilian specimens (in which the longest reach a length of about 50 mm).

(3). In the Suriname specimens the long dorsal hairs are of two kinds: (a) thin hairs which all are blackish except for a pale basal part, and (b) stronger hairs, which apart from a pale base, are bicoloured, having the shorter proximal part black, the larger distal part white or (in the extreme posterior part of the back) slightly yellowish; the fur of this species thereby acquires a uniform greyish overall tinge. In the Brazilian specimens the thin hairs are brown with a pale base, while the more robust hairs have the part above the pale base dark brown with a ferruginous distal part. The general colour impression of the fur of this species is brown to reddish brown.

(4). In the Suriname specimens the tail is distinctly bicoloured: the distal furry part being deep black, the proximal third (or a somewhat smaller part) having the hairs of the same greyish colour as the back; spines occur only in this proximal part. In the Brazilian specimens the fur of the tail is of a rather uniform brownish colour similar to that of the back, and in this species the basal half of the tail (or a somewhat greater part) bears spines.

(5). In the Suriname specimens the legs are covered by a black fur with whitish tips, giving them a blackish appearance. In the Brazilian specimens the fur of the legs is brownish, similar to that of the back.

(6). Although externally all the Brazilian specimens are larger than those from Suriname, their skulls are smaller. In five specimens from Suriname the condylo-basal length varies from 73.2 to 79.4 mm (mean 75.3 mm); in five specimens from Brazil the condylobasal length varies from 65.0 to 68.5 mm (mean 67.2 mm).

Waterhouse (1848: 425-430) already distinguished these two forms as good species and gave excellent descriptions of them. He named the Suriname form *Cercolabes melanurus* (Wagner, 1842) and the other form *Cercolabes villosus* (F. Cuvier, 1822), treating *Hystrix insidiosa* Lichtenstein as a doubtful species. Lichtenstein's (1818) original diagnosis of *Hystrix insidiosa* is very short and insufficient. Fortunately Kuhl (1820: 71) gave a more extensive description of Lichtenstein's type: "*H. insidiosa* Lichtenst. Magnitudine *Arctomyis marmotae*. *Aculeis sparsis*, basi stramineis, apice brunneis, acutissimis, pollice minoribus, ad caudae basin, collum et supra oculos magis confertis. Pilis villosis, longis, pallide cinereis, spinas obtegentibus. Cauda setosa. In Museo Berolinensi". The fact that Kuhl called the spines bicoloured (basal part of a straw colour, tip brown) and the long hairs ash grey, shows that the type of *H. insidiosa* belongs to the same species as the Suriname specimens. Consequently the name *H. insidiosa* is a senior synonym of *Cercolabes melanurus*, and should be used for the species that Waterhouse indicated with the latter name. For the second species the name *Sphiggurus villosus* (F. Cuvier, 1822) should be adopted. F. Cuvier's (1826: 534-535) description is quite sufficient, as he described the long hairs as whitish at the base, black in the following part, and in the distal part of a blonde or chestnut colour; he also described the spines as tricoloured.

Cabrera (1961: 600, 601) considered the two species discussed here as subspecies of a single species, and he unfortunately identified the typical *Hystrix insidiosa* with *Hystrix villosa* (without giving his reasons for doing so). Therefore he gave the eastern form (i.e. *Hystrix villosa*) the name *Coendou insidiosus insidiosus*, and used the name *C. insidiosus melanurus* (Wagner, 1842) for the true *C. insidiosus*.

The type locality of *Hystrix villosa*, as indicated by Rode (1945: 268) is "Corcoracoto, montagne près de Rio de Janeiro", Brazil. That of *Hystrix insidiosa* is Salvador, Bahia State, Brazil, as already mentioned above.

The type of *Hystrix insidiosa* formed part of the collection of the Berlin Museum and, as stated by Lichtenstein (1818: 18), was collected in Brazil. The holotype, as Dr. R. Angermann of the Berlin Museum kindly informed me (in litt. 16 April

1975), unfortunately cannot now be located. Concerning this holotype Dr. Angermann remarked: "In unserem ältesten Katalog steht unter Nummer 1293 "Cercolabes (Sphiggurus) insidiosus Lichtst. Kuhl*, Fundort: "Brasil", Sammler: Sellow, ein Datum ist nicht angegeben. Bei diesem Stück handelt es sich mit grosser Wahrscheinlichkeit um den fraglichen Typus, jedoch sind weder ein Balg noch ein Schädel mit dieser Nummer auffindbar". The asterisk indicates that the specimen is a type. Friedrich Sellow (born 12 March 1789 at Potsdam, Germany, died in October 1831, at Rio Doce, Brazil) was the collector of the holotype; by these data the type locality can be more accurately defined. According to Stresemann (1948: 423) three shipments from Brazil sent by Sellow reached the Berlin Museum before 1819 and thus might have contained the material mentioned by Lichtenstein in 1818. The first shipment included specimens collected between Caravelas and Salvador (= Bahia) in Bahia State, but Stresemann (1948: 411) noted as the contents of this shipment "600 Vogelbälge, 3000 Insekten, 300 Spezies Pflanzen (4-6 Exemplare von jeder Art) und ein Päckchen Samen, "alles zwischen Caravellas und Bahia gesammelt"", so apparently no mammals were contained in this shipment. According to Stresemann (1948: 423) the two following shipments contained material collected in the "Umgebung von Bahia"; there appears to be no list of the contents of these two shipments, but one of them must have contained the specimens of *Hystrix insidiosa*. Accordingly the locality of the specimen is the area of Salvador, Bahia State, Brazil, which thereby becomes the type locality of *Hystrix insidiosa* Lichtenstein.

The two species, *Sphiggurus villosus* and *S. insidiosus*, seem to be quite rare in museum collections, and therefore their range is not known with certainty. *Sphiggurus insidiosus*, apart from Suriname and Bahia (Brazil), is also known from "Rio Negro [Bara], near Manaus, Amazone State (type locality of *Cercolabes melanurus* Wagner, 1842). *Sphiggurus villosus* is known from south-eastern Brazil (from the state of Minas Gerais to that of Rio Grande do Sul; see Vieira, 1955: 423).

In my check-list of the Suriname mammals (Husson, 1973: 13) I followed Cabrera (1961: 601) in naming the present species *Coendou insidiosus melanurus* (Wagner, 1822), but data obtained since that time made me change my opinion on its nomenclature.

FAMILY MURIDAE

The three species of murid rodents now known from Suriname were all unintentionally introduced by man; at present they form an integral part of the Suriname fauna. They are mainly found near human habitations. The Roof Rat, *Rattus rattus* (Linnaeus, 1758), and the House Mouse, *Mus musculus* Linnaeus, 1758, are more widely distributed than the Brown Rat, *Rattus norvegicus* (Berkenhout, 1769). In the interior only the two first named species are found, but it is not exactly known how far inland they have penetrated.

These three rodents are a pest wherever they occur, not only because they transmit contagious diseases, but also because of the enormous damage which they in-

flict upon stored food. They can also become a nuisance by gnawing through electrical wires and small water pipes, thereby disturbing communications and causing short circuits and serious leakages.

Notwithstanding the damage and diseases caused by these rodents, no official measures to control them have so far been taken in Suriname. The people have to learn to live with these pests; the animals are only incidentally killed by hand, sometimes caught with traps. The experience in countries in which a systematic control of rats and mice by official authorities is undertaken shows that it is impossible to eradicate these pests. Then the only result is that the numbers of these animals either temporarily decrease or remain about constant. The usual methods taken to combat rats and mice are (1) a better construction of the buildings with special emphasis on the prevention of entry through drains and sewers; (2) a regular fumigation of storage spaces; (3) the use of roofing other than thatch or palmleaf covers; (4) the storage of food, food-remains, offal, and anything attractive to rats and mice in closed metal containers; and (5) poison, to be used when there is no risk that it will come within reach of children and domesticated animals. These methods can only be used in towns and in buildings near the airstrips, but in the settlements of the Amerindians and the Bush-Negroes, at least for the time being, we must accept the occurrence of these harmful and injurious animals.

Some time after the discovery of the Guianas by the Spanish, *Rattus rattus* and *Mus musculus* may have been introduced into Suriname, first by ships entering the mouth of the Suriname River. From the area around the lower Suriname River the rats and mice probably made their way into the interior and to other localities, overland and in small crafts. We may assume that since 1550 these two rodents were present in Suriname. The introduction of *Rattus norvegicus* most likely is

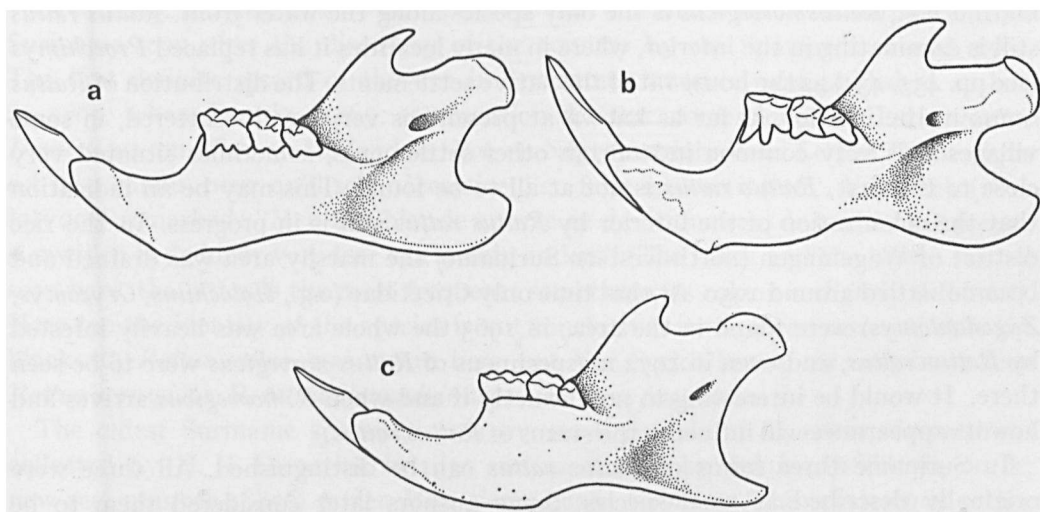


Fig. 48. Right half of mandible, inner view. a, *Rattus rattus rattus* (Linnaeus); b, *Rattus norvegicus* (Berkenhout); c, *Mus musculus* Linnaeus.

from a later date, probably not earlier than the second half of the 18th century, but possibly as late as the beginning of the 19th century.

The origin of the populations of rats and mice in Suriname cannot be determined and probably is highly diverse, as ships of many nationalities came into Paramaribo harbour and may have carried rats and mice from practically any country in the world. Due to the busy shipping, in almost any harbour the population of rats and mice is extremely mixed, and it is impossible to recognize subspecies in these populations.

Specimens of *Rattus norvegicus* are rather uniform in morphology and colour all over the world, showing extremely little variation. This is quite different from what is to be observed concerning the two other species of Muridae. Of both *Rattus rattus* and *Mus musculus* a number of forms have been described, mainly based on differences in colour and colour pattern. Such forms have been considered by different authors to be (a) good species, (b) subspecies, or (c) just colour variants.

The origin and status of the various species and forms of *Rattus rattus* has given rise to an enormous literature, in which the wildest theories and speculations have been put forward. The reliable data at hand are too few either to confirm or to definitely reject such theories. Most authors accept the unproven assumption that the origin of *Rattus rattus* was in southern Asia and that the species has spread from this region; some authors even point to the crusades as a means by which the species might have reached western Europe, but this is refuted by evidence of fossil specimens. Actually we know little at all about the movements of the species until very recent times. It is known, however, that where the species is introduced and becomes established it is afterwards pushed out by *Rattus norvegicus* (see p. 501), which usually is later introduced in the same areas. This phenomenon has been observed in large areas in Europe and also seems to happen in Suriname. In Paramaribo, e.g., *Rattus norvegicus* is the only species along the water front. *Rattus rattus* still is dominating in the interior, where in many localities it has replaced *Proechimys* (see pp. 433, 434) as the house rat of the native settlements. The distribution of *Rattus rattus* in the interior, as far as known at present, is very much scattered, in some villages it is very common indoors, in other settlements, sometimes situated very close to the first, *Rattus rattus* is not at all to be found. This may be an indication that the colonization of the interior by *Rattus rattus* still is in progress. In the rice district of Wageningen (north-western Suriname) the marshy area was drained and became settled around 1950. At that time only Cricetidae (e.g., *Holochilus*, *Oryzomys*, *Zygodontomys*) were found in the area; in 1963 the whole area was heavily infested by *Rattus rattus*, and even in 1972 no specimens of *Rattus norvegicus* were to be seen there. It would be interesting to note exactly if and when *R. norvegicus* arrives and how its appearance will influence the status of *Rattus rattus*.

In Suriname three forms of *Rattus rattus* can be distinguished. All three were originally described as good species. Some authors later considered them to be subspecies, because they interbreed. The usual modern opinion is that the three are to be considered nothing but colour forms of a single species (Tomich & Kami,

1966; Tomich, 1968; Caslick, 1956). This conclusion is, however, not entirely satisfactory, as the number of intermediates between the three forms is rather small. In Suriname material there is hardly ever any doubt whether a specimen belongs to *Rattus rattus rattus* or to *R. rattus frugivorus*, while it also is remarkable that the third form, *R. rattus alexandrinus*, in Suriname is apparently very rare in comparison with the two other forms. In my opinion the problem is not yet definitely solved; for reasons of convenience, and also to draw attention to the problem, the three forms are treated here as subspecies.

***Rattus rattus rattus* (Linnaeus, 1758)**

Text-figs. 48a (mandible), 49a (skull), 50a (first upper molar), pl. 106 lower fig. 2 (hind foot), pl. 112 fig. 2 (upper and lower tooth-rows), pl. 140 upper figures (skull), plate H (animal)

Mus Rattus Linnaeus, 1758, *Systema Naturae*, (ed. 10) 1: 61-62.

Type locality. — "Habitat in domibus Europae". Restricted by Thomas (1911: 147) to "Sweden (Upsala)".

Synonymies. — Ellerman & Morrison-Scott, 1951: 581-582; Hall & Kelson, 1959 (2): 768; Husson, 1960a: 91-92.

Vernacular names. — (E) Black Rat, House Rat, Ship Rat, Roof Rat; (N) Zwarte Rat, Huisrat, Scheepsrat, Stadsrat, Pestrat, Pakhuisrat, Suikerrat, Klapperrat, Plantage Rat; (S) Ton-alata.

Distribution. — By human action the Black Rat has become a cosmopolitan species which is to be found all over the world near human habitations. Its region of origin is stated to be southern Asia. On purely theoretical grounds it has been assumed that the original form was bicoloured and that the true black specimens represent a melanistic domestic form.

Occurrence in Suriname. — It is possible that the Black Rat was introduced into Suriname soon after the discovery of the country by the Spaniards around 1550. The first definite record of this rat in Suriname, however, was published as late as 1765, when Fermin (1765: 25) mentioned "Rat domestique, en Latin *Rattus Domesticus*, ou *Mus*, en Hollandois, *Rot*, en Nègre Anglois *Rata*. Le Rat Domestique est trop connu, pour qu'il soit nécessaire d'en faire la description". Von Sack (1812 (2): 204) remarked: "Men ziet hier de zwarte en de bruine rat, de laatste het meest; somwijlen is de kleur van deze een weinig anders" (The black and the brown rat are seen here, the latter is the most frequent; sometimes its colour is slightly different). Here too the identity of the species is not conclusive: it might be assumed that the black rat, *Rattus rattus*, was meant here, but Von Sack's brown rat may have been *Rattus norvegicus*, *R. rattus alexandrinus*, or *R. rattus frugivorus*.

The oldest Suriname specimen seen by me is a male of *R. rattus alexandrinus* collected by H. H. Dieperink in 1830 and mentioned by Jentink (1888: 56, no. k; new reg. number 18856) under *Mus alexandrinus* Geoffroy. The specimen is rather faded and might be a discoloured *R. rattus rattus*. Teenstra (1835 (2): 401) mentioned the presence of "de zwarte en de bruine rat" (the black and the brown rat) in Suri-

name. His remark that some of the rats "zich achter de heiningwerken aan den rivieroever verschuilen, en 's avonds . . . voor den dag komen" (hide themselves behind the piling along the river banks, and emerge in the evening), is strongly indicative of *Rattus norvegicus*. Most later authors dealing with Suriname do not mention rats, or add so few details that it is impossible to determine the identity of the animals. Droogleever Fortuyn (1945: 5) published a note concerning the occurrence of the Black and the Brown Rats in Paramaribo; he remarked that all his specimens belonged to "Rattus norvegicus with the possible exception of one young male rat".

The following Suriname material of *Rattus rattus rattus* has been examined by me (of all specimens skins and skulls are present, unless otherwise indicated):

1. Prodobong, a fishermen's camp on the sea-shore near Nieuw Nickerie, Nickerie District, north-west Suriname, 1 male (no. 16086).
2. Wageningen, lower Nickerie River, Nickerie District, in cowsheds, 8 males (nos. 20187-20189, 20193-20197), 3 females (nos. 20186, 20190, 20192).
3. On ferryboat "Beatrix" between Wageningen and Coppename Punt, 1 female (no. 20185).
4. Garnizoenspad, 19 km west of Paramaribo, Saramacca District, 1 skull (no. 21852).
5. Road near Kwatta, 9 km west of Paramaribo, Suriname District, 4 skulls (nos. 21844-21845, two unnumbered).
6. Plantation "De Morgenstond" on Suriname River, north-east of Paramaribo, 1 female (no. 17218).
7. Paramaribo, various localities (in houses), 6 males (nos. 3757, 3763-3765, 3909, 21937), 9 females (nos. 3908, 3910, 3911, 3913, 7479, 17237, 20173 (skull only), 21927, 21928), 2 juveniles (nos. 3912, 20293), 1 skull (no. 17255).
8. Cultuurtuin (Agricultural Experimental Station), Paramaribo, 1 male (no. 20176), 2 females (nos. 21939 (skin only), 21931).
9. Meerweg, Paramaribo, 1 female (no. 22369).
10. Jodensavanne, east bank of Suriname River, about 50 km south of Paramaribo, Suriname District, 1 male (no. 16078).
11. Copieweg, south of Lelydorp on highway Paramaribo-Zanderij, Para District, 1 male (no. 20175), 1 female (20174).
12. Onverwacht, south of Lelydorp on highway Paramaribo-Zanderij, Para District, 1 male (no. 22368, skull only).
13. Kwakoe Gron on Saramacca River, Brokopondo District, 1 female (ZMA no. 10134).
14. Hermansdorp near Brokopondo, 4 males (ZMA nos. 9220, 9221, 9345, 10246).
15. Brokopondo, 2 males (ZMA nos. 9346, 9525), 1 female (ZMA no. 9344).
16. Brokobaka, south-west of Brokopondo, 2 females (nos. 21928, 21929).
17. Afobaka on Brokopondo Lake near outlet into Suriname River, south of Brokopondo, 3 males (nos. 18244, 18289 (skull only), 18290 (skull only)), 1 female (no. 22373), 1 juvenile (ZMA no. 10481).
18. Brownsweg, west bank of Brokopondo Lake, 2 males (nos. 20268, 20273), 4 females (nos. 20269-20272).
19. Ganiakondre, locality now flooded by Brokopondo Lake, 4 males (nos. 20242, 20249, 20250, 20252), 3 females (nos. 20247, 20253, 20264).
20. Gansee, locality now flooded by Brokopondo Lake, Brokopondo District, 25 males (nos. 20202-20204, 20206, 20209, 20211, 20214, 20215, 20218, 20221-20224, 20236, 20237, 20245, 20246, 20248, 20251, 20254, 20258, 20259, 20261, 20263, 20266), 36 females (nos. 18262, 20198-20201, 20207, 20208, 20210, 20212, 20213, 20216, 20217, 20219, 20226, 20228-20233, 20238-20241, 20243, 20244, 20247, 20253, 20255-20257, 20260, 20262, 20264, 20265, 20267).
21. Maripa-ondro (= Mooimankondre), right upper Commewijne River, just south of Peninika Creek, Commewijne District, 5 males (nos. 20181, 20184, 22370-22372), 3 females (nos. 20180, 20182, 20183).

22. Langamankondre, mouth of Marowijne River, north of Albina, Marowijne District, 1 male (no. 20179).

23. Lokalokatabbetje, island in Marowijne River, Marowijne District, 2 juveniles (ZMA nos. 10483, 10484).

24. Suriname, probably near Paramaribo, 5 males (nos. 18371, 18372, 18373 (skin only), 20291, 20292).

Description. — The following description is based on the extensive Suriname material examined. The dorsal surface of the body is dark slate grey to almost black with a brownish shade and with a slight sprinkling of white. The hairs all have their base greyish; they are of three kinds: (a) the very thin grey hairs of the under fur, (b) the thin and rounded stiffer hairs, which are often black, and (c) stiffer, broader and longer hairs with a longitudinal groove, which are whitish or light grey. Dorsally the head is darker and somewhat more brownish than the back, because the grooved whitish hairs are less numerous. The ears are large and rounded with short and sparse hairs on outer and inner surfaces. The under surface of head and body is of a uniform slate grey, slightly paler than the back and without a line of demarcation from the colour of the sides. The under surface of the head has the

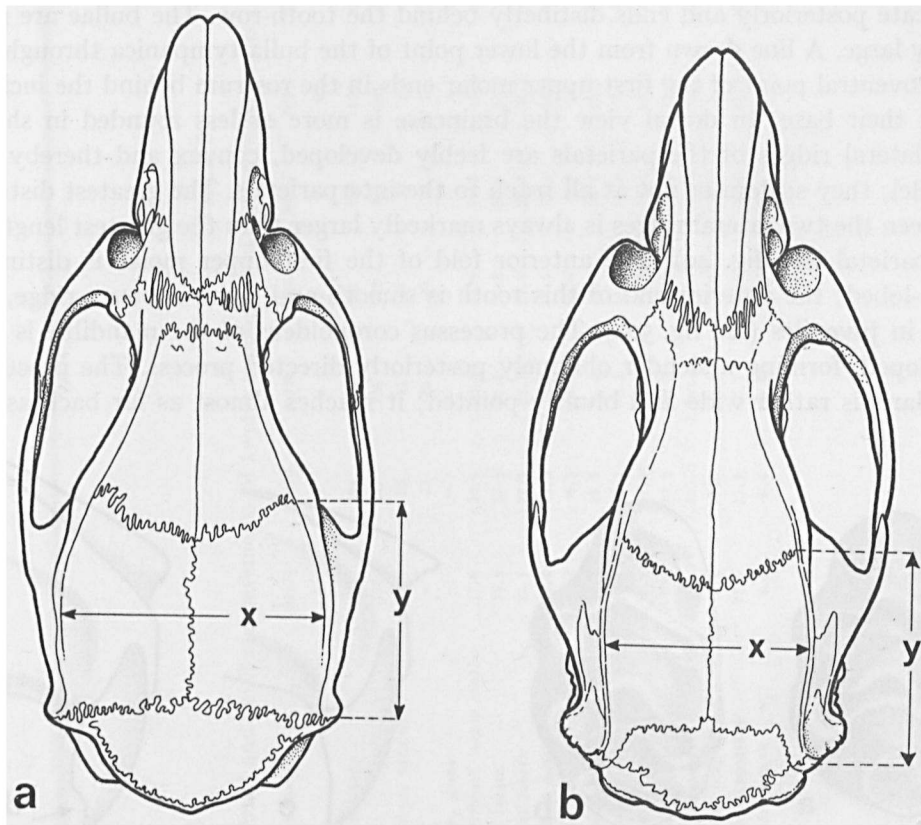


Fig. 49. Dorsal view of skull. a, *Rattus rattus* (Linnaeus); b, *Rattus norvegicus* (Berkenhout). — x, parietal width; y, parietal length (see text).

same colour as the rest of the ventral surface. The three types of hairs of the upper surface are also found here, but they are shorter and softer. The proximal part of the legs has the same colour as the adjoining parts of the body, the outer surface being of a colour similar to that of the dorsal surface, the inner surface having the same colour as the ventral part of the body. The upper surface of the feet is dark brownish grey. The forefeet have five toes, the inner of which is rudimentary and bears no nail. The hind feet have five toes, all of which are well developed and have nails, the middle three are of about equal size and distinctly longer than the other two. The dorsal fur continues for a slight distance (about 2 cm) over the base of the tail. The rest of the tail is distinctly ringed by scales and bears very short appressed hairs. The length of the tail is rarely equal to, usually longer than the combined length of head and body.

There are one pair of pectoral, two pairs of abdominal and two pairs of inguinal mammae; sometimes supernumerary mammae are found.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The foramen incisivum is large, extending to the anterior ends of the first molars or slightly beyond. The palate is squarely truncate posteriorly and ends distinctly behind the tooth-row. The bullae are relatively large. A line drawn from the lower point of the bulla tympanica through the anteroventral point of the first upper molar ends in the rostrum behind the incisors or at their base. In dorsal view the braincase is more or less rounded in shape. The lateral ridges of the parietals are feebly developed, convex and thereby not parallel; they seldom or not at all reach to the interparietals. The greatest distance between the two lateral ridges is always markedly larger than the greatest length of the parietal (see fig. 49). The anterior fold of the first upper molar is distinctly three-lobed; the anterior end of this tooth is smooth and never shows a ridge, not even in juveniles (see fig. 50a). The processus coronoideus of the mandible is well developed, forming a slender obliquely posteriorly directed process. The processus angularis is rather wide and bluntly pointed; it reaches almost as far back as the

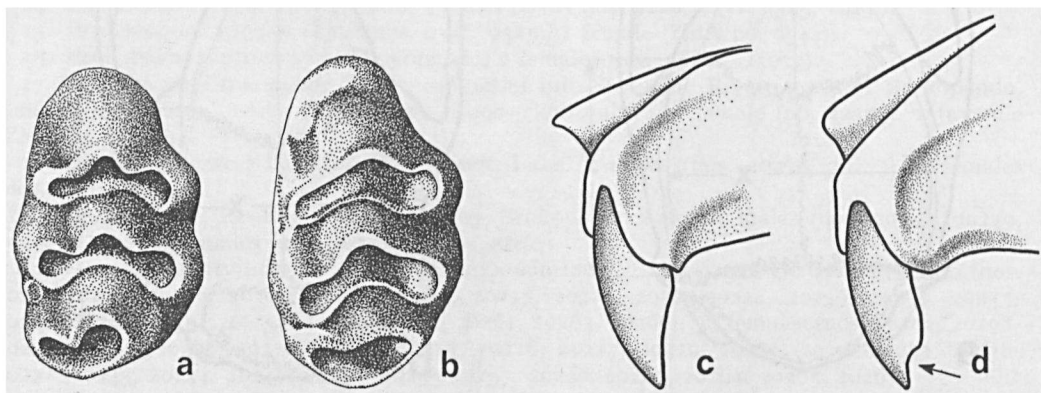


Fig. 50. a, b, first right upper molars. a, *Rattus rattus* (Linnaeus); b, *Rattus norvegicus* (Berkenhout). —c, d, left upper incisors, side view. c, *Oryzomys* spec.; d, *Mus musculus* Linnaeus.

TABLE 87
External and skull measurements of twelve specimens of *Rattus rattus* (Linnaeus) from Suriname in the Leiden Museum.

Reg. number	20174	20230	21929	20207	20257	20217	20176	20175	20251	20181	20215	20214
Sex	♀	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂	♂
Head and body	170	194	184	191	197	186	181	184	183	203	198	186
Tail	198	227	224	232	231	231	197	202	209	231	226	220
Hind foot, with nail	36	35	35	36	37	35	34	37	35	39	37	37
Ear	-	23	23	23	23	24	23	-	22	24	26	23
Weight, grams	-	-	-	-	-	-	125	-	-	240	-	-
Condylobasal length skull	37.4	39.8	40.4	40.9	41.3	43.1	38.6	38.8	40.4	41.3	41.7	42.1
Basal length	34.9	37.5	38.8	38.6	38.9	41.0	35.8	36.2	37.8	38.8	39.4	39.8
Palatal length	21.1	22.4	22.7	23.3	22.8	24.4	21.8	22.0	22.6	23.7	23.4	24.0
Length of nasals	13.6	15.6	14.8	14.6	15.4	16.5	15.6	15.0	14.8	16.1	15.9	16.2
Interorbital constriction	5.7	6.3	6.0	6.6	6.0	6.7	5.7	6.0	6.0	6.2	6.1	6.6
Zygomatic breadth	18.8	19.6	21.0	20.1	20.2	20.7	18.8	19.4	19.7	20.4	19.7	20.8
Breadth of braincase	16.1	16.2	16.2	16.6	15.9	16.7	16.2	16.3	16.0	17.2	16.6	16.5
Diastema	10.9	11.5	11.5	12.2	12.0	12.5	10.8	11.4	11.5	12.1	11.9	12.1
Height of rostrum	9.5	10.5	10.0	10.5	10.7	11.3	10.0	10.3	10.2	11.1	10.6	11.3
For. incisivum, l x br	7.4x2.9	7.5x3.0	7.8x2.8	8.1x3.0	7.8x3.2	8.3x3.1	7.0x2.7	7.5x2.8	7.5x3.0	7.5x3.0	7.7x2.9	7.8x3.0
Alveolar length m ¹ -m ³	6.2	7.0	7.2	7.2	6.9	7.3	7.0	6.8	6.9	7.1	7.0	7.1
Length of mandible	22.6	23.8	24.7	25.4	24.8	26.5	23.2	23.0	24.2	25.6	24.9	26.0
Alveolar length m ¹ -m ³	6.1	6.4	6.6	6.0	6.5	6.8	6.3	6.2	6.5	6.7	6.6	6.6

processus condylicus. The alveolar length of the upper molar series varies in 43 specimens from 6.1 to 7.4 mm (mean 6.8 mm).

In Table 87 external and skull measurements of twelve Suriname specimens are noted.

Remarks. — In the Suriname Game Ordinance of 1954, as revised in 1970, the present form is classed among the predominantly harmful animals under the names: "Huisrat (*Rattus rattus*)".

Apart from man the Barn Owl, *Tyto alba hellmayri* Griscom & Greenway, 1937, is one of the natural enemies of the three forms of *Rattus rattus* in Suriname (see Haverschmidt, 1962, Table II on p. 241; 1968: 158). In the stomach of two snakes, viz., *Boa constrictor constrictor* Linnaeus, 1758, and *Epicrates cenchria* (Linnaeus, 1758) I found remains of these rats.

No data about the rate of reproduction of the three forms of *Rattus rattus* from Suriname are known to me. During my visit to Suriname I did not obtain pregnant females. In my material juveniles are present, collected in the months January, February, March, April, May and November; there is therefore an indication that in Suriname *Rattus rattus* breeds the year round.

The largest specimen, a male, was collected on 4 May 1963 at Maripa-ondro (= Mooimankondre); its external measurements are: head and body, 203; tail, 231; hind foot, 39; ear, 24 mm; weight, 240 grams (no. 20181).

The question whether or not *Rattus norvegicus* drives out *Rattus rattus* has been discussed under the former species (see p. 506).

It is accepted by most authors that Linnaeus's *Mus rattus* is the present, black form. Linnaeus (1758: 62), however, described the colour of the animal as "corpore fusco cinerascete". This short description of the coat colour points more convincingly to *Rattus rattus alexandrinus* and *Rattus rattus frugivorus* than to the black form. For the time being I prefer to follow current usage and to consider the typical form to be blackish.

***Rattus rattus alexandrinus* (E. Geoffroy, 1803)**

Pl. H (animal)

Mus alexandrinus E. Geoffroy, 1803, Catalogue Mammifères Muséum National Hist. nat. Paris: 192.

Type locality. — "L'Egypte"; cited by most authors as "Alexandria, Egypt", because Geoffroy used the vernacular name "le rat d'Alexandrie".

Synonymies. — Ellerman & Morrison-Scott, 1951: 581-582; Miller, 1912: 854.

Vernacular names. — (E) Grey-bellied Rat; (N) Stadsrat. See further under *Rattus rattus rattus*, p. 493.

Distribution. — Like *Rattus rattus rattus*, the present form is found all over the world, having been transported with ships. It lives close to human habitations and often is found together with the previous and the following forms.

Occurrence in Suriname. — This seems to be the rarest of the three forms of

Rattus rattus occurring in Suriname. Although I have examined about 135 skins of *R. rattus rattus* and 24 skins of *R. rattus frugivorus*, only 4 specimens could be assigned to *R. rattus alexandrinus*. These 4 specimens are the following (all represented by skins and skulls):

1. Paramaribo, Cultuurtuin (Agricultural Experimental Station), Suriname District, 2 females (nos. 20276, 21936).
2. Paramaribo, 1 female (no. 3907).
3. Nengrekondre-pepre, Peninika Creek, right upper Commewijne River, Commewijne District, 1 semi-adult female (no. 20284).

Description. — The present form in all morphological details is very similar to *Rattus rattus rattus*, and only differs in the following features: (1) The colour of the dorsal surface, instead of being dark slate grey, is greyish brown with a dark longitudinal median area, becoming lighter toward the sides. The head is not darker than the median area of the back. Apart from the grey under fur and the long cylindrical dark brown hairs, there are other cylindrical hairs that are pale russet brown, while the wide grooved hairs are whitish or pale reddish brown, the whitish hairs being in the minority and often having brownish tips. (2) The ventral surface is much paler than the dorsal, brownish or yellowish grey, passing without any line of demarcation into the brownish grey of the sides. Here the same three types of hairs are found as on the back, but they all are shorter, thinner, softer and of a uniform colour. (3) The hairs of the dorsal surface of the feet are brownish grey, distally becoming lighter.

The mammae formula and the skull are the same as in the previous form.

Remarks. — In the Game Ordinance of 1954, as revised in 1970, the present form is classed under the predominantly harmful animals under the names: "Stadsrat (*Rattus alexandrinus*)".

***Rattus rattus frugivorus* (Rafinesque, 1814)**

Pl. H (animal)

Musculus frugivorus Rafinesque, 1814, Précis des découvertes et travaux somiologiques: 13.

Type locality. — "En Sicile", Sicily, Italy.

Synonymies. — Barrett-Hamilton & Hinton, 1961: 601; Miller & Kellogg, 1955: 621.

Vernacular names. — (E) White-bellied Rat, Tree Rat, Roof Rat, Fruit Rat; (N) Witbuikige Zwarte Rat.

Distribution. — Cosmopolitan, like the previous two forms.

Occurrence in Suriname. — *R. rattus frugivorus* is found everywhere in Suriname where also *R. rattus rattus* is to be found, namely near human habitations in the coastal area and in villages along the great rivers farther into the interior. It seems to be less common than the typical form. I have examined material from the following localities (all specimens, except where indicated, represented by skins and skulls):

1. Wageningen, lower Nickerie River, northern Nickerie District, in cow sheds, 4 males (nos. 20287, 20288, 20290, 21697), 4 females (nos. 20285, 20286, 20289, 21696).
2. Plantation "De Morgenstond", west bank of Suriname River north-east of Paramaribo, Suriname District, 2 females (nos. 17220, 17236).

3. Agricultural Experimental Station (Cultuurtuin), Paramaribo, 1 male (no. 22079, skull), 1 female (no. 20275).
4. Paramaribo, 1 female (no. 3963).
5. Lelydorp, about 15 km south of Paramaribo, Suriname District, 1 male (no. 21639), 1 female (no. 21638).
6. Onverwacht, about 25 km south of Paramaribo, Para District, 1 male (no. 20274).
7. Matapica, coastal Commewijne District, north of the Commewijne River at about 54°51'W, in house, 1 female (no. 20277).
8. Nengrekondre-pepre, Peninika Creek, east tributary of upper Commewijne River, 2 females (nos. 20282, 20283).
9. Maripa-ondro (= Mooimankondre), east bank of upper Commewijne River, south of Peninika Creek, Commewijne District, 4 males (nos. 20156, 20278, 20279, 20281), 1 female (no. 20280).

Description. — Like the previous form the present agrees in practically all morphological details with *Rattus rattus rattus*. The only differences are the following: (1) The colour of the dorsal surface is brownish grey, caused by a mixture of whitish, yellowish, brown and grey colours. Sometimes, the median area is somewhat darker than the rest. Dorsally the head has the same colour as the back. Apart from the grey underfur there are cylindrical hairs which are entirely grey or grey with a yellowish or dark brown distal part; the length of this distal part varies from one-half to one-third of the length of the hair; the dark brown hairs are usually thicker and less appressed than the yellowish hairs. The wider and stiffer grooved hairs are rather scarce, they are light grey, pale brownish or whitish, often with a slightly darker tip. The dorsal colour of this form is somewhat like that of *R. rattus alexandrinus*. (2) The sides are greyish and less brown than the dorsal surface; their colour merges imperceptibly into that of the back, but is very sharply separated

TABLE 88

External and skull measurements of ten specimens of *Rattus rattus frugivorus* (Rafinesque) from Suriname in the Leiden Museum.

Reg. number	17220	20280	21696	20285	20277	20288	20287	21697	20274	20279
Sex	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂
Head and body	174	172	171	177	197	163	181	180	185	213
Tail	221	233	215	227	218	168	—	195	205	251
Hind foot, with nail	36	36	37	37	36	33	34	35	37	42
Ear	—	24	22	21	22	20	21	21	21	25
Weight, grams	—	180	—	—	205	—	—	130	—	250
Condylbasal length skull	40.0	41.9	39.5	39.8	39.8	34.7	39.4	39.7	38.5	44.9
Basal length	37.5	39.7	37.3	37.2	37.3	32.3	36.7	37.4	35.5	47.7
Palatal length	22.6	24.0	22.4	21.8	22.5	19.4	22.1	22.3	21.5	25.8
Length of nasals	15.4	15.0	15.7	14.7	14.5	13.0	15.5	15.6	14.0	15.8
Interorbital constriction	6.0	6.6	6.0	5.5	6.2	5.6	6.3	5.5	5.9	7.2
Zygomatic breadth	19.7	20.5	20.0	20.3	19.5	18.1	19.7	19.9	19.0	21.6
Breadth of braincase	15.9	16.8	16.3	15.9	16.4	15.5	15.8	15.8	16.4	17.3
Diastema	11.5	12.3	11.0	10.5	11.5	9.5	11.0	11.7	10.9	13.4
Height of rostrum	10.6	11.2	10.0	9.8	10.5	8.8	9.8	10.0	9.8	12.0
For. incisivum, l x br	7.6x3.0	7.7x3.1	7.5x2.8	7.3x2.9	7.6x2.8	6.9x2.6	7.8x3.0	7.9x2.8	7.5x2.3	8.3x3.7
Alveolar length m^1-m^3	6.6	6.8	7.0	7.4	7.1	6.4	7.3	6.7	6.7	7.5
Length of mandible	24.0	25.5	25.2	24.7	24.2	21.5	23.6	23.6	22.7	28.3
Alveolar length m_1-m_3	6.2	6.4	6.7	7.2	6.6	6.3	6.9	6.5	6.2	7.1

from the ventral colour. (3) The ventral surface is strikingly pure white or cream coloured, sharply set off from the grey colour of the sides. The hairs are all of the same colour throughout their length, and, although of different types, they are shorter and softer than the hairs of the dorsal surface. In a few specimens (nos. 20156, 20274, 20278, 20283) there is a very pale blue greyish hue over the whitish ventral colour, but still the line of demarcation between the sides and the ventral surface is distinct. (4) In most of the specimens the hairs of the upper surface of the feet are white, but in a fairly large number of specimens it is brownish or dark grey. The variation in the colour is considerable.

The mammae formula and the skull are the same as in the two previous forms. In Table 88 external and skull measurements of 10 Suriname specimens are noted.

Remarks. — The present form is not mentioned in the Game Ordinance 1954, as revised in 1970; evidently this omission is caused by a lapsus.

The present form is easily recognizable and can be readily distinguished from the two other forms by its white ventral surface, which is sharply demarcated. On pages 492 and 493 the problem of the status of this and the other forms is discussed.

The largest specimen in my material of *R. rattus frugivorus* is a male, collected on 5 May 1963 in the cabin of an Amerindian near Maripa-ondro; the measurements are noted in Table 88 (no. 20279).

***Rattus norvegicus* (Berkenhout, 1769)**

Text-figs. 48b (mandible), 49b (skull), 50b (first upper molar), pl. 106 lower fig. 1 (hind foot), pl. 112 fig. 3 (upper and lower tooth-rows), pl. 140 lower figures (skull), pl. G (animal)

Mus Norvegicus Berkenhout, 1769, Outlines of the natural history of Great Britain and Ireland, 1: 5.

Type locality. — As the word Norway has only been referred to in the scientific name of the species and as in Berkenhout's book there is no reference to a specimen or a record of this species from Norway, this country therefore cannot be considered to be a type locality. The type localities for the species thus are "Great Britain and Ireland". The first type locality restriction for *Mus norvegicus* Berkenhout, 1769, is that by Barrett-Hamilton & Hinton (1916: 606), who stated: ". . . since his [Berkenhout's] description was based ostensibly on British specimens, the type locality is technically Britain and not Norway". The thus restricted type locality "Britain" was further restricted to "England" by Miller & Kellogg (1955: 620). Miller's (1912: 858) restriction of the type locality of *Mus norvegicus* Erxleben, 1777, to Norway is of no concern here as (1) there is no proof that Erxleben's species, although a primary homonym, is an objective synonym of Berkenhout's and therefore it has to be considered nomenclaturally a distinct taxon, (2) Norway is not one of the type localities of *Mus norvegicus* Berkenhout.

Synonymies. — Barrett-Hamilton & Hinton, 1916: 605-606; Ellerman & Morrison-Scott, 1951: 589; Hall & Kelson, 1959 (2): 769.

Vernacular names. — (E) Brown Rat, Wharf Rat, Norway Rat, Common Rat; (N) Bruine Rat, Rioolrat, Trekrat; (S) Ton-alata.

Distribution. — Like the Black Rat, the Brown Rat is practically cosmopolitan, having been transported by ships to most parts of the world. It is generally assumed that the species invaded Europe from Asia in the first half of the 18th century, but as records of early times are usually vague and incomplete, there exist many conflicting statements. Moreover, from the very old accounts it is extremely difficult to determine whether the Brown Rat or the brown phase of the Black Rat is meant.

Occurrence in Suriname. — If, as generally assumed, the Brown Rat did not become common in western Europe until the middle or the end of the 18th century, it is most likely that it did not reach Suriname before that time. The first record of the occurrence of the Brown Rat in Suriname is by Von Sack (1821 (2): 204) who stated (free translation from the Dutch): 'One finds here the Black and the Brown Rat, the last mentioned is the most numerous, it sometimes has a slightly different colour. The rats are especially harmful to sugar plantations, and all efforts to eradicate them are in vain because, apart from the fact that its propagation is stimulated by the climate, every year a number are brought in by ships'. It is not certain from Von Sack's account that what he calls the Brown Rat actually is *Rattus norvegicus*; it also might be *Rattus rattus alexandrinus*, *R. rattus frugivorus*, or even *Holochilus*. The first reliable Suriname record of *R. norvegicus* is that by Teenstra (1835 (2): 401), who described the Brown Rat from the shore of the Suriname River in Paramaribo (see under *Rattus rattus*, p. 494). Most later records of the occurrence of the Brown Rat in Suriname are vague or doubtful until 1945, when Droogleever Fortuyn (1945: 3-9) devoted a rather extensive study to the Brown Rat and the Common House Mouse of Paramaribo.

In Suriname the Brown Rat is known only from a few restricted areas, which shows that the species probably extends its range more slowly than *Rattus rattus* and *Mus musculus*. The following material has been examined:

1. Plantation "Clevia", north-east of Paramaribo on Suriname River, Suriname District, 1 male (no. 20155).
2. Plantation "Ma Retraite" on Suriname River, north-east of Paramaribo, 2 males (nos. 20151, 20178).
3. Cultuurtuin (Agricultural Experimental Station), Paramaribo, 2 males (nos. 20148, 20177), 4 females (nos. 20146, 20147, 20152, 20158), 1 female skull (no. 20160).
4. Various localities throughout the town of Paramaribo, Suriname District, 12 males (nos. 3955, 17290, 20133, 20135, 20136, 20141, 20142, 20143, 20153, 20154, 21925; ZMA no. 10482), 1 male skin only (no. 21924), 11 females (nos. 3953, 3954, 3956, 17222, 20134, 20137, 20138, 20140, 20144, 20145, 21926), 8 skulls (nos. 18280, 20139, 20159, 20166, 20167, 20168, 21848, 23904).
5. Brokopondo Lake, about 5 km south of the barrage in the Suriname River, Brokopondo District, 1 male (no. 18249).
6. Matapica, coastal Commewijne District, north of Alliance, about 54°51'W, 1 male (no. 20149), 2 females (nos. 20150, 20157).
7. Suriname (probably in or near Paramaribo), 4 males (nos. 20169, 20171, skulls and skeletons; nos. 20170, 22078, skin only), 1 female (no. 23846, skin only), two skulls.

If not indicated otherwise, the specimens are preserved as skins and skulls.

Description. — The following description is based on the above listed Suriname material. The dorsal surface of the body is greyish brown, the brown colour dominating. Like in *Rattus rattus* there are three kinds of hairs. The underfur consists of very thin wavy hairs of a pale mouse grey or slightly brownish colour. The cylindrical hairs are of two types: strong and stiff ones with a grey basal half and a dark brown distal part, and shorter thinner ones that have only the base grey and the rest yellowish brown. The third type of hairs is broadest and shows a median longitudinal groove; these hairs are pale grey or whitish with a darker grey or dark brownish grey tip. The dorsal median area is darkest and more greyish brown, the lateral parts being more russet brown and the sides often becoming more greyish, but there exists here a considerable variation. The dorsal surface of the head has the same colour as the median part of the back. Of the whiskers of the snout the dorsal are usually black, the ventral white, but there are also dark ones with a white distal part. The ears are shorter than in *Rattus rattus*, when laid forwards they do not attain the eyes; the hairs of the ears are similar to those of *Rattus rattus*. The hairs of the ventral surface are of the same three types as dorsally, but all are shorter and thinner; most of them have the basal part grey, the distal white, although also entirely white hairs do occur. The general impression of the colour of the ventral part is pale grey, varying somewhat in intensity, and only rarely showing a pale brownish or yellowish hue. A faint line of demarcation between the ventral colour and that of the sides is sometimes visible. On the ventral surface of one specimen (no. 20157) irregular white areas occur.

The legs have their proximal part of the same colour as the adjoining regions of the body. The upper surface of the feet usually is very clear white, strikingly set off from the brownish proximal part, but in some specimens it is grey or somewhat brownish. In 31 specimens the length of the hind foot (with nails) varies from 40 to 49 mm. The number of toes and nails is five.

The tail is always somewhat shorter than the length of head and body combined. The fur of the posterior part of the dorsal surface extends even less far over the base of the tail than in *Rattus rattus*. The tail itself is ringed with scales and has short appressed hairs implanted under the scales. In most specimens the tail is bicoloured, being pale below, dark above, but this is not always distinct.

There is one pair of pectoral mammae, three abdominal and two inguinal. In comparison to *R. rattus* there is therefore an additional pair of abdominal mammae. Of the three pairs of abdominal mammae two are placed slightly behind the front legs, the third pair is placed closer to the inguinal mammae than to the second abdominal pair.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The posterior end of the foramen incisivum, in contrast to that of *Rattus rattus*, reaches as far as the anterior margin of the first molars or remains somewhat shorter. The palate is squarely truncate posteriorly and ends far behind the tooth-rows. The bullae are small. The mandible strongly resem-

bles that of *R. rattus*. A line drawn from the lower point of the bulla tympanica through the anteroventral point of the first upper molar ends in about the middle of the posterior margin of the visible part of the upper incisor. In dorsal view the braincase is rectangular, the lateral ridges of the parietals are practically parallel, almost straight, well developed, and reach to the interparietal. The greatest distance between the two lateral ridges is equal to the greatest length of the parietal or is slightly shorter. The anterior fold of the first upper molar has the anterior margin feebly sinuate, not distinctly three-lobed as in *Rattus rattus*; the anterior edge of this tooth is elevated to a ridge, which in juveniles is very distinct, showing one or two tubercles; in the adults this ridge wears down and becomes inconspicuous or invisible (see fig. 50b). In 28 skulls from Suriname the alveolar length of the three upper molars varies from 6.7 to 8.2 mm (mean: 7.5 mm).

In Table 89 the external and skull measurements of twelve full-grown Suriname animals are noted.

Remarks. — In the Game Ordinance 1954, as revised in 1970, the Brown Rat is placed in the list of predominantly harmful animals under the names: "Rioolrat (*Rattus norvegicus*)".

In Paramaribo and in the surrounding area the Brown Rat is the most injurious mammal, not only because of its enormous numbers, but also because of the damage done to stored goods and other property. The rats do gnaw through practically all material they meet. They do attack sleeping persons, especially children, and thereby may make wounds that can easily become infected.

In Suriname the main enemy of the Brown Rat evidently is man. Some dogs and cats will attack rats, but others seem to be afraid of them (see Teenstra, 1835 (2):401). In Paramaribo special dogs are trained for the catching of rats. The Barn Owl, *Tyto alba hellmayri* Griscom & Greenway, 1937, is known to feed on young specimens of the Brown Rat.

The rate of reproduction of the Brown Rat is very high; this is also indicated by the great number of mammae (12). On 25 January 1963 I obtained a female specimen (no. 20147) with 10 embryos of about 40 mm in length, caught in the Agricultural Experimental Station at Paramaribo. Concerning the reproduction of the species in Suriname, Droogleever Fortuyn (1945: 4) stated that "rats in Paramaribo may be born in the months of March, April, May, June and September. Perhaps they breed all the year round".

Although in Suriname the Brown Rat is mostly found in close proximity of human habitations (the densest population exists at the Paramaribo waterfront), it sometimes occurs far away from human settlements. The three specimens from Matapica, for instance, were obtained in a mangrove area (*Avicennia nitida* Jacq.) with brackish water canals, and artificial fish ponds. Although these ponds are man-made no permanent human habitation occurs in the area, which is only occasionally visited for repair of the ponds and harvesting of the fish-crop. Probably the rats came to the area when the ponds were constructed, and since succeeded to live

TABLE 89
External and skull measurements of twelve specimens of *Rattus norvegicus* (Berkenhout) from Suriname in the Leiden Museum.

Reg. number	20138	20147	20138	20140	21926	20134	20154	20141	17290	20159	20143	20135
Sex	♀	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂	♂
Head and body	238	250	258	250	255	255	224	232	200	243	225	270
Tail	185	201	210	193	210	220	216	212	188	205	205	205
Hind foot, with nail	42	44	46	44	44	46	49	49	46	45	47	46
Ear	21	22	-	-	22	-	22	21	-	22	21	-
Weight, grams	275	505	-	-	-	-	465	480	-	-	410	-
Condylbasal length skull	45.3	47.9	49.1	50.0	50.2	49.8	48.8	47.4	48.1	50.2	51.4	54.4
Basal length	42.4	45.0	46.2	46.8	47.5	46.5	46.0	44.0	45.0	47.6	48.4	52.0
Palatal length	25.4	27.1	27.6	28.3	28.8	28.1	27.5	26.7	27.5	28.8	29.3	31.5
Length of nasals	18.1	18.8	19.2	19.9	19.7	20.6	18.7	18.4	19.4	20.4	20.3	21.7
Interorbital constriction	6.9	6.6	7.7	7.4	7.3	6.8	7.2	6.9	6.9	7.2	7.0	7.5
Zygomatic breadth	23.5	23.3	26.7	25.8	25.8	24.3	24.3	23.9	25.1	25.7	26.2	27.5
Breadth of braincase	16.6	17.3	17.2	17.1	17.0	16.7	17.2	16.7	16.4	17.6	18.2	17.2
Diastema	13.3	14.9	14.1	15.0	14.9	15.3	14.1	14.8	14.5	15.1	15.7	16.5
Height of rostrum	12.8	13.5	13.5	13.6	14.1	12.9	13.3	12.8	13.5	14.1	13.4	15.0
For. incisivum, 1 x br	8.1x3.1	8.8x3.2	7.8x3.7	8.8x3.6	8.9x4.0	8.9x3.4	8.9x3.9	8.6x3.6	9.0x3.7	9.5x4.2	9.0x3.7	8.7x3.9
Alveolar length m ₁₋₃	7.5	7.5	8.2	7.7	7.9	8.0	7.6	7.8	7.0	8.0	8.0	8.2
Length of mandible	28.2	30.3	30.5	30.5	31.4	30.2	28.1	29.1	29.4	30.6	31.5	33.0
Alveolar length m ₁₋₃	7.5	7.5	8.3	7.7	7.9	8.0	7.6	7.8	7.1	8.0	7.9	8.2

there. Possibly they feed on the fish, as this also has been reported to form part of their diet (see Barrett-Hamilton & Hinton, 1916: 622). The peculiarity that the Brown Rat may be living far away from human settlements has also been reported upon in the literature, e.g., Drummond (1960), Langeveld (1964), and Zapletal (1964). In these cases it is not justified to assume that these rats are living in a "wild" state.

Droogleever Fortuyn (1945: 12, table 1) mentioned a melanistic specimen of *Rattus norvegicus* from Paramaribo. I did not see any such specimen myself. Albino forms are often used in the Paramaribo hospitals and laboratories as test objects; nowadays they are gradually replaced by other species.

Adult specimens of the Brown Rat can immediately be distinguished from *Rattus rattus* by their greater size, by their colour, and by the fact that their tail is always somewhat shorter than the length of head and body combined; in *Rattus rattus* the tail is rarely equal to the length of head and body, usually distinctly longer.

Usually the Brown Rat is supposed to be tougher than the Black Rat, *Rattus rattus*, and to drive it away from its dwelling places. This supposition holds only for those places where the two species occupy the same niche and have the same source of food. Usually, however, the Black Rat lives in drier parts of human settlements (granaries, attics, etc.), while the Brown Rat is mostly restricted to more humid environments (river banks, cellars, sewers, etc.). Accordingly we may expect that in large towns the two species live side by side, while in the interior there may be a sharper competition because of the lesser variation in food sources near the human habitations, causing the two species to be committed to the same food.

In 1969 Mr. J. J. van den Bosch compared the Brown Rat occurring in Suriname with animals from the Netherlands preserved in the Leiden Museum. The Suriname specimens are those listed above. Van den Bosch's unpublished report is now in the archives of the Museum. His main conclusions are as follows: (1) there is a significant difference between the lengths of the foramen incisivum, in the males as well as in the females: in the Suriname Brown Rat this length is greater than in specimens from the Netherlands; (2) consequently in Suriname specimens the palate is shorter than in those from the Netherlands; (3) in some characters the Brown Rat from Suriname shows a distinct sexual dimorphism, while in specimens from the Netherlands no such dimorphism is to be found; (4) the length of the hind foot of females of the Brown Rat from Suriname on an average is longer than that of the females from the Netherlands; in the males no such difference was found. Mr. Van den Bosch's main conclusion is, however, that these differences are of such a minor nature that there is no good reason to consider the Brown Rat from Suriname subspecifically different from that from the Netherlands; especially so as the series of specimens examined was rather small.

In their paper on the *Rattus rattus* group Schwarz & Schwarz (1967: 120-123) considered *Rattus norvegicus* to be a subspecies of *Rattus rattus*. In my opinion,

however, there are such striking and constant differences between the two that I consider them to be two distinct species, and as such they are treated in the present paper.

In the literature on Suriname mammals the names *Mus decumanus*, *Epimys decumanus*, and *Epimys norvegicus* are also used for the present species.

Mus musculus Linnaeus, 1758

Text-figs. 48c (mandible), 50d (upper incisor), pl. 106 lower fig. 3 (hind foot), pl. 112 fig. 1 (upper and lower tooth-rows), pl. 117 lower figs. (skull), pl. G (animal)

Mus Musculus Linnaeus, 1758, *Systema Naturae*, (ed. 10) 1: 62.

Type locality. — "Habitat in domibus". Restricted by Thomas (1911: 147) to "Sweden (Upsala)".

Synonymies. — Ellerman & Morrison-Scott, 1951: 604-605; Hall & Kelson, 1959 (2): 770; Schwarz & Schwarz, 1943.

Vernacular names. — (E) Common House Mouse; (N) Huismuis; (S) Moismoisi.

Distribution. — The Common House Mouse is a cosmopolitan species because by human traffic it has been transported all over the world. Usually the Palearctic (from western Europe to Japan) is mentioned as the region of origin, but of course very little can be positively said about the origin of this species. It is not known when the House Mouse reached South America, but this may have happened shortly after the discovery of America by the Spaniards. In most of its areas the species occurs in or near human settlements, but there are also specimens that seem to live entirely outdoors, away from human habitations.

Occurrence in Suriname. — There is not the slightest indication as to when the House Mouse first reached Suriname; this may have happened shortly after the first Spaniards landed there around 1500. In the old literature dealing with Suriname mammals very little attention has been paid to the species, which evidently was too well known. Europeans, who described the fauna of the Guianas, concentrated on the animals that are different from those of the European fauna, and regarded as unimportant the species that the Guianas have in common with Europe. The first positive record of the House Mouse in Suriname is the note by Fermin (1765: 44), who wrote: "Souris domestique, en Latin *Musculus domesticus*, en Hollandais *Muis*, en Nègre Anglois Muisi. Cet animal est assez connu pour qu'il soit nécessaire d'en faire la description". In his later book Fermin (1769 (2): 116) also pointed to the damage caused by the animal: "La *Souris domestique* est si connue, par elle-même, & par les désordres qu'elle fait, que je dirai seulement que celle, qu'on a à *Surinam*, ne diffère en rien de la nôtre". Later authors casually mentioned the presence of the House Mouse in Suriname, remarking that the animals did not differ from the European form. Droogleever Fortuyn (1945: 9-11) gave some more attention to the House Mouse of Paramaribo, and provided measurements and remarks on its biology; he stated that the 84 specimens examined by him all gave the impression of being a small form of *Mus musculus*.

We may assume that throughout Suriname the species occurs in or near human habitations, with the possible exception of some settlements of the Amerindians and of the Bush-Negroes far in the interior. However, the fact that there are now regular air connections between the coastal area and the interior may cause the introduction of the House Mouse to many new localities.

In the collections from Suriname at my disposal the House Mouse is rather poorly represented, notwithstanding its common occurrence. For this scarcity there are several reasons.

In the first place the species as a rule does not interest collectors, because it is not a genuine Suriname species and moreover partly domesticated. Secondly, its being easily transported causes that its capture, even far in the interior, is not very interesting from a zoogeographic point of view. Thirdly, the species is not very easy to collect as it is very small and fast; also its nocturnal habits and the ease with which it can escape or hide itself in the most unusual places makes that it easily escapes the attention of eventual collectors. When in Suriname in 1963, I myself made the error of not giving enough time and effort to the collecting of the species, and obtained it only at a few localities. Altogether I could examine 39 specimens (skins and skulls) which originated from the following localities:

1. Wageningen, on Nickerie River, Nickerie District, north-western Suriname, 1 female (no. 22340).
2. In human habitations near Sipaliwini airstrip, Sipaliwini River near Brazilian border, south-eastern Nickerie District, 1 female (no. 22332).
3. Kwattaweg, west of Paramaribo, Suriname District, 2 specimens (nos. 22330, 22331).
4. Combé, northern suburb of Paramaribo, 1 male (no. 22516), 1 female (no. 22517).
5. Agricultural Experimental Station (Cultuurtuin), northern Paramaribo, 4 males (nos. 18205, 22327-22329).
6. Paramaribo, Suriname District, various localities (in houses, covered market, etc.), 15 males (nos. 22322, 22324, 22325, 22336, 22339, 22341, 22342, 22345, 22347, 22349, 22350, 22518-22521), 13 females (nos. 3761, 3762, 18286, 22323, 22326, 22334, 22335, 22337, 22338, 22343, 22346, 22348, 22522).
7. Upper Saramacca River, Brokopondo District, 1 female (no. 17890).

Description. — The following description is based on 27 Suriname skins examined. The coat colour of the upper surface is quite variable, ranging from dark slate grey to olive brown. The median dorsal area, including the head, sometimes shows a darker colour than the rest of the dorsal surface. The underfur is slate grey. The hairs are of two types: the first type consists of long stiff uniformly blackish hairs, which are much rarer and slightly less appressed than the hairs of the shorter and thinner second type, which are slate grey in their basal half or two thirds or in an even greater part of their length. The distal parts of these hairs are brownish or straw coloured, sometimes they are entirely grey. In the dark forms the brownish tips of these hairs are very short so that the slate colour of the hairs dominates. In the pale forms practically all of the hairs of the second type have at least the entire distal half brownish or yellowish so that dorsally the animal obtains a distinctly brownish appearance. On the sides the fur becomes less blackish and more greyish

or brownish. The colour of the ventral surface is uniform, although still more variable than that of the dorsal surface. It varies from dark grey (no. 22336) to light ochraceous buff (no. 22335), but most of the specimens have the under parts darker or lighter grey with a brownish hue. The basal part of the hairs of the second type is dark to very pale grey, the distal part is pale brown or whitish. The extent of the colour of the distal part determines the general colour impression. The hairs of the first type are here far in the minority, they have the distal part grey, usually with a dark brown tip, or are tricoloured, viz., with a grey base, a dark distal part and a whitish tip. The colour of the sides merges without a line of demarcation into that of the venter; in only one specimen (no. 22335) a very faint line of demarcation is visible. The head is of the same colour as the body. The whiskers are long, implanted on the snout and above the eyes; they are black, except some of the ventral whiskers of the snout which may be white. The ears are large and rounded, with scattered short hairs inside and out, their length in 19 specimens being up to 13 mm. The fur at the basal part of the legs is of the same colour as that of the adjoining parts of the body. The upper surface of the feet is covered with brownish grey hairs, which on the toes sometimes are lighter; the length of the hind feet varies in 24 specimens from 15 to 21 mm, being usually 17 or 18 mm. The fur does not extend on to the base of the tail, or only over a very short distance. The tail is either somewhat shorter, equal to or somewhat longer than the combination of head and body. The scales of the tail are distinct and arranged in rings. Short appressed hairs are implanted behind each scale. The base of the tail, especially the ventral part, is sometimes somewhat lighter than the distal part.

There are one pair of pectoral mammae, two pairs of abdominal (which are situated close to the front legs) and two pairs of inguinal mammae.

Dental formula: $I \frac{1}{1}$, $C \frac{0}{0}$, $P \frac{0}{0}$, $M \frac{3}{3}$. The skull of the Common House Mouse can immediately be distinguished from that of the other Suriname Muridae by (1) its small size, (2) the very large foramen incisivum, which reaches backward to about the middle of the first molars, and (3) the upper incisors, which, when seen in lateral view, show a deep notch on the posterior margin. The species may be distinguished from the non-murine rodents by that the molars have three parallel longitudinal rows of tubercles over the crown of the first and the second molars. In 15 skulls the alveolar length of the upper molar series varies from 3.1 to 3.8 mm (mean: 3.4 mm).

In Table 90 external and skull measurements of twelve Suriname specimens of *Mus musculus* are noted.

Remarks. — In the Game Ordinance 1954, as revised in 1970, the Common House Mouse is listed among the harmful animals under the names: "Huismuis of mois-moisi (*Mus musculus*)".

According to Droogleever Fortuyn (1945: 11) "pregnant mice were caught in the months of January, February, March, April, August and November".

Apart from man, one of the natural enemies of *Mus musculus* in Suriname is the Barn Owl, *Tyto alba hellmayri* Griscom & Greenway, 1937 (see Haverschmidt,

TABLE 90
External and skull measurements of twelve specimens of *Mus musculus* Linnaeus from Suriname in the Leiden Museum.

Reg. number	22340	3761	18286	17890	22334	22326	22520	22327	22516	22329	22521	22325
Sex	♀	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂	♂
Head and body	78	-	72	-	77	96	66	76	77	78	68	89
Tail	79	-	76	-	82	81	75	81	74	82	75	72
Hind foot, with nail	16	-	16.5	-	18	18	17.5	18	18.5	16	18	18
Ear	11	-	12.5	-	12.5	-	11	12.5	12	12	12	-
Weight, grams	-	-	-	-	-	-	-	13	14	-	-	-
Condylbasal length skull	19.4	19.8	20.3	20.3	20.8	22.1	18.8	18.9	19.2	19.3	20.1	20.3
Basal length	17.6	17.9	18.4	18.3	18.8	20.1	17.2	16.9	17.2	17.3	17.8	18.6
Palatal length	10.6	10.7	11.0	10.8	11.4	12.3	10.5	10.4	10.2	10.4	10.8	10.8
Length of nasals	7.3	7.4	7.9	6.9	7.9	8.2	7.0	7.1	7.0	7.3	-	7.7
Interorbital constriction	3.5	3.6	3.5	3.7	3.6	3.6	3.5	3.4	3.6	3.6	3.4	3.7
Zygomatic breadth	10.8	10.8	10.8	11.5	11.5	12.3	10.2	10.5	10.6	10.5	10.7	11.3
Breadth of braincase	9.1	9.8	9.5	9.8	10.0	10.1	9.2	9.5	9.6	9.6	9.2	9.5
Diastema	5.3	5.3	5.6	5.4	5.5	6.0	5.3	5.3	5.1	5.2	5.3	5.1
Height of rostrum	5.0	5.3	5.5	5.7	5.5	5.8	5.0	4.9	5.0	5.2	5.0	4.9
For. incisivum, L x Br	4.8x1.7	4.7x1.7	4.9x1.8	4.8x1.6	5.1x1.8	5.4x1.7	5.0x1.7	4.6x1.5	4.4x1.5	4.5x1.5	4.9x1.6	4.9x1.7
Alveolar length m ₁ -m ₃	3.2	3.4	3.2	3.8	3.8	3.7	3.3	3.4	3.4	3.2	3.3	3.5
Length of mandible	11.5	11.3	11.2	12.0	12.5	13.0	10.9	11.3	11.4	11.2	11.2	11.7
Alveolar length m ₁ -m ₃	2.7	3.0	3.0	3.2	3.2	3.0	3.1	3.0	2.9	2.8	3.1	3.2

1962, Table II on page 241; 1968: 158). In the stomachs of the snakes *Oxyrhopus petola* (Linnaeus, 1758) and *Mastigodryas boddaerti* (Sentzen, 1796), I found remains of the present species.

Externally the light coloured individuals of the Suriname *Mus musculus* resemble *Oryzomys delicatus* J. A. Allen & Chapman, 1897; the main differences of the two species are noted on p. 398.

There exists an extensive literature on the House Mouse, dealing with its biology, colour variations, genetics, etc. In the monograph by Grüneberg (1952) many data on these subjects are noted, especially concerning the genetics and the influence of the external environment on the coat colour. This publication emphasizes difficulties connected with a decision whether or not certain characters are of subspecific value or are due exclusively to the influence of climate, food, etc.

The posterior notch in the incisors of the present species was found in all Suriname specimens examined. According to Reinwaldt (1971: 158) this notch can be absent in specimens kept in cages and the absence must be considered an acquired abnormality. Specimens with only two or more than three molars have been reported (Wallace, 1966; Sheppe, 1966), but do not occur in my Suriname material. Among the aberrations should also be ranged the albinistic White House Mouse, which in Suriname is kept as a pet or used in the laboratory.

In their revision of the House Mouse Schwarz & Schwarz (1943) recognized several subspecies and forms. The Suriname specimens agree rather closely, although not completely, with their account of *Mus musculus brevirostris* Waterhouse, 1837, the only subspecies recognized by them in South America. Most of our specimens, for instance, have the belly much darker than the "buffy white, or buffy" as described by Schwarz & Schwarz, and also in a few other characters there is not a complete agreement. This might, however, be expected in a strongly variable form, which, moreover, may interbreed with specimens of other races imported from overseas. A comparison with *Mus musculus domesticus* Ruddy, 1772, from the Netherlands showed that the Suriname material is significantly smaller. My largest Suriname specimen has the head and body 96 mm long, the average being 75 to 80 mm. In my Dutch material specimens of over 100 mm are not rare. Already Droogleever Fortuyn (1945: 9-11) remarked that the Suriname specimens "gave the impression of being a small type of *Mus musculus*".

In a previous publication (Husson, 1973: 14) I reported both *Mus musculus domesticus* and *M. musculus brevirostris* from Suriname. On reconsideration and after re-examination of the entire material I am now inclined to consider all my material to belong to a single form, even though I cannot definitely attach a subspecific name to it.

RODENTS INCORRECTLY ASSIGNED TO THE SURINAME FAUNA

Echimys macrourus Jentink, 1879

Echimys macrourus Jentink, 1879a, Notes Leyden Museum, 1: 97.

Type locality. — "Surinam".

Remarks. — In 1879 Jentink described a long-tailed spiny rat-like animal, reputedly from Suriname, under the name *Echimys macrourus*. Examination of the mounted type specimen (the skull of which is lacking), preserved in the Leiden Museum under reg. no. 17215, showed that this specimen actually belongs to *Rattus sabanus* (Thomas, 1887), a species with a wide distribution in the Malaysian subregion. The locality "Surinam", written in pencil on the under surface of the board on which the animal is mounted, must be incorrect; it is possible that the type locality actually is "Sumatra", and that the original label, which is now missing, was incorrectly copied.

The problems caused by Jentink's type and the nomenclatural repercussions of the discovery of its true identity are extensively dealt with by Husson (1963: 37-40, pl. 2).

ORDER CETACEA

The Cetacea are treated here as an order comprising two suborders, the Odontoceti (toothed whales) and the Mysticeti (baleen whales or whalebone whales). Some recent authors elevate these suborders to the full rank of orders (see, e.g., Rice, 1967: 291-324). Although there is much to be said for this modern point of view, for convenience's sake it seems better to use here the old and better known classification.

In Suriname the Odontoceti are represented by two species only, *Sotalia guianensis* (family Delphinidae), which is a characteristic animal of the mouths of the Suriname rivers, and *Physeter macrocephalus* (family Physeteridae), which has twice been reported washed ashore on the Suriname coast.

Little is known about the Mysticeti living in the open sea off Suriname, their occurrence being only known from strandings on the muddy coast. As a rule but little attention has been paid to such strandings; often they were not noticed at all or only very late. The same is true also for the other Guianas.

The stranding of whales on the Suriname coast is mainly due to the presence along that coast of a very wide zone of shallow water with extensive mud banks. Here, with rapidly falling tide, whales can be trapped behind the mud banks, especially in the winter months when the sea is rough. The presence of whales off the coast of the Guianas may be due to migration of these animals along the coast of the South American continent.

As far as known to me, the first record of a whale in the coastal waters of the Guianas has been made known by David Pietersz. de Vries (1655; re-issue, 1911: 202, fig.) in the account of his second voyage to the 'wild coast in the West Indies' made in 1634. During his visit to Cayenne, French Guiana, he made an interesting observation on 14 September of that year, a free translation of which runs as follows: 'While walking along the sea-shore I saw a whale fighting with a sword-fish, the water becoming as red as blood every time the whale jumped out of it; in its fear for the sword-fish it blew a great mass of water; when the whale came down, the sword-fish cut it with the sword in its belly, causing the whale to jump again out of the water; it was a wonderful sight'. De Vries's figure of the fight of the whale and the sword-fish (see text-fig. 51 of the present paper) does not provide sufficient information to allow identification of the whale.

Several more recent records of whales seen on the Suriname coast also are so vague that the specific identity of the specimens can not be determined. Thus, in the Paramaribo newspaper "De West" of 9 September 1953, under the heading "25 jaar geleden" (25 years ago) appeared a quotation from an earlier short notice in the same newspaper (7-10 September 1928), informing us that 'some fishermen, who returned yesterday from the shore, reported to have seen a whale . . .', while the

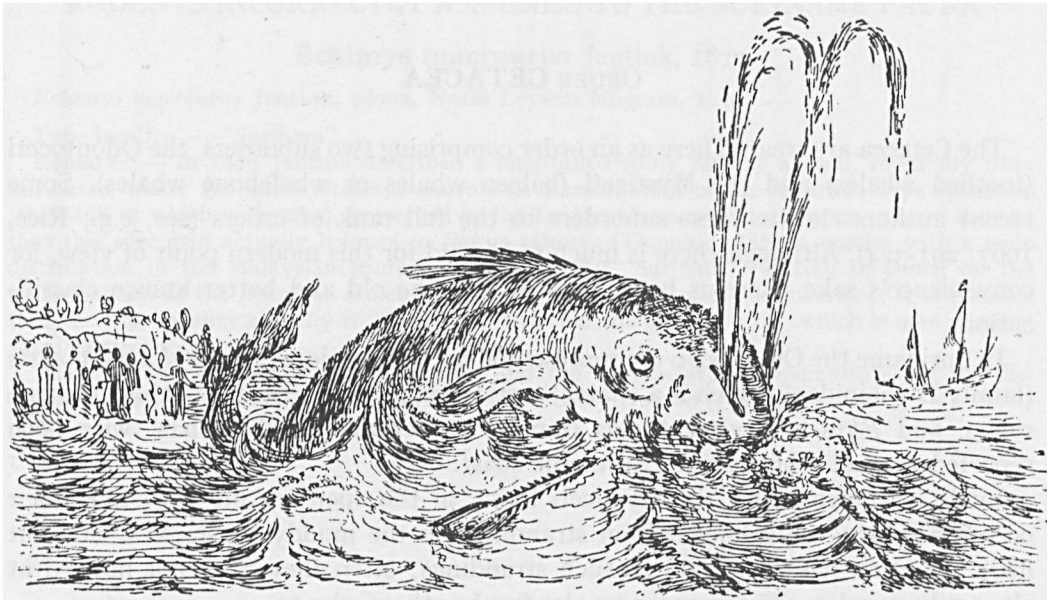


Fig. 51. Fight between a whale and a "swordfish" [recte sawfish] near Cayenne, French Guiana (after De Vries, 1655); see text p. 513

same notice stated that 'about 20 years ago [i.e., around 1908] the skeleton of a whale was found on our coast' (both quotations translated here from the original Dutch). As no material or other data are available about this 1908 stranding and the 1928 observation, it remains unknown which species were involved. It is possible, as pointed out below (p. 524) that the report of the 1908 stranding actually refers to the stranding in 1910 of a specimen of *Balaenoptera physalus* (Linnaeus, 1758), but no certainty can be obtained in this respect. This is also true of the stranding of a whale near a fishermen's camp at the Wiawia bank near Kwerimankreek on the north-east coast of Suriname in 1964 or 1965. This stranding was brought to my attention by Mr. P. A. Teunnissen of Paramaribo through letters to Dr. D. C. Geijskes, dated 25 January 1973, and to Dr. P. J. H. van Bree, dated 24 February 1973, who both kindly allowed me to make use of the available data. The intact animal is stated to have been described by a certain Mr. Lok as follows: "It was neither a shark nor a dolphin; it had teeth nor baleen plates; it was light chocolate-brown in colour and about 5 metres long". The skeleton of the animal was preserved and was displayed near the camp. A later search for remains of the animal at the deserted fishermen's camp, however, did not yield any results. It seems most likely that the specimen belonged to the Odontoceti, but the available data are too few and too vague to permit a more definite identification.

Of several other whales stranded on the Suriname coast, the specific identity could be established with greater or lesser certainty. These strandings are dealt with below.

For the identification and description of Cetacea, which in the future may strand on the Suriname coast, the works of Hall & Kelson (1959 (2): 806-840, figs. 439-464), Fraser (1948) and Mörzer Bruyns (1971), to give a few examples, are very useful, at least for a first orientation.

FAMILY PHYSETERIDAE

Physeter macrocephalus Linnaeus, 1758

Physeter macrocephalus Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 76.

Type locality. — "Habitat in Oceano Europaeo". Restricted by the lectotype selection by Husson & Holthuis (1974: 210) to Berkhey (also written Berkheide), a village, now no longer extant, which was situated on the Dutch coast between Scheveningen and Katwijk, in the province of Zuid-Holland, the Netherlands.

Synonymies. — Cabrera, 1961: 608-609 (under *Physeter catodon*); Hershkovitz, 1966b: 116-122 (under *Physeter catodon*); Husson & Holthuis, 1974: 205-217.

Vernacular names. — (E) Sperm Whale, Cachalot; (N) Potvis, Cachelot.

Distribution. — All oceans, approximately between 70°N and 65°S.

Occurrence in Suriname. — According to an old manuscript by Johannis Sneebeling, which was published by Kloos (1973), a Cachalot was washed ashore in Suriname in the year 1774 (Kloos, 1973: [30]).

Between February and June 1938, a specimen of the Sperm Whale stranded east of the mouth of the Suriname River. This stranding was extensively dealt with by Sanderson (1939: 150-170; 1939a: 479-480, 2 phot.). It is unknown to me whether or not material of the skeleton of this specimen has been preserved in a museum. Sanderson sent his collection of Suriname mammals to the British Museum (Natural History), London. Dr. F. C. Fraser of that Museum informed me in 1965 that no bones of the Sperm Whale mentioned by Sanderson are present in the Cetacea collection under his charge.

Description. — The most conspicuous characters of the present species are: (1) Its large size (length of males up to 20 m, of females up to 12 m). (2) The large blunt head which reaches distinctly beyond the narrow lower jaw. (3) The presence of about 24 to 30 distinct and large conical teeth in each half of the lower jaw, and their usual absence in the upper (often some very small teeth may be present in the upper jaw). (4) The absence of a true dorsal fin. In its stead a rough somewhat elevated area is present on the posterior part of the dorsal surface.

The usual colour is uniformly dark brown to black.

Remarks. — The complicated and confused nomenclatural history of this species has been extensively dealt with by Husson & Holthuis (1974), who showed that the old and well known name *Physeter macrocephalus* Linnaeus, 1758, is the correct one; the name *Physeter catodon* Linnaeus, 1758, reintroduced by Thomas (1911: 157) and accepted by several authors (e.g., Hershkovitz, 1966b: 116-122) is not to be used.

FAMILY DELPHINIDAE

Sotalia guianensis (P. J. van Beneden, 1864)

Pl. 141 (animal), pls. 142 and 143 (skull), pl. I (animal)

Delphinus Guianensis P. J. van Beneden, 1864, Mémoires Académie Royale Sciences, Lettres Beaux-Arts Belgique, (coll. in-8°) 16 (2): 1-22, 2 figs. (sternum and flipper), 1 pl. (skeleton).

Type locality. — Mouth of the Marowijne River, western French Guiana. There has been considerable confusion in the literature concerning the actual type locality of this species. In the original description of *Delphinus guianensis*, P. J. van Beneden states that "ce dauphin habite les côtes de la Guiane" (p. 10), and on two other occasions (pp. 3 and 11) that author mentioned that his material originated from Cayenne. Hershkovitz (1966b: 21) was of the opinion that Suriname also is a type locality, but P. J. van Beneden (1864: 3) only stated that the Stuttgart Museum had received natural history specimens from one of its collectors in Suriname. This gentleman later on proved to be A. Kappler, who lived in Suriname, but who also obtained material from nearby French Guiana. E. van Beneden (1875: 8, 43) stated that the type material of *Delphinus guianensis* originated "de l'embouchure du Surinam" (mouth of Suriname River). Williams (1928: 114), after correspondence with the Stuttgart Museum, came to the conclusion that the two specimens of the present species held by that museum are both types, originating from "Maroni River, Surinam, Kappler". As has been shown by Slijper (1938: 19-21), the specimens in Stuttgart can not be P. J. van Beneden's types. P. J. van Beneden (1864: 3 and 4), as a matter of fact, clearly stated that his description was based on three specimens which he obtained from the Stuttgart Museum and which formed part of the duplicates of that museum. His description is entirely based on these three specimens and it is clear from his account that he did not see the material of the species that the Stuttgart Museum had kept for its own collections. Of the three type specimens, as shown by Slijper (1938: 20-21), the largest went to the Brussels Museum, the two others, one of which is damaged (lacking the rostrum), remained in the collection of Louvain University. The largest of the three specimens, viz., the skeleton of 152 cm total length, now preserved in the Brussels Museum, is selected here as the lectotype of the species. The correct locality of these three specimens, like the two non-types in Stuttgart, is the mouth of the Marowijne River, which forms the border between French Guiana and Suriname. The fact that the original publication mentions the material as coming from Cayenne, makes it likely that the specimens came from the French side of the estuary. Kappler lived for a long time in Albina (a village founded by himself and named after his wife) on the Suriname shore of the Marowijne River, and it was easy for him to obtain material both from the French and the Dutch part of the Marowijne estuary.

Synonymies. — Cabrera, 1961: 609-610; Hershkovitz, 1966b: 20-21; Mörzer Bruyns, 1971: 98-99, pl. 54.

Vernacular names. — (E) Guiana White Dolphin, Guiana River Dolphin; (S) Profossoe.

Distribution. — Coast and rivers of the Guianas and Venezuela, including Lake Maracaibo (HersHKovitz, 1966b: 21).

Occurrence in Suriname. — Rather common in the mouths of the larger rivers, ascending them as far as the limit of the tidal influence. In the Suriname River they occur as far as Domburg and Paranam and are regularly to be seen near Paramaribo. In groups of about 10 individuals they may play around and sometimes jump completely free of the water. The first record of the occurrence of the species in Suriname is by the brothers Penard ("De Surinamer", 29 October 1905), who dealt with it under the incorrect scientific name *Delphinus delphis* Linnaeus, 1758, and the Dutch vernacular name "Gewone Dolfijn" (Common Dolphin). There can not be the slightest doubt that what the brothers Penard referred to was *Sotalia guianensis*. *Delphinus delphis* has so far not been found in Suriname; however, as it does occur in the Gulf of Mexico and in the Atlantic, it is not to be precluded that some day a specimen will be found stranded on the Suriname coast. I have examined 11 specimens of *Sotalia*, all from the north-eastern part of the mouth of the Suriname River near Braamspunt and Pomona (just south of Braamspunt). These specimens were received by the Rijksmuseum van Natuurlijke Historie, Leiden, through the courtesy of Ir. H. E. Lionarons, chief of the Fisheries Service of Suriname, whom I want to thank most cordially for his interest in the present project and for his unfailing assistance.

Description. — The colour of the living animal is pale greyish-blue dorsally, whitish to light pinkish ventrally; the dorsal and ventral colours gradually merge into each other and no sharp line of demarcation is visible. The colour is rather uniform, although in the light area small darker spots may sometimes be observed. Immediately after death these colours change, the dorsal parts becoming dark slate grey to almost pure black, the ventral parts turning a dark pink. The largest Suriname male seen by me is 187 cm long, the largest female 182 cm.

In Table 91 the length and weight of the 11 specimens I examined are noted. The total length given here is measured from the tip of the upper jaw to the deepest part of the notch between the flukes, as indicated by Norris (1961: 472, fig. 1). Of the five largest specimens some of the skull measurements are noted in Table 92; these measurements are those adopted by Tomilin (1957: 16, 17, fig. 2; 1967, xx, xxi, fig. 2). The number of teeth in each half, both of upper and lower jaw, varies in my specimens from 30 to 35. The alveoli of the teeth are very close together; the breadth of the teeth at the upper margin of the alveoli is about 4.5 to 5.5 mm.

Remarks. — *Sotalia guianensis* is not favourably regarded by the Suriname fishermen, as it catches fish and shrimp and may damage the nets and fish- and shrimp-traps placed in the mouths of the rivers. Sometimes dolphins are caught in these traps; by the time that such trapped animals are discovered they have usually already drowned. It is possible that by pursuing fish and shrimp the dolphins

TABLE 91

Length and weight of eleven specimens of *Sotalia guianensis* (P. J. van Beneden) from Suriname in the Leiden Museum.

Date	Sex	Total length in cm	Weight in kg	reg. number
18 April 1963	♂	123.5	-	18168
8 June 1963	♂	124.5	-	18166
15 June 1963	♂	-	28	18167
19 June 1963	♀	131.5	30	18165
	♀	182	78	21755
Between 15 Febr. and 13 April 1971	♂	146	35	22256
	♂	167	60	22257
	♂	157	52	22258
	♀	165	57	21756
5 May 1971	♂	187	83	22259
5 May 1971	♂	183.5	66	22260

get caught in the traps. An examination of the stomachs of Suriname specimens of this species so far has provided no information, as the stomachs examined were all empty, apart from some parasitic worms.

The female specimen no. 21755, collected between 15 February and 13 April 1971 in the estuary of the Suriname River, carried a foetus of a length of about 60 cm. The specimen showed Lobo's disease; this case has been extensively treated by De Vries & Laarman (1973: 26-33, figs. 1-4). This disease, caused by the fungus *Loboa lobo* (Fonseca & Leao), had up to the present only been encountered in man and in *Tursiops truncatus* (Montagu, 1821).

There exists no uniformity in the quotation of the pages of P. J. van Beneden's article containing the original description of the present species. Some authors,

TABLE 92

Skull measurements of five specimens of *Sotalia guianensis* (P. J. van Beneden) from Suriname in the Leiden Museum.

Reg. number	21755	21756	22257	22260	22259
Sex	♀	♀	♂	♂	♂
Condylabaal length	365	378	335	338	382
Length of rostrum	215	220	198	235	225
Width of rostrum at base	75	77	78	79	77
Interorbital breadth	139	139	136	141	140
Zygomatic breadth	157	160	153	160	164
Breadth of braincase	122	130	127	124	132
Condyle width	80	85	80	77	81
Length of upper tooth-row	185	180	168	190	183
Number of upper teeth, right	32	32	32	34	30
Number of upper teeth, left	31	31	31	33	31
Length of lower jaw	305	312	293	324	322
Height of lower jaw	71	69	64	69.5	70
Length of lower tooth-row	182	182	167	195	190
Number of lower teeth, right	30	31	31	32	31
Number of lower teeth, left	30	31	32	32	30

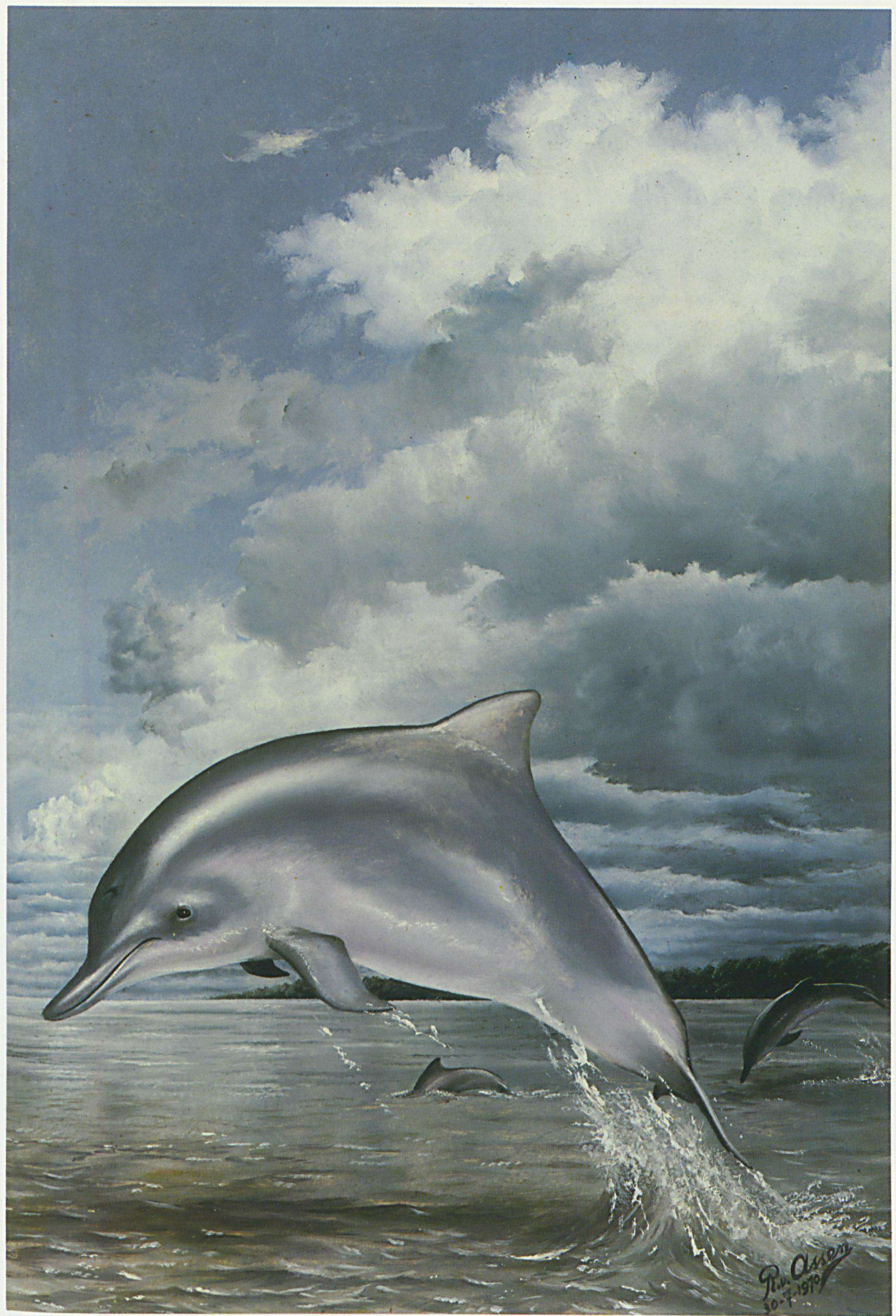


Plate I — *Sotalia guianensis* (P. J. van Beneden).

e.g., Hershkovitz (1966b: 20) cited this paper as covering pp. 24-45, others cite it as pp. 1-23. In vol. 16 of the "Mémoires" every article has a separate pagination and starts with p. 1. The first article is P. J. van Beneden's "Mémoire sur une nouvelle espèce de Ziphius de la mer des Indes" (pp. 1-23, 1 unnumbered page (with explanation of the figures), 1 pl.). The second article is the same author's paper "Sur un dauphin nouveau et un ziphioïde rare" (pp. 1-21, 1 unnumbered page (with the explanation of the text-figures), and pls. [2] and 3). In both copies of the complete vol. 16 of the "Mémoires" examined by me this separate numbering of the pages occurs, and it has thus to be accepted as the official pagination. A reprint of P. J. van Beneden's article "Sur un dauphin nouveau et un ziphioïde rare", in the library of the Rijksmuseum van Natuurlijke Historie, Leiden, however, shows the pagination 23-45, having the text on *Sotalia* on pp. 27-35, as cited by Hershkovitz. It seems possible that when obtaining his reprints P. J. van Beneden asked to have the two papers referred to above issued together and paginated consecutively, whereby the second then obtained the page numbers 23-45.

FAMILY BALAENOPTERIDAE

Balaenoptera acutorostrata Lacépède, 1804

Pl. 144 (decomposed animal), pls. 145 and 146 (baleens), pls. 147 and 148 (skull)

Balaenoptera acuto-rostrata Lacépède, 1804, Histoire naturelle des Cétacées, 1: 197-207, pl. 4 fig. 2 (animal), pl. 8 (animal).

Type locality. — "On le rencontre non seulement auprès des côtes du Groenland et de l'Islande, mais encore auprès de celles de Norvège; on l'a vu aussi dans des mers beaucoup moins éloignées du tropique. Il entre dans le golfe britannique. Il pénètre dans le canal de France et d'Angleterre. Un jeune individu de cette espèce échoua, en avril 1791, aux environs de la rade de Cherbourg" (page 206). Restricted by later authors (e.g., Cabrera, 1961: 620; Hershkovitz, 1966b: 158) to "Cherbourg", western France.

Synonymies. — Cabrera, 1961: 620; Hershkovitz, 1966b: 153-158; Mörzner Bruyns, 1971: 171-173, pl. 91, map 11.

Vernacular names. — (E) Little Piked Whale, Lesser Rorqual, Minke Whale; (N) Dwergvinvis.

Distribution. — All oceans between approximately 75°N and 65°S. It is possible that two subspecies or even species are to be distinguished, a northern and a southern (see under Remarks).

Occurrence in Suriname. — Around 1923 or 1924 parts of the skeleton of a whale were found on a sandy beach near Coppename Punt. These bones were at first kept at the Department of Education in Paramaribo from where around 1954, through the courtesy of Mr. R. D. Simons, head of the Department, they were transferred to the Surinaams Museum. A left scapula and two vertebrae were donated in July 1963 to the Rijksmuseum van Natuurlijke Historie at Leiden (reg. no. 17832), two verte-

brae and a few ribs are kept by the Surinaams Museum. Examination of the remains in Leiden showed them to be closest to similar material of *Balaenoptera acutorostrata*, of which this stranding would be the first known in Suriname. Unfortunately we do not know the exact date of the stranding except for the oral information from the officials of the Department of Education that it took place around 1923 or 1924. On 15 November 1963 Dr. D. C. Geijskes was told by an informant, Brother Sebastiaan of Paramaribo, that in 1922 a whale stranded at Coppename Punt, on the sandy point between the Coppename and the Saramacca Rivers, and that two fragments of the lower jaw and vertebrae were brought to the Amerindian village Kalebaskreek. It is likely that these are the fragments that finally ended up in the Department of Education. Whether any other fragments (e.g., those of the jaw) were retained at Kalebaskreek, or that those indicated as jaw fragments actually were ribs, remains undecided. It is most likely that both reports pertain to the same individual of *B. acutorostrata*.

A baleen of *Balaenoptera physalus*, which was said also to originate from Kalebaskreek, is discussed on p. 526; it certainly does not belong to the present species, and may have been incorrectly labelled as far as concerns the locality.

On 21 October 1963, a single female individual of the Minke Whale was seen swimming in the mouth of the Coppename River, in the direction of the Coesewijne River. On 23 October the animal was killed in the Coppename River near the Amerindian village Goede Hoop, at about 45 km upstream from the mouth of the river. Much publicity was given to this incident and articles on it were published in Suriname newspapers (Geijskes, 1963; Bolwerk, 1963; Anonymous, 1964). The skeleton of this animal was prepared on the spot and transported to Paramaribo, where it is now housed in the Surinaams Museum. The total length of this female was 8.25 m. The following measurements (all in projection) were taken, all from the tip of the upper jaw: to the middle of the blowhole, 1.18 m; to the centre of the eye, 1.85 m; to the base of the pectoral fin, 2.97 m; to the middle of the back-fin, 5.95 m. The length of the pectoral fin (flipper) was 1 m. The greatest width of the flukes was 1.85 m, their length 0.50 m, the width at their base 0.21 m. I am most thankful to Dr. D. C. Geijskes for providing these measurements, and especially for informing me that the upper surface of the flippers was uniformly dark. This specimen was also mentioned by Slijper, Van Utrecht & Naaktgeboren (1964: 34). As far as I know the species has not been reported before from off the north coast of South America.

Description. — The species is the smallest of the Rorquals, attaining at most a length of 11 m, but usually being far shorter. Like in the two other species of *Balaenoptera* mentioned below, (1) the anterior half of the ventral surface of the body is deeply grooved longitudinally, (2) the back-fin is small and placed in the posterior half of the body, (3) the surface of the head and the flippers (pectoral fins) is smooth, and (4) the flippers are less than one sixth of the length of the body. The dorsal surface of the body is of a dark grey, almost black colour; the ventral surface is white all over, including the chin and the lower surface of the flukes. In the typical

northern *Balaenoptera acutorostrata* the pectoral fins have a characteristic white band over the upper surface, in the southern form this band is absent. The baleens are up to 30 cm long, usually shorter. In the typical northern form they are uniformly yellowish white to pure white; in the southern form they are two-toned with the outer part brownish to blackish, much darker than the inner part which is yellowish or whitish.

Remarks. — Of the present species a northern and a southern form can be distinguished. The described differences between these two forms pertain mainly to (1) difference in colour of the pectoral fins, which have a conspicuous white dorsal band in the northern form, while this band is lacking in the southern, and (2) difference in colour of the baleens, which are uniformly yellowish or whitish in the northern form, and have (at least the posterior plates) a distinct dark area along the outer margin in the southern form (see Williamson, 1959). Other differences are less conspicuous; Ohsumi, Masaki & Kawamura (1970: 81, 116) found the southern form to be slightly (about 60 cm) longer than the northern, and Satake & Omura (1974: 15) found some differences in the shape of the hyoid bone. As the number of specimens studied of necessity is rather small, these differences may not be reliable (Satake & Omura stated that the differences they found might be due to differences in age of their material). Ohsumi, Masaki & Kawamura (1970) found so many similarities in other features of the two forms (number of baleen plates; position of umbilicus relative to the ventral grooves; number of vertebrae) that they came to the conclusion that the northern and the southern form belong to the same species; they were strengthened in this conclusion by (rather vague) reports of specimens without white flipper bands in the north and specimens with such bands in the south, and by the fact that specimens with a dark outer band on the baleen plates have been reported from the north (Jonsgård, 1951). Van Utrecht & Van der Spoel (1962) examined a specimen of this species from the Antarctic which perfectly agrees in colouration with the southern form; they conclude, basing themselves on this specimen and data from the literature, that the southern form should be considered "a variation" of *Balaenoptera acutorostrata*. The published data clearly show that two distinct forms do exist, but too few specimens from too few localities have been examined to make it perfectly clear whether or not the two forms are distinct species, subspecies, or just varieties, while their exact range is also unknown. It will be necessary to study a greater number of specimens with the problem of the two forms in mind, and also to examine more characters: e.g., the skulls of the two forms have never been carefully compared. For the time being we consider the southern form to be *Balaenoptera acutorostrata*, and leave the decision of its specific or subspecific status to later investigators.

The Suriname specimen, dealt with above, must be considered to belong to the southern form as the baleen plates (pls. 145 and 146) have a wide and conspicuous dark band along the outer margin, while the flippers show no white at all. None of the photographs taken clearly show the pectoral fins, but Dr. D. C. Geijskes, who

saw the specimen and realized the importance of the colour of the upper surface of the flippers, specifically noticed the absence of a white band.

If the southern form is to be considered a distinct species or subspecies, the specific or subspecific epithet *bonaerensis* Burmeister, 1867, should be used for it. The type locality of *Balaenoptera bonaerensis* Burmeister is: near Belgrano, Buenos Aires, Argentina.

***Balaenoptera borealis* Lesson, 1828**

Pl. 149 (skull and vertebrae)

Balaenoptera borealis Lesson, 1828, Histoire naturelle générale et particulière des mammifères et oiseaux, 1: 342-361.

Type locality. — “. . . le rorqual du nord vit dans les mers du pôle boréal et ne quitte guère les parages glacés du Spitzberg, du Groenland, du détroit de Davis, et de l'Islande. Ce n'est jamais que dans les tempêtes de notre hiver, qu'on le voit fréquenter les mers de l'Europe tempérée, et que parfois son cadavre est jeté sur nos rivages” (Lesson, 1828: 360). Lesson includes localities mentioned by name: “île d'Oleron”, off Rochefort, south-western France (pp. 344, 345); “Eyemouth”, Berwick, south-eastern Scotland; “comté de Cornwall”; “la côte d'Irlande”; “dans la Tamise” (the Thames, England) (all p. 360). Lesson's description is mainly based on the specimen from île d'Oleron, but Hershkovitz (1966b: 162) made the specimen stranded on 21 February 1819 near Grömitz, about 54°9'N 10°57'E on the Baltic coast of Schleswig-Holstein, Germany, described and figured by Rudolphi (1822), the (lecto)type, so that Grömitz becomes the restricted type locality.

Synonymies. — Cabrera, 1961: 621; Hershkovitz, 1966b: 160-163; Mörzer Bruyns, 1971: 173-175, pl. 93, map 12.

Vernacular names. — (E) Sei Whale; (N) Noordse Vinvis.

Distribution. — All oceans from about 70°N (in the Atlantic; 55° in the Pacific) to 60°S.

Occurrence in Suriname. — On 11 February 1964, a living male specimen of the Sei Whale stranded on a mudbank about 1.5 km offshore west of the Prodobong Creek, east of Nieuw Nickerie, north-western Suriname. Fishermen observed the animal to be alive, as it still flipped its tail. The next morning the animal was dead and profusely bleeding, because evidently sharks had torn pieces of flesh from the throat, the belly and the tail. At high tide the dead body drifted much closer to the coast. On 21 February, Dr. D. C. Geijskes of the Surinaams Museum in Paramaribo visited the locality and found that the body, although dead for about ten days, was still remarkably firm, so that one could walk over it. Dr. Geijskes took the following measurements of the body: length, 15.5 m; width, 3 m; length of pectoral fin, 1.65 m. He noted that the dorsal surface and the sides were black, the breast white. The pectoral fin was entirely black. On the breast 37 grooves could be counted, 25 of these being on one side of the body so that the total number of grooves may be estimated at about 50; these grooves extended beyond the end of the flippers. As

the mouth was closed, nothing was noted about the baleens. The large tongue protruded through a hole in the throat. The blowholes were not seen, for that part of the head was buried in the mud. The penis had a length of 1.80 m. A photograph of the specimen in situ was published by Geijskes & Bolwerk (1964). The skeleton was saved for the Surinaams Museum where it is now shown in a mounted condition; a photograph of the mounting activities was published in Mededelingen Surinaams Museum, no. 10 (1973), p. [2]. Unfortunately, at the time when the skeleton was prepared for shipping to Paramaribo, all the baleens had already been removed by the inhabitants of the Nieuw Nickerie region, so that none of those could be obtained. A photograph of the skull and some vertebrae of this specimen is given here (pl. 149).

Description. — The Sei Whale attains a length of 12 to 18, rarely 20 m. Like *Balaenoptera physalus* and *B. acutorostrata*, it has the anterior half of the ventral surface deeply grooved, with the head and pectoral fins smooth. These fins measure less than one sixth of the length of the body. The back-fin is somewhat larger than in *B. physalus* and is placed slightly more anteriorly, but still in the posterior half of the body. The dorsal surface of the body is grey to bluish grey, the ventral surface is somewhat lighter, with an irregular whitish colour in the grooved area. The most characteristic feature of the species is the colour of the baleens, which are blackish and have white soft curly fringes. The baleens are up to 70 cm long, usually shorter.

***Balaenoptera physalus* (Linnaeus, 1758)**

Text-fig. 52 (tail), pl. 150 (tail), pl. 151 (baleen)

Balaena Physalus Linnaeus, 1758, Systema Naturae, (ed. 10) 1: 75-76.

Type locality. — "Habitat in Oceano Europaeo". Restricted by Thomas (1911: 156) to "Spitzbergen seas".

Synonymies. — Cabrera, 1961: 621-622; Hershkovitz, 1966b: 163-170; Mörzer Bruyns, 1971: 176-178, pl. 94, map 13.

Vernacular names. — (E) Fin Whale, Common Finback, Common Rorqual, Razorback; (N) Gewone Vinvis.

Distribution. — All oceans from about 75°N to 75°S.

Occurrence in Suriname. — Up to now only two or three specimens of the Fin Whale have been reported from Suriname.

(1). The first known stranding of *Balaenoptera physalus* on the Suriname coast dates from 1910 and was reported upon in a letter by Jhr. W. C van Heurn (dated Paramaribo, 9 September 1911), addressed to Dr. F. A. Jentink, Director of the Leiden Museum. Jhr. W. C. van Heurn, who at that time (May to October 1911) collected in Suriname for the Leiden Museum, wrote: "Het geldt . . een walvisch, die verleden jaar tusschen de Surinamerivier en den Marowijne mond gestrand is. . . . het is een dier van middelmatige grootte geweest. Bij het skeletteeren is ééne hand, die in den modder begraven lag, verloren geraakt, het overige skelet, dat volledig moet zijn, is met aluin en kalk bestreken, naar de stad vervoerd, en zoowel

te Demerary als te Paramaribo tentoongesteld geweest door den eigenaar, den Heer H. B. Heyde, uitgever te Paramaribo (Wagenstraat)". (It concerns a whale which last year [i.e., 1910] stranded between the Suriname River and the mouth of the Marowijne River. It is an animal of medium size. During the cleaning of the skeleton, one of the hands, which was buried in the mud, got lost, but the rest of the skeleton, which should be complete, has been coated with alum and lime and carried to Paramaribo, and has been exhibited in Demerary [British Guiana] and in Paramaribo by the owner Mr. H. B. Heyde, publisher in Paramaribo (Wagenstraat)). In a later letter (dated 13 October 1911) Van Heurn mentioned that he did examine the skeleton, which by then had been mounted: "Het is een zeer fraai stuk, compleet, uitgezonderd de phalangen van één der handen. Het is een vinvisch van 20 M.". (It is a very fine specimen, complete, with the exception of the phalanges of one of the hands. It is a Rorqual of 20 m length). Van Heurn's efforts to obtain this specimen for the Leiden Museum evidently did not meet with success. I have not been able to ascertain what subsequently happened with this skeleton. Judging by the size of the specimen and Van Heurn's provisional identification as a "vinvisch" (Rorqual) it seems likely that the specimen belonged to *Balaenoptera physalus*. It is possible that this specimen is the whale of unknown identity reported upon above (p. 514) as having been stranded around 1908.

(2). Around 20 May 1923, a Fin Whale stranded alive east of Braamspunt, a fishing village situated just east of the mouth of the Suriname River. The Suriname newspaper "De West" of 22 May 1923 contained a vivid account of this stranding; a free translation is given here: 'Some persons, who arrived per cutter in Paramaribo from Albina, reported that they had encountered a whale in the sea near the lightship "Suriname Rivier". They succeeded in chasing the animal towards the coast, where it stranded; they tied it with its tail to a pole. After that they went to Paramaribo and returned with the motorboat "Brittania" with the intention to tow the monster to town. The animal, however, resisted so strongly, that it proved impossible to transport it alive. Thereupon, they shot it several times in the region of the head, chopped off the tail and inflicted some shallow injuries in the neck area. The tail was transported to town and it was intended to bring the animal, which by now had died, also to Paramaribo. In our [i.e., the editor's] opinion, in order to avoid unpleasant consequences, it seems preferable to leave the animal where it is and to organize trips to the beach for those interested persons, who want to see the monster. The gentlemen informed us that they are willing to do so and would charge 2½ guilders per person. They stated the animal to be 17 m long, 4 m wide and 8 feet high'.

A notice of this stranding was also published by Reyne (1924: 47-48). In a letter (dated Paramaribo, 16 July 1923) sent by Reyne to Dr. A. B. Droogleever Fortuyn of Leiden the following account of the animal is given: "Omstreeks 22 Mei strandde op de Surinaamse modderkust op korten afstand ten O. van de monding der Suriname-rivier een vinwalvisch (*Balaenoptera* sp.). Eenige visschers poogden het dier te dooden. Niet zonder moeite slaagden ze er in om den staart af te hakken, dien zy

naar Paramaribo brachten en in een autogarage ten toon stelden. De visschers waren van plan om ook de walvisch naar Paramaribo te sleepen, maar konden daartoe van de betrokken autoriteiten geen vergunning krygen. De staart was zwartleiblaauw van kleur en in het midden van den achterrand hartvormig ingesneden. De afstand tusschen de uiteinden der slippen bedroeg 2.90 M. By den afgesneden staartwortel was de staart 0.70 M. hoog en 0.30 M. breed. Volgens mededeeling van de visschers, die het dier ontdekten (de berichtgever kon tot zyn spyt het dier zelf niet bezichtigen, daar hy niet kon beschikken over een zeewaardig vaartuig), was het 17 M. lang en had het een driehoekige vin op den rug van ongeveer 2 voet hoogte. Het oog was zoo groot als een mansvuist, de borstvinnen hadden naar schatting een lengte van ongeveer 2 M. In den bek bevonden zich baleinen. De kleur van het lichaam was aan de bovenzijde als die van den staart en aan den onderkant wit of grys. De visschers aan wie de figuren 76-80 uit Flower-Lydekker-Introduction to the study of mammals getoond werden, wezen eenstemmig de in fig. 80 afgebeelde *Balaenoptera musculus* aan als de door hen waargenomen walvisch. Ze deelden nog mee, dat het dier boven op den kop twee gaten had, waaruit water spoot, toen zy naderden". (Around 22 May a Rorqual (*Balaenoptera* sp.) stranded on the muddy coast of Suriname, a short distance east of the mouth of the Suriname River. Some fishermen tried to kill the animal. With some difficulty they managed to chop off the tail and they brought it to Paramaribo, where it was exhibited in a garage. The fishermen intended to tow the whale to Paramaribo, but did not succeed to obtain the necessary permit from the authorities. The colour of the tail of the animal was black to slate blue. The tail was heart-shapedly incised in the middle of the posterior margin. The distance between the tips of the flukes was 2.90 m. The base of the tail, where it was chopped off, was 0.70 m high and 0.30 m wide. According to information by the fishermen who discovered the animal (unfortunately I did not see the animal myself as no seaworthy boat was available), it was 17 m long and had a triangular back-fin of about 2 feet high. The eye was as large as a man's fist, the flippers were estimated to be 2 m long. The mouth contained baleens. Dorsally the body had the same black to slate blue colour as the tail, and ventrally it was white or grey. The fishermen, who were shown the figures 76-80 of Flower & Lydekker's "An introduction to the study of mammals" [depicting *Balaena mysticetus* fig. 76, *B. australis* fig. 77, tympanic bones fig. 78, *Megaptera novaeangliae* fig. 79, and *Balaenoptera musculus* fig. 80], unanimously indicated fig. 80 as representing the animal found by them. They also remarked that the animal had two holes on top of the head, through which it spouted water, when they came close).

Reyne provided the sketch reproduced here as fig. 52, showing the dimensions of the tail as measured by him. Droogleever Fortuyn, at the request of Reyne, sent the above letter as well as a photograph of the tail (reproduced here as pl. 150) to Dr. E. D. van Oort, Director of the Leiden Museum, and a specialist on Cetacea. Dr. Van Oort identified the flukes as most probably belonging to *Balaenoptera physalus*; Dr. F. C. Fraser, of the British Museum (Natural History), came to the same conclusion

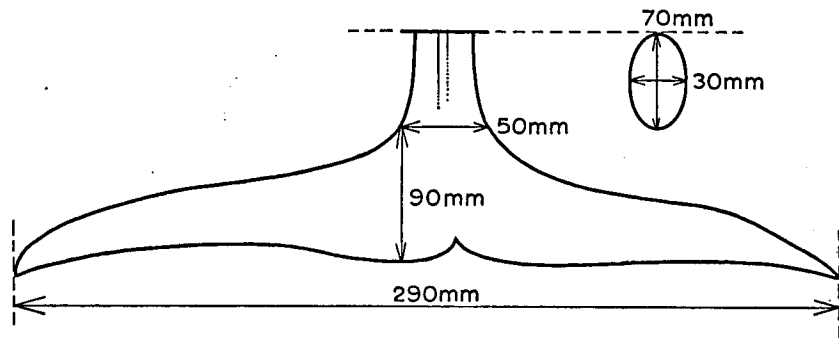


Fig. 52. *Balaenoptera physalus* (Linnaeus). After a rough sketch, made by A. Reyne of the tail of the specimen from near Braamspunt (1922), giving the various measurements.

when, in 1963, I discussed this question with him and showed him the photograph. No skeletal remains of this animal are known to have been preserved.

(3). In the natural history department of the St. Paulusschool in Paramaribo a baleen is preserved, which was found in 1922 or 1923 in the Amerindian village of Kalebaskreek on the right bank of the Coppename River, about 15 km upstream from the mouth; it was donated to the St. Paulusschool by Mr. R. D. Simons, chief of the Department of Education at Paramaribo. This baleen, which is shown here on pl. 151, is about 75 to 80 cm long (fringes included) and has a greatest width of about 16 cm. The colour is black with a few irregular lighter areas, the fringes are brown (probably darkened by age and external influences, e.g., smoke). This baleen without any doubt is from *Balaenoptera physalus*. It is quite possible that a mix-up in labelling has taken place here. This baleen as well as the skeleton fragments of *Balaenoptera acutorostrata* dealt with on pp. 519, 520 are said to have been obtained at the same time (1922 or 1923) in the same place (Kalebaskreek, Coppename River) and formed part of the same collection, viz., that of Mr. R. D. Simons in the Department of Education in Paramaribo. Additional evidence shows that the skeleton fragments indeed come from the Coppename River (see p. 520). As it seems highly unlikely that within one or two years 2 species of whale (*B. physalus* and *B. acutorostrata*) should have stranded at the mouth of the Coppename River, and that fragments of both were taken to the village of Kalebaskreek, I regard the correctness of the locality indication of the present "Kalebaskreek" baleen with considerable doubt. Although this cannot be proven, it seems not unlikely that the baleen actually came from the specimen of *Balaenoptera physalus* which stranded near Braamspunt in 1922 (discussed in par. 2 above), and that in the Simons collection it was incorrectly labelled as being of the same origin as the skeleton fragments of *B. acutorostrata* from Kalebaskreek. If this surmise is true, only two definite records of strandings of *Balaenoptera physalus* on the Suriname coast are known, the paragraphs 2 and 3 then dealing with the same specimen.

Description. — The present species may attain a length of 20 to 25 m. It is characterized by the deeply grooved under surface of the anterior half of the body, the

small back-fin which is placed in the posterior third of the dorsal surface, the smooth surface of the head and the flippers, the flippers measuring less than one sixth of the body length, and by the colour. The dorsal colour is dark bluish or brownish grey; ventrally the species is white, also the ventral surface of the flippers and the flukes is white. The baleens are 70-80 cm long, mostly bluish black with longitudinal paler stripes and with yellowish-white fringes; the anterior baleens of the right side are usually white.

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Afobaka	3 (49)	Coppename River	1
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Albina	2 (54)	Coronieweg	2 (21)
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Aurora	2 (40)	Dijkveld	3 (34)
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Awarra savanna	2 (8)	Djoemoe	2 (42)
Baboehol	3 (46)	Domburg	3 (38)
Bedoti	3 (57)	Donderbariberg (Donderberg)	3
Berg en Dal	3 (45)	Doublesteps Falls	1
Berlijn	3 (24)	Ebba Mountain	2
Bigi Poika	3 (7)	Eilerts de Haan Gebergte (nature reserve)	1
Bigisanti	3 (77)	Emma Range	2
Bitagron	2 (30)	Emma River	1
Blakkawatra	3 (42)	Fallawatra River	1
Blanche Marie Falls	1	Finisanti	3 (10)
Boskamp	2 (23)	Frederik Willem IV Falls	1
Bossee- or Saramacca Creek	3	Galibi	2 (50)
Botopasi	2 (41)	Galibi (nature reserve)	1
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PLATE I



1



2



3



4

Sole of right hind foot of some Marsupials. – 1, *Monodelphis brevicaudata brevicaudata* (Erxleben); 2, *Marmosa murina murina* (Linnaeus); 3, *Metachirops opossum opossum* (Linnaeus); 4, *Didelphis marsupialis marsupialis* Linnaeus.



Caluromys philander philander (Linnaeus)



Monodelphis brevicaudata brevicaudata (Erxleben)



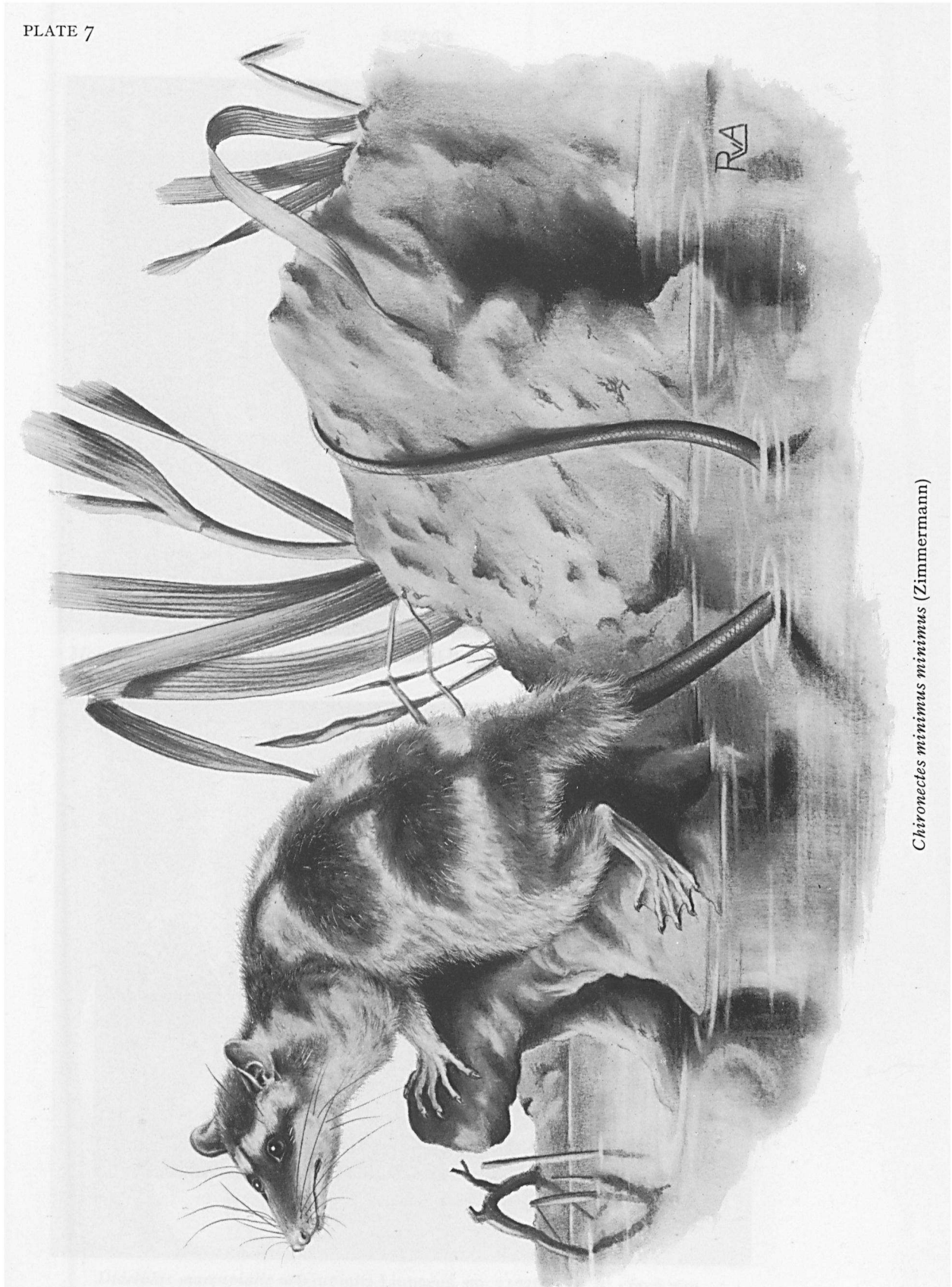
Marmosa murina murina (Linnaeus)



Metachirops opossum (Linnaeus)

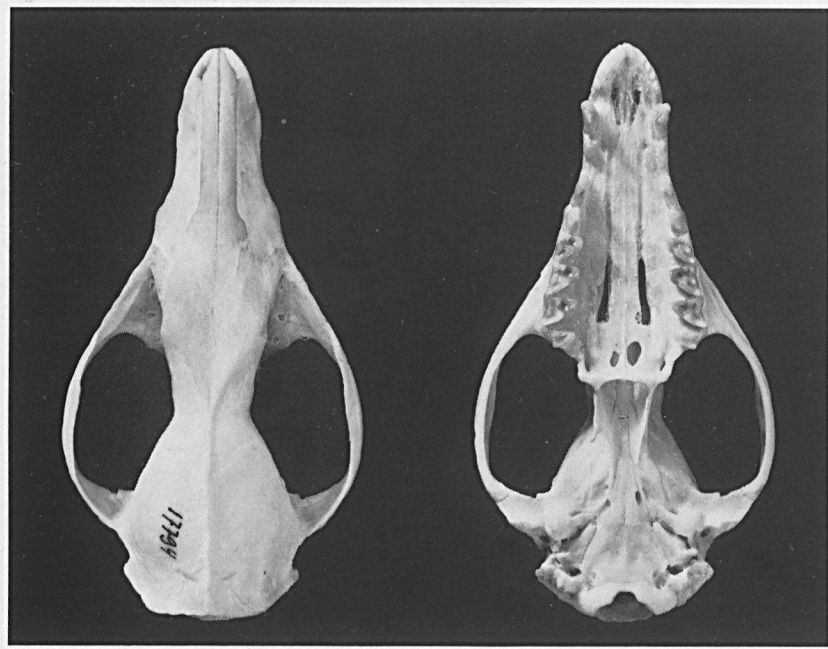


Didelphis marsupialis marsupialis Linnaeus



Chironectes minimus minimus (Zimmermann)

PLATE 8

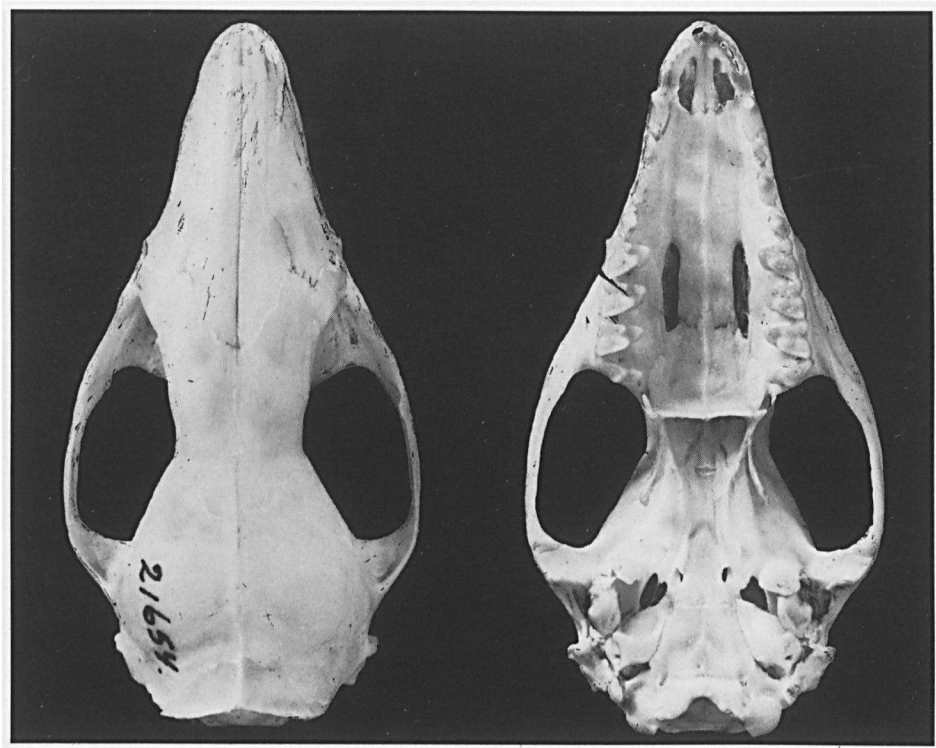


Metachirops opossum opossum (Linnaeus), ♂, no. 17794; zyg. br., 35.8 mm.

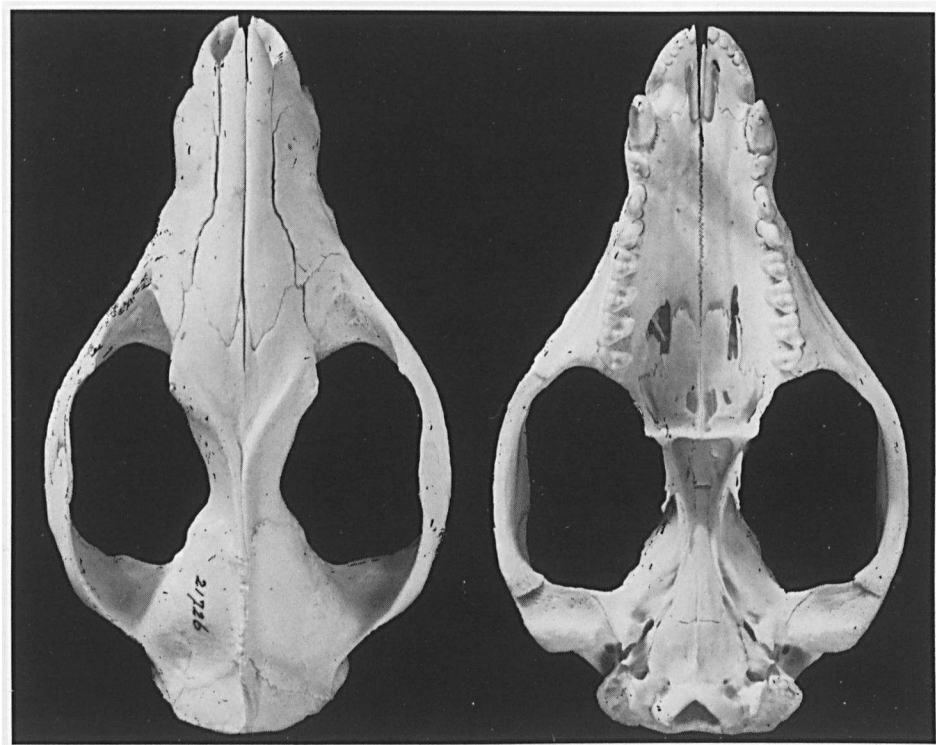


Caluromys philander philander (Linnaeus), ♀, no. 18025; zyg. br., 32.3 mm.

PLATE 9

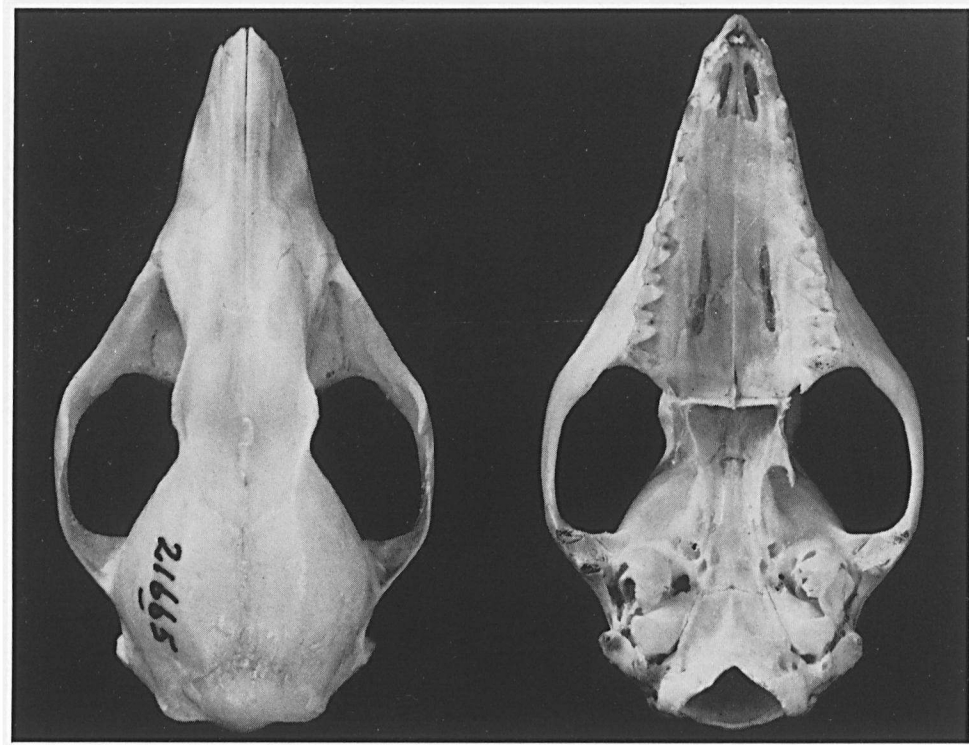


Monodelphis brevicaudata brevicaudata (Erxleben), ♂, no. 21654; zyg. br., 18.0 mm.



Didelphis marsupialis marsupialis Linnaeus, no. 21726; zyg. br., 69.7 mm.

PLATE IO

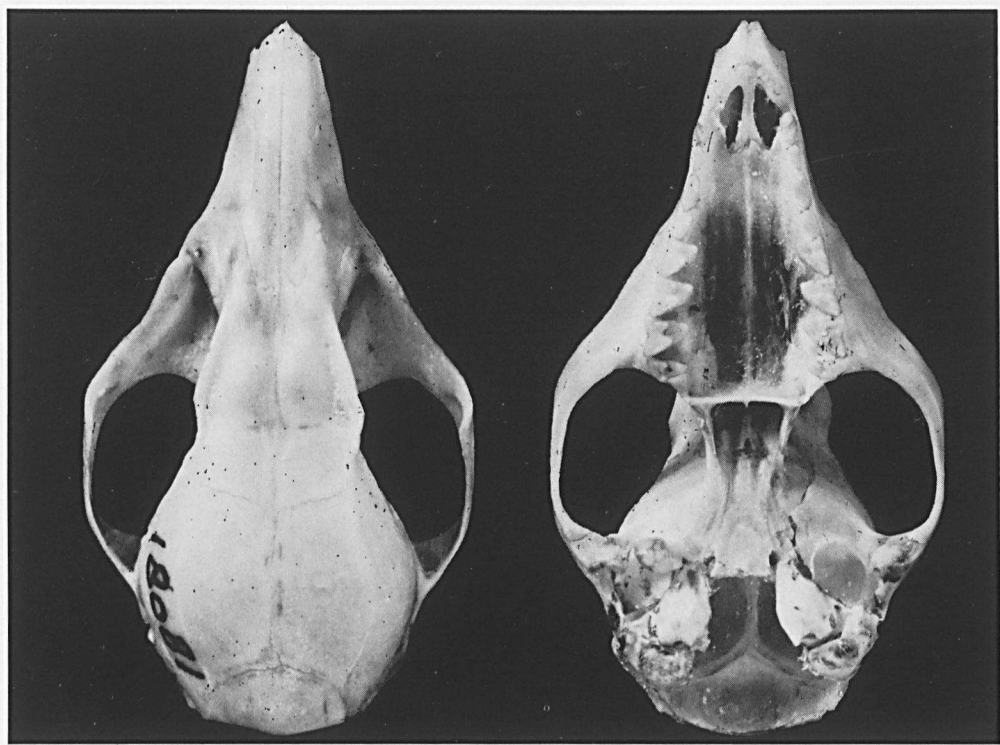


Marmosa murina murina (Linnaeus), ♂, no. 21665; zyg. br., 19.2 mm.



Marmosa cinerea demerarae Thomas, ♀, no. 18228; zyg. br., 24.5 mm.

PLATE II

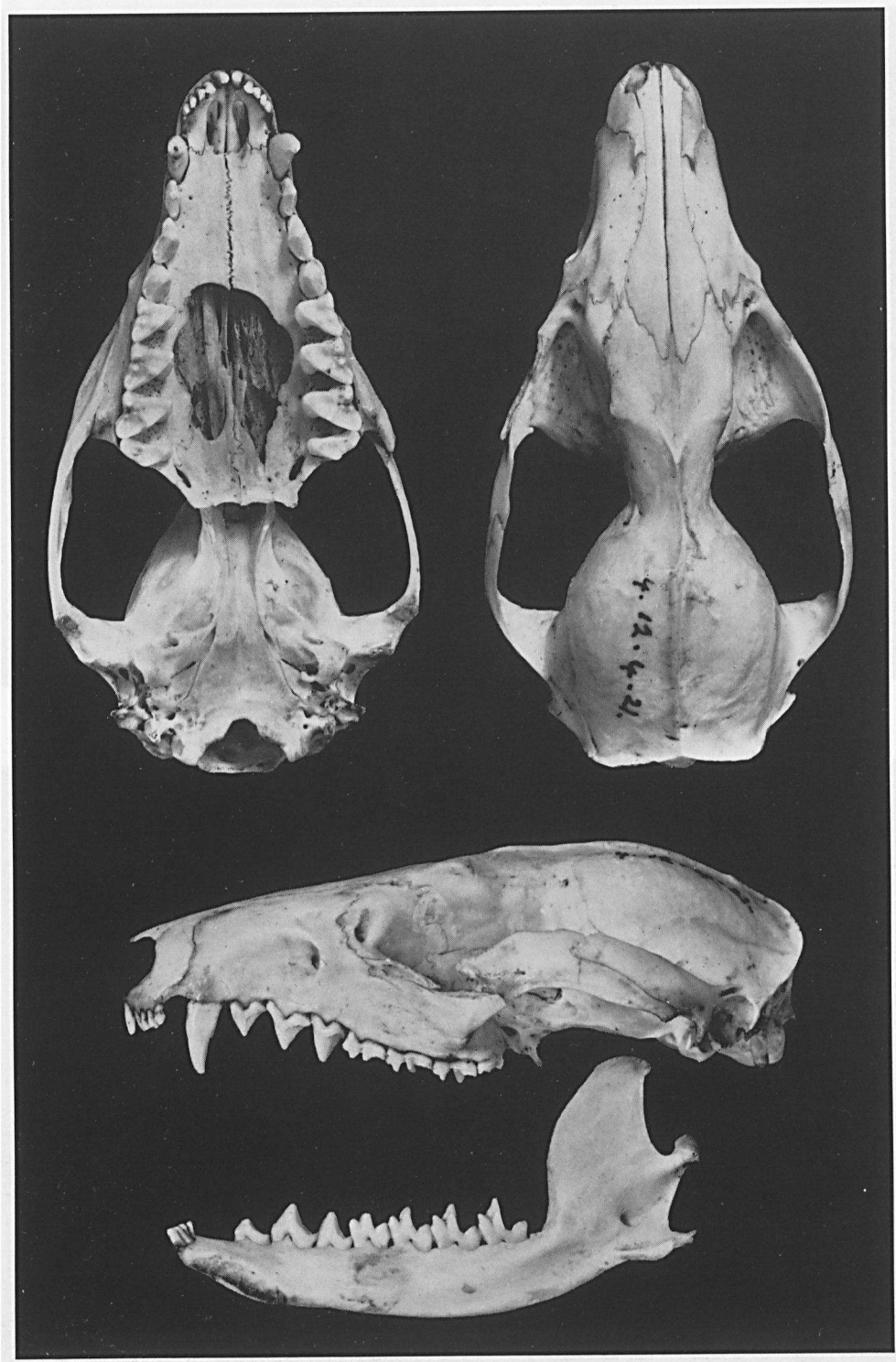


Marmosa lepida (Thomas), ♂, no. 18081; zyg. br., 16.2 mm.

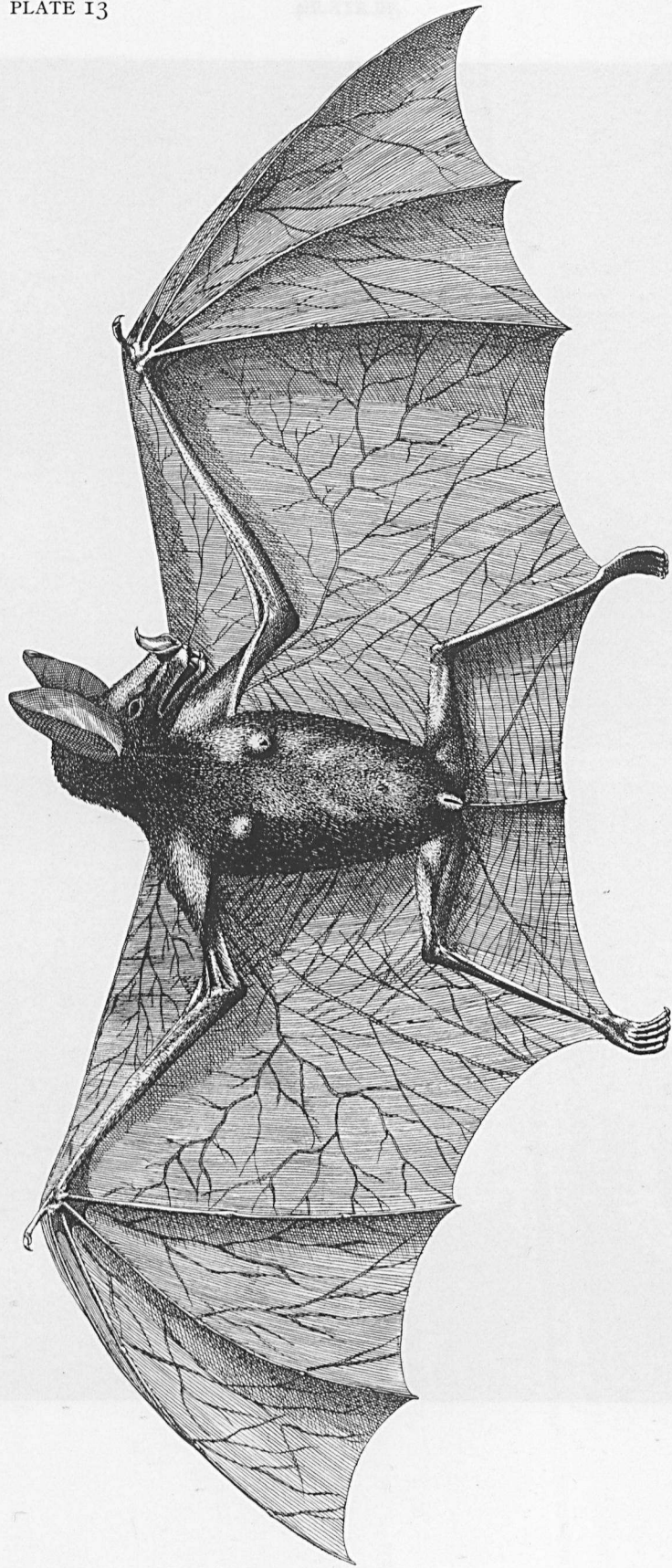


Marmosa emilae Thomas, juv. ♂, no. 18231; zyg. br., 11.8 mm.

PLATE I2



Chironectes minimus minimus (Zimmermann), ♂, Marcapta (Peru), BMNH no. 4.12.4.21; zyg. br., 36.8 mm.

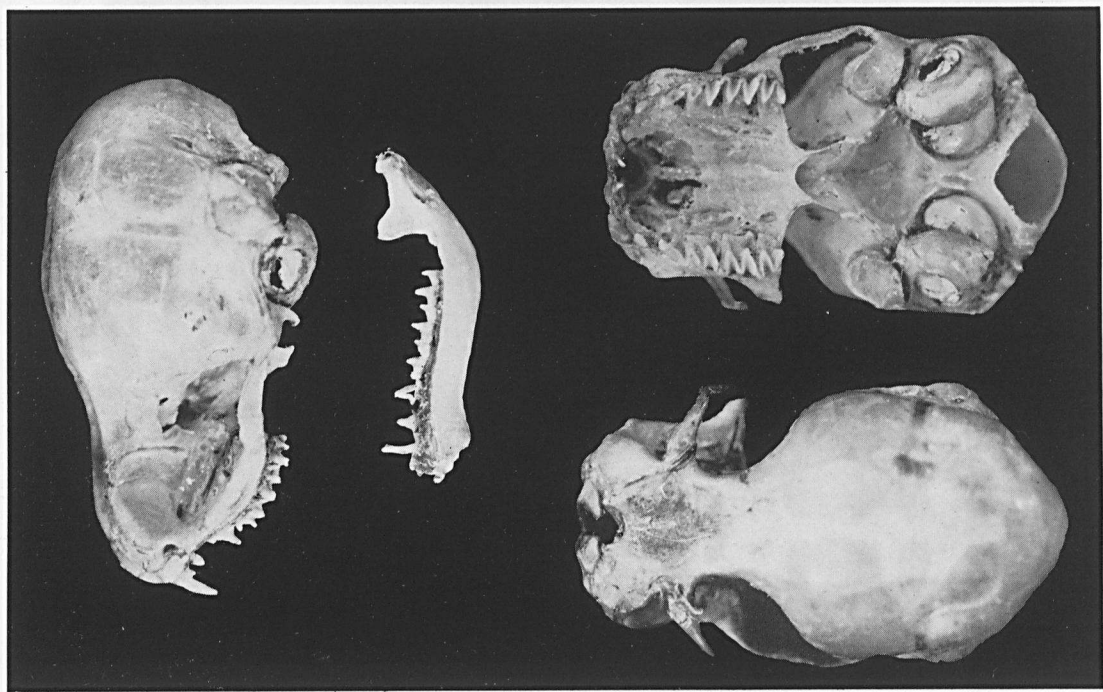


Vampyrum spectrum (L.), after Seba, 1734

PLATE I4

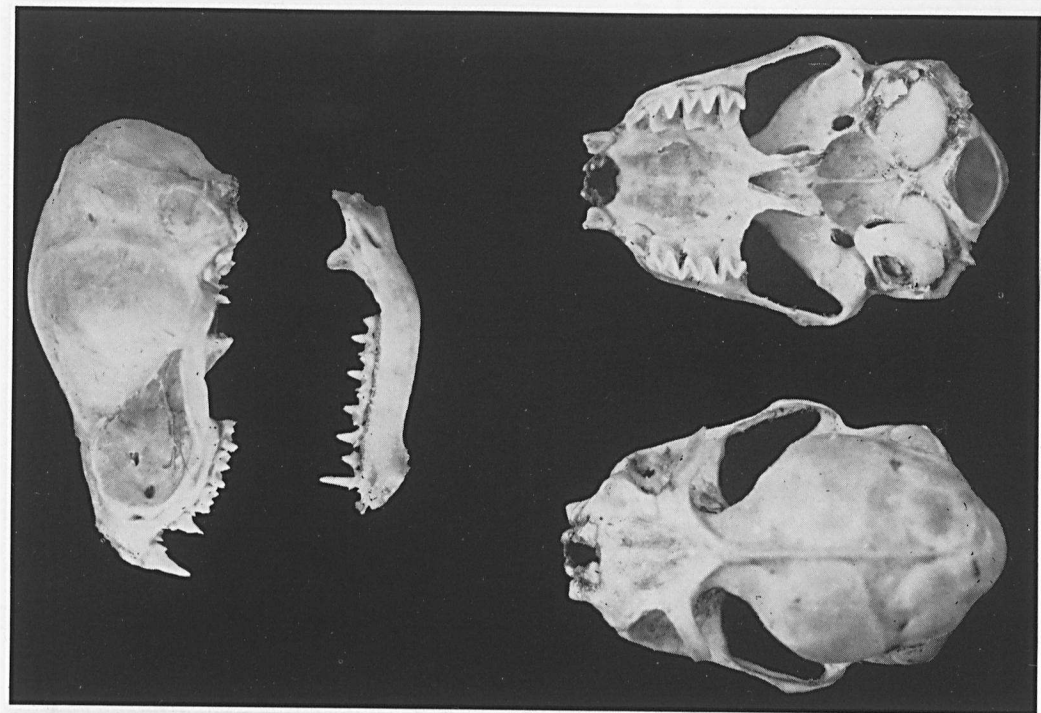


Saccopteryx bilineata (Temminck), SMN no. 1176a-3



Rhynchonycteris naso (Wied), SMN no. 264b-370e

PLATE 15

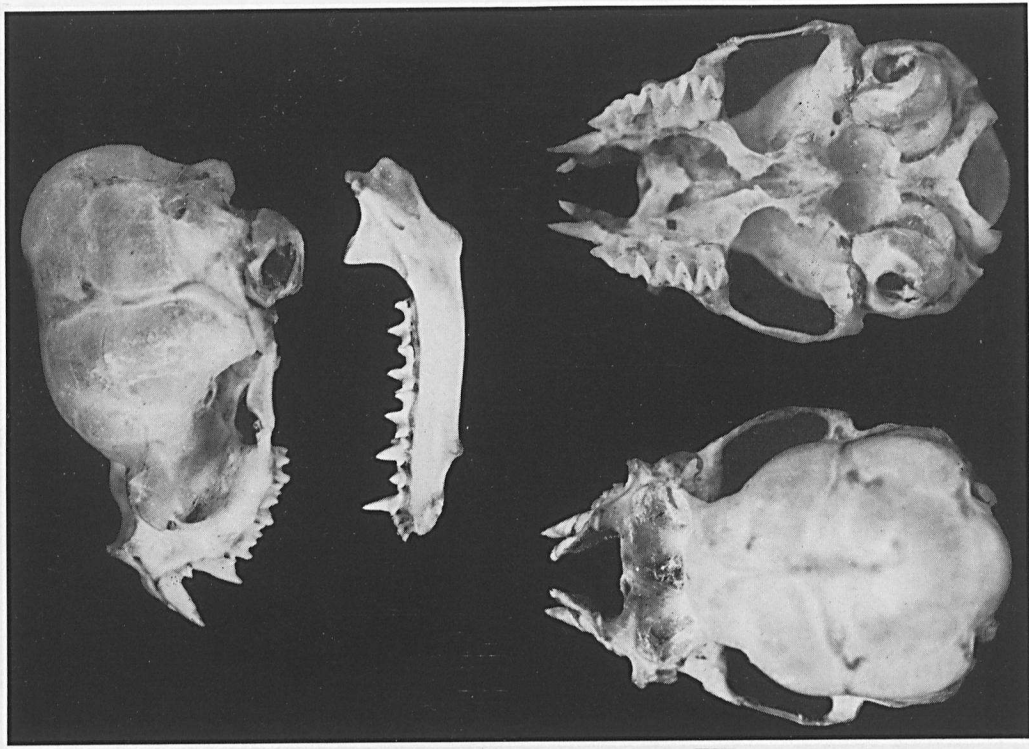


Saccopteryx leptura (Schreber), ZMB no. 3982

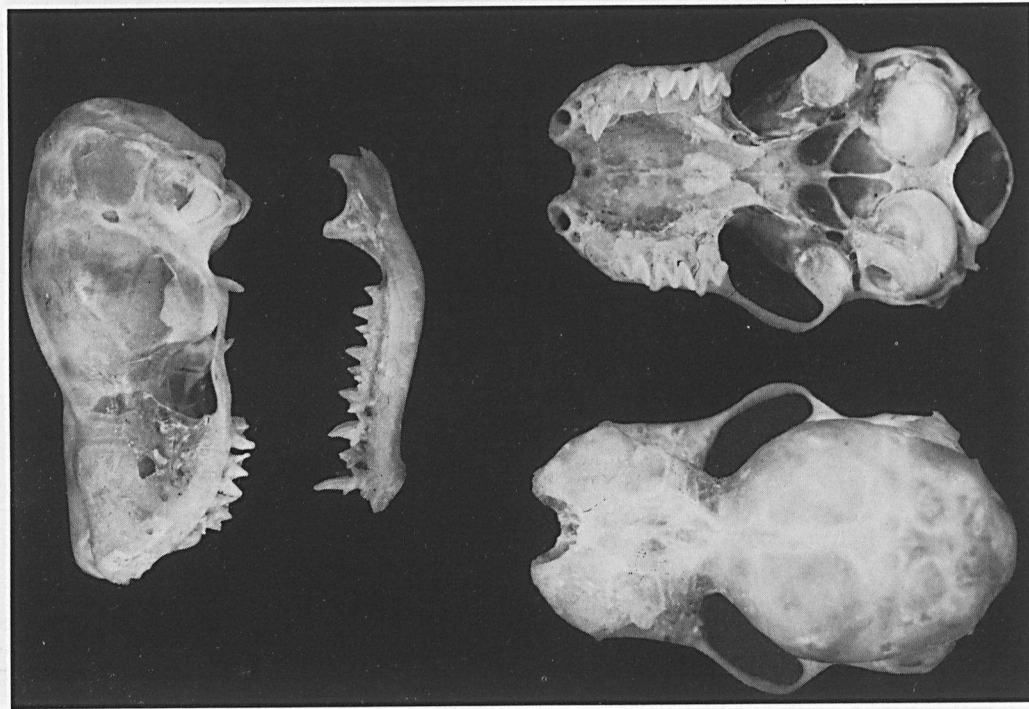


Cormura breviostris (Wagner), no. 2031-2

PLATE 16

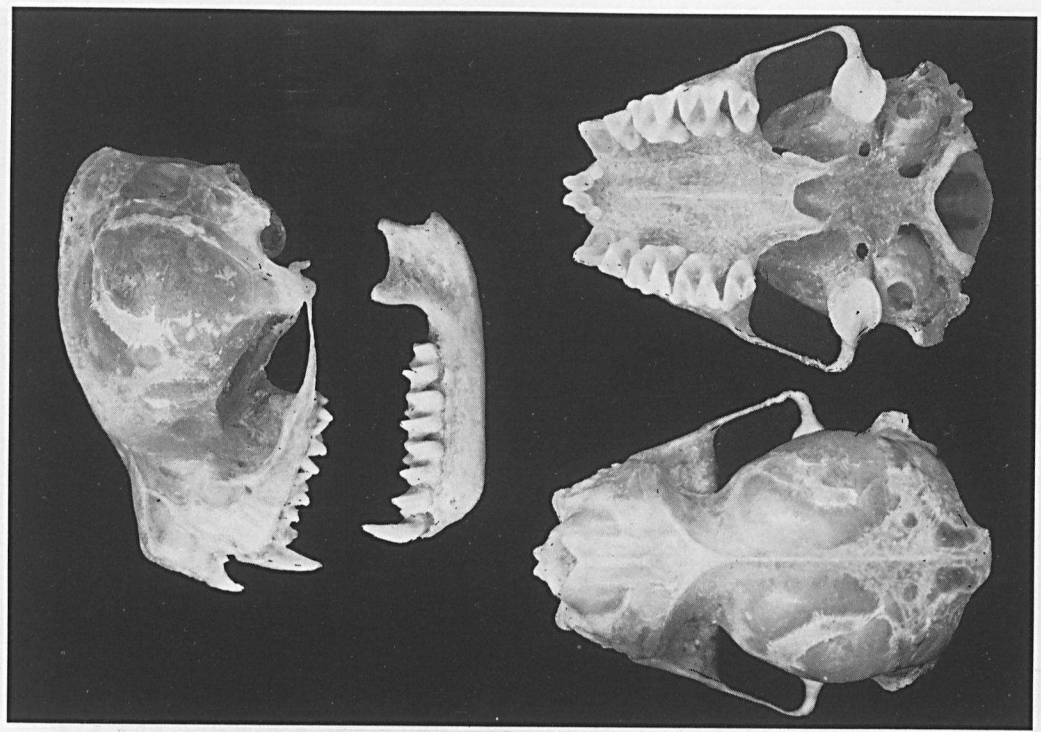


Diclidurus scutatus Peters, ZMA no. 1625

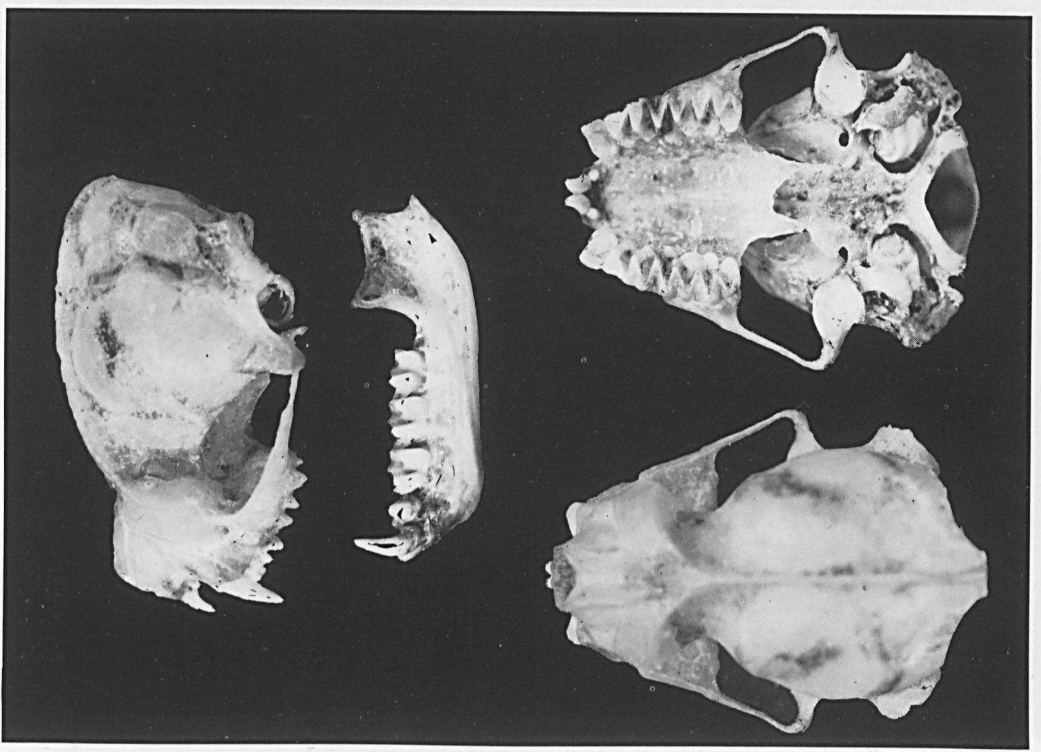


Centronycteris maximiliani maximiliani (Fischer), no. 12111

PLATE 17

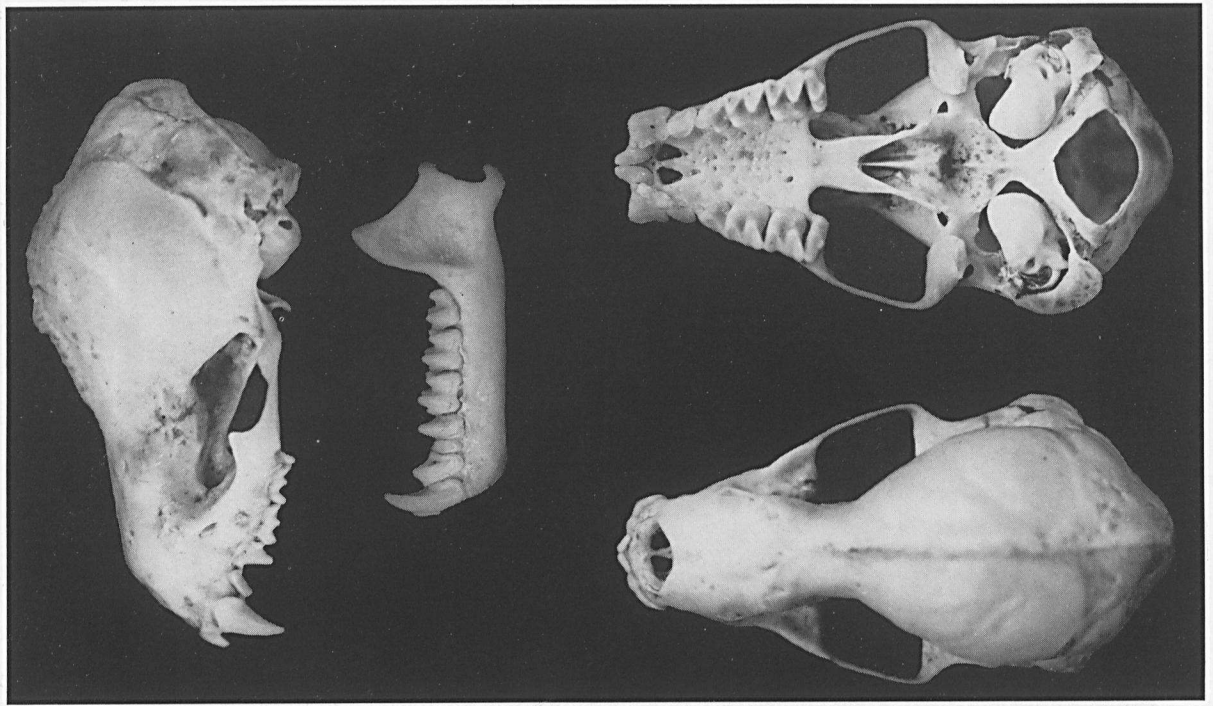


Noctilio leporinus leporinus (L.), no. 12003

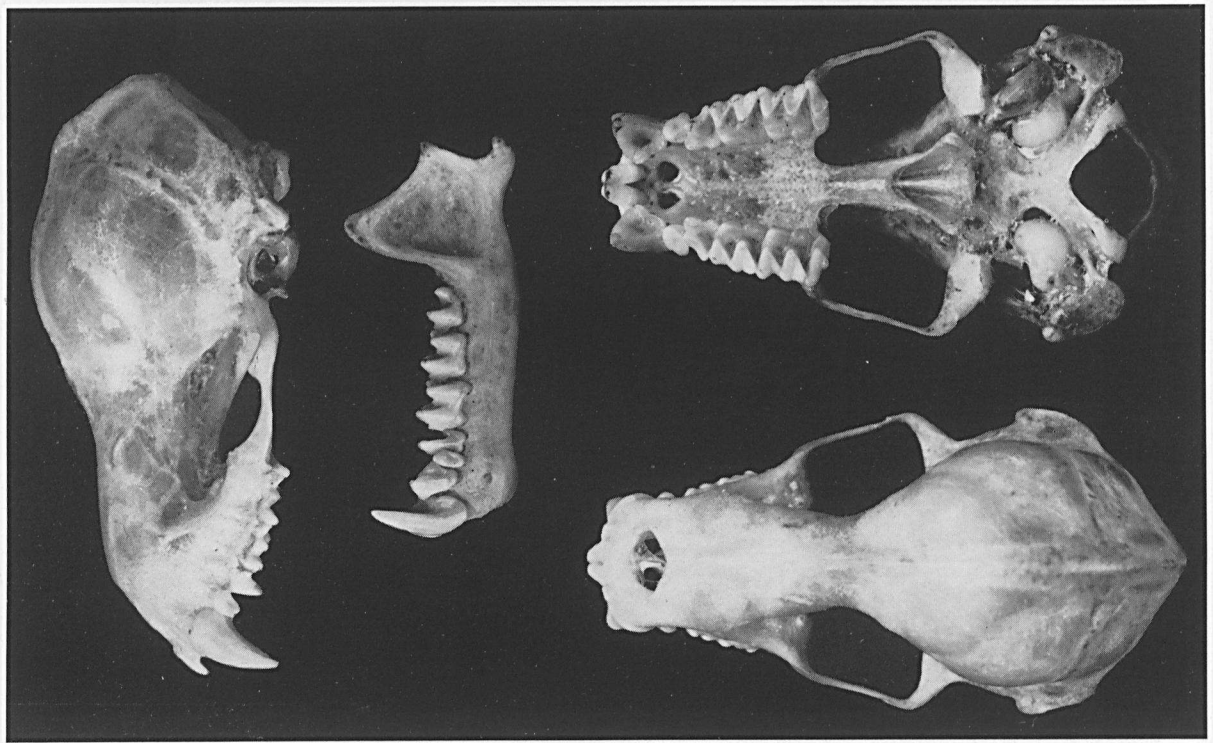


Noctilio labialis albiventris Desmarest, no. 17296

PLATE 18

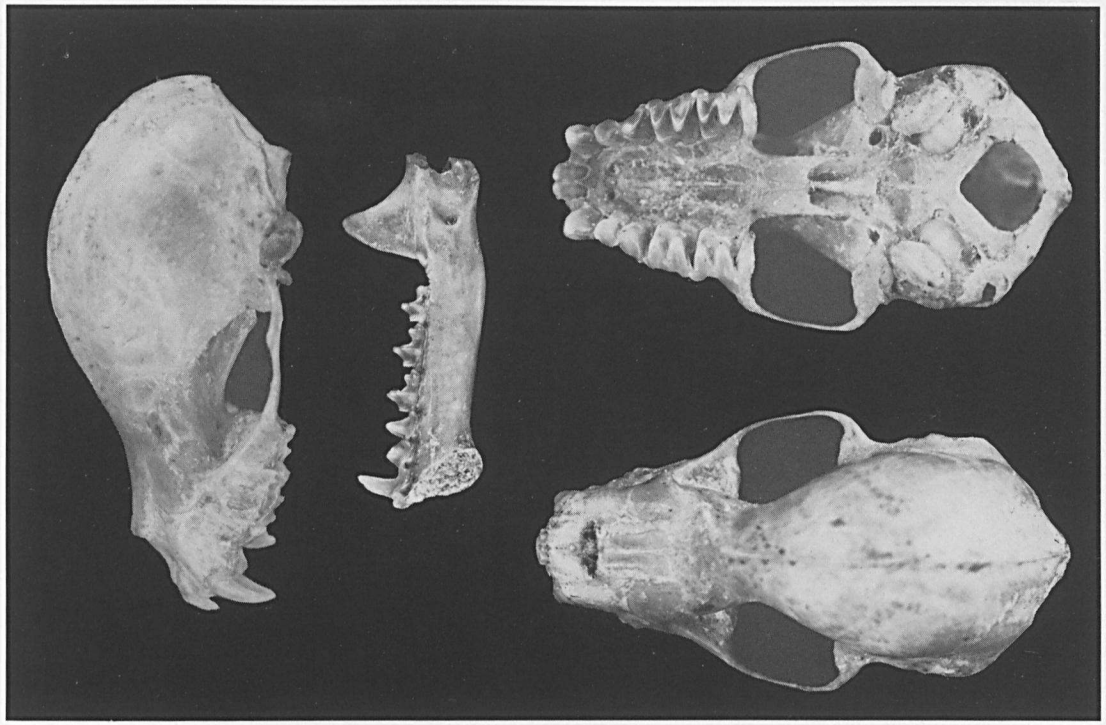


Tonatia carriheri (J. A. Allen), ZMB no. 4234

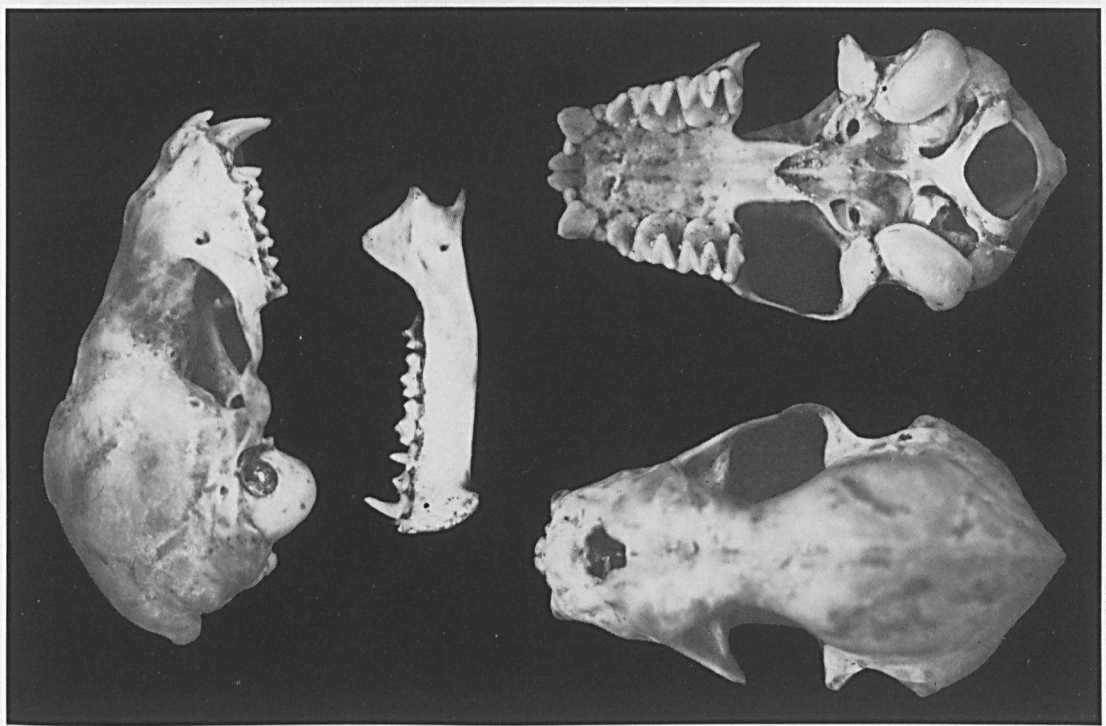


Tonatia silvicola laephotis Thomas, no. 15786

PLATE 19

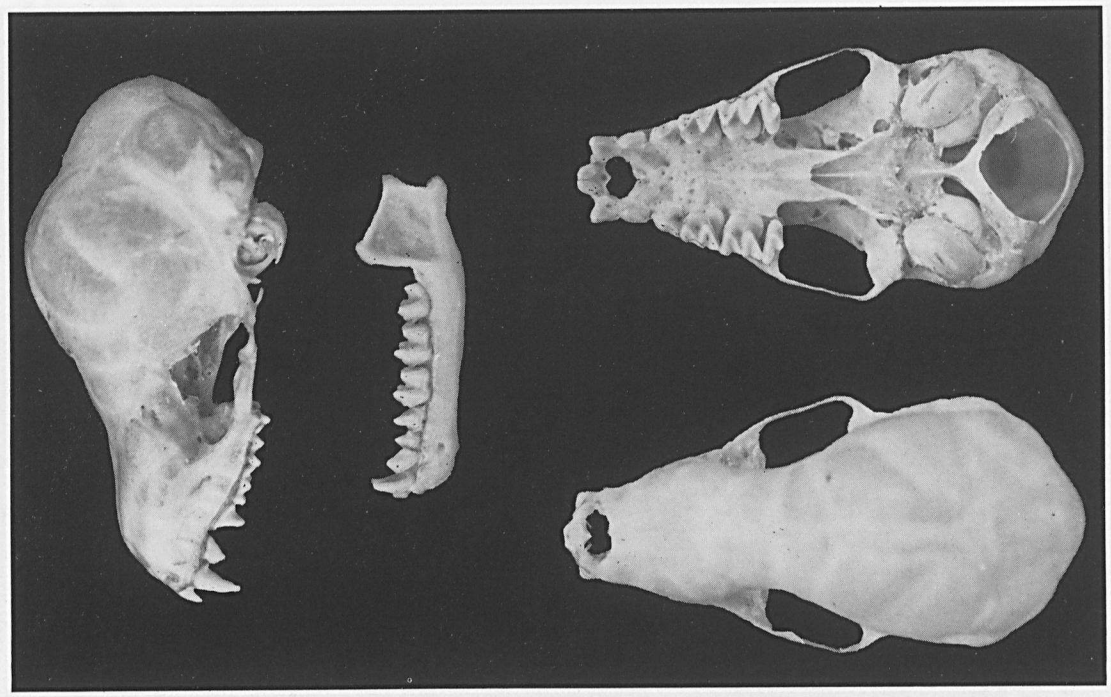


Mimom bennettii (Gray), ZMB no. 3350a

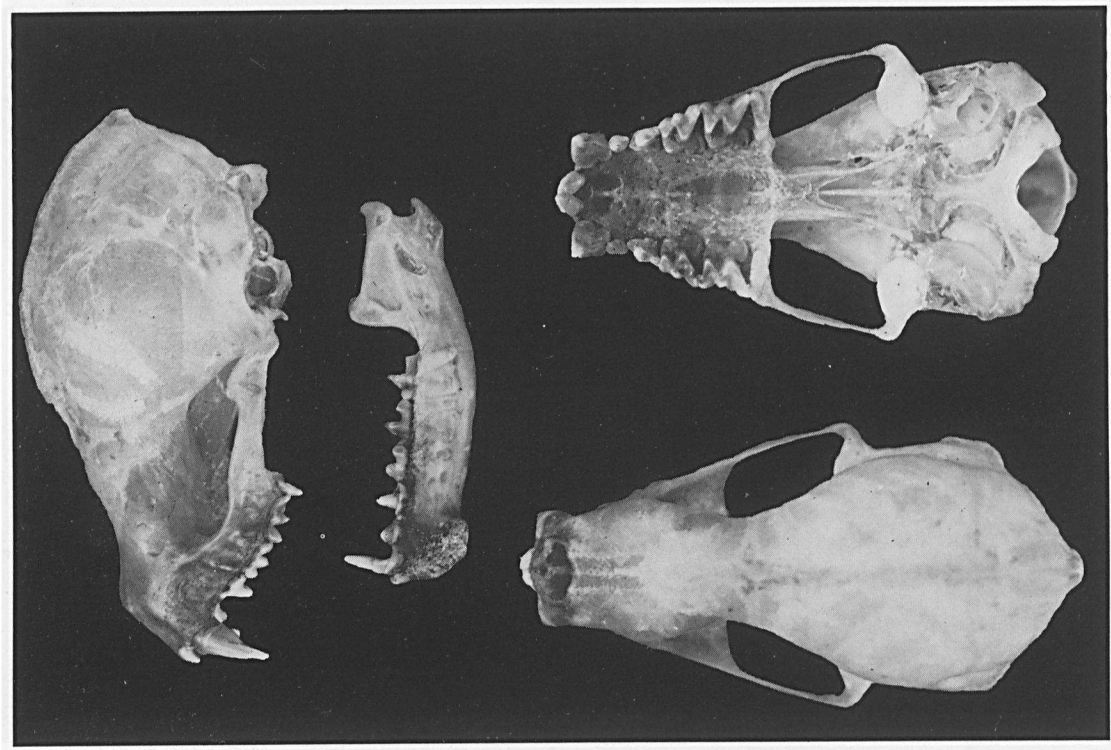


Anthorhina crenulata (E. Geoffroy), no. 12089

PLATE 20

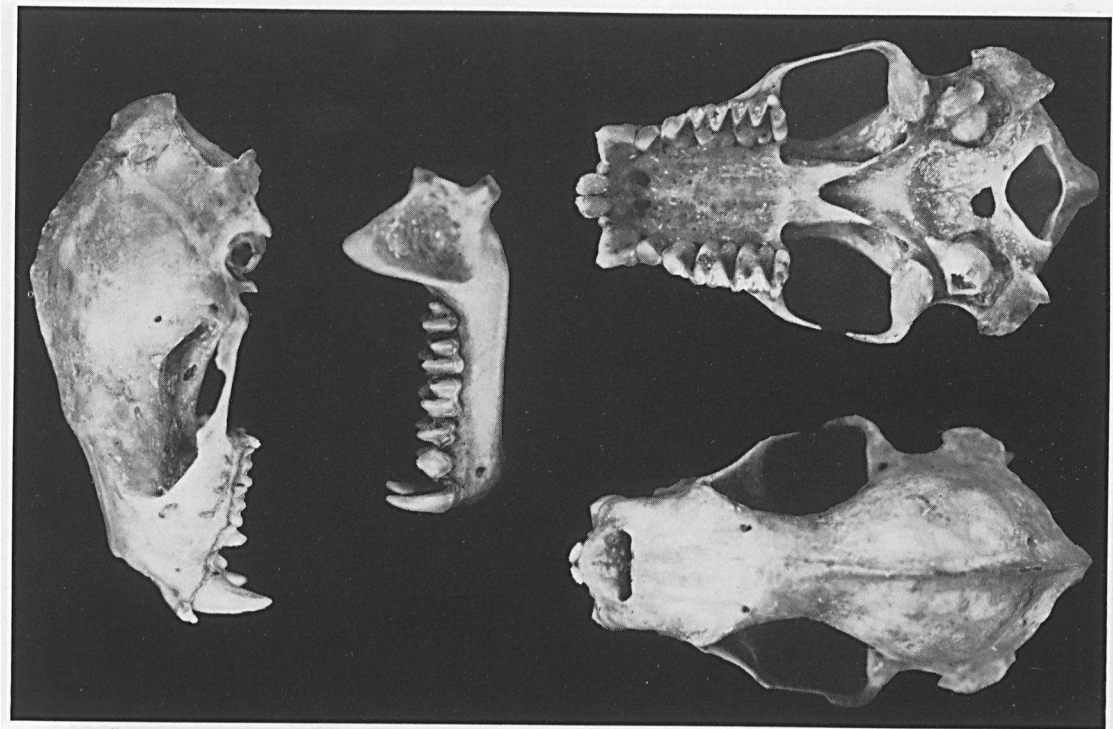


Micronycteris megalotis megalotis (Gray), ZMB no. 4265b

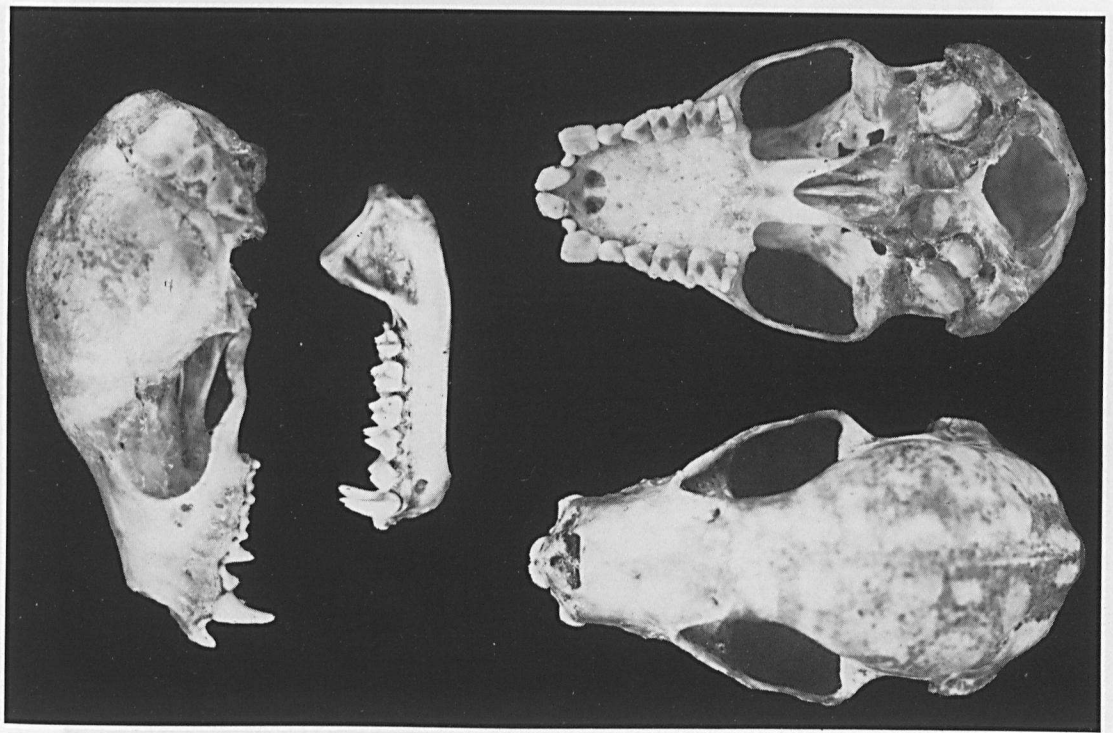


Trachops cirrhosus cirrhosus (Spix), no. 13127

PLATE 21

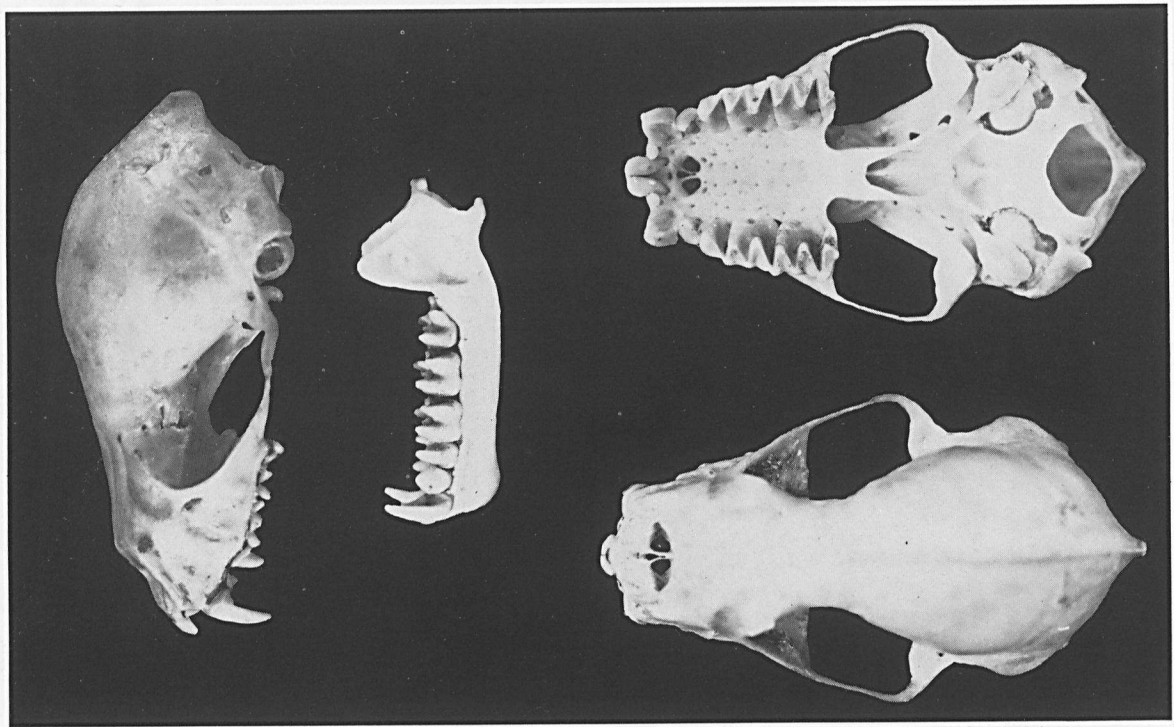


Phyllostomus hastatus hastatus (Pallas), no. 15887

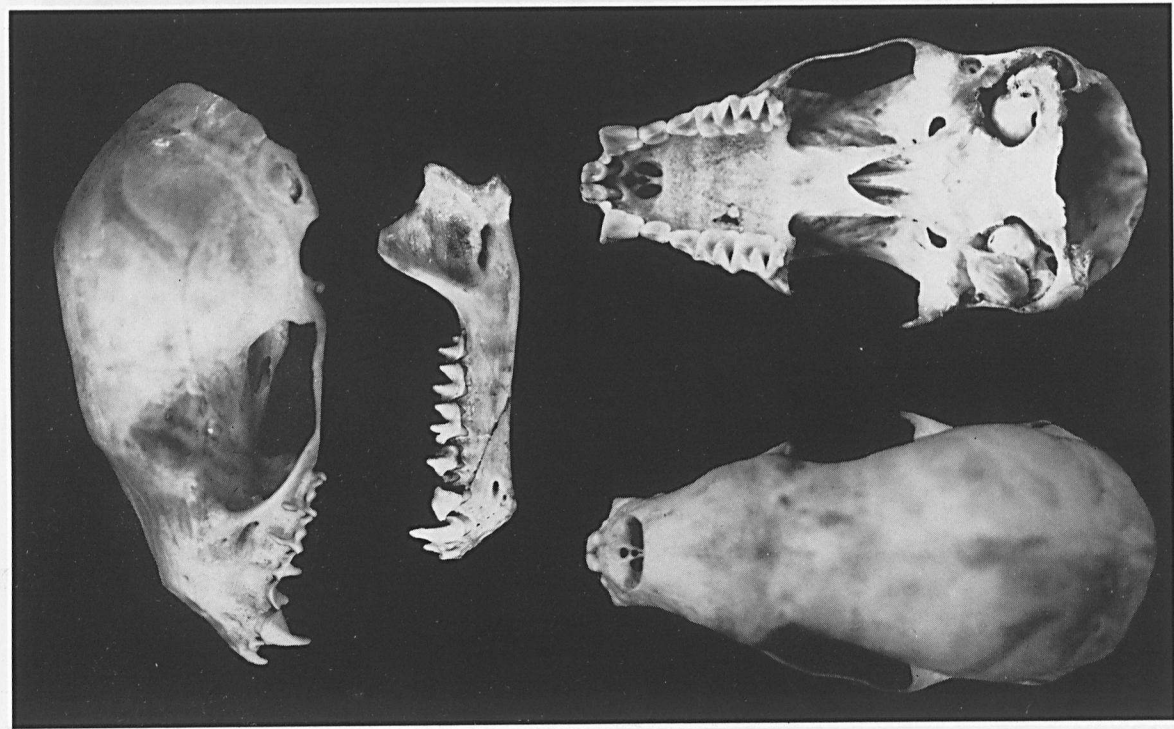


Phyllostomus discolor discolor (Wagner), CNHM no. 93187

PLATE 22

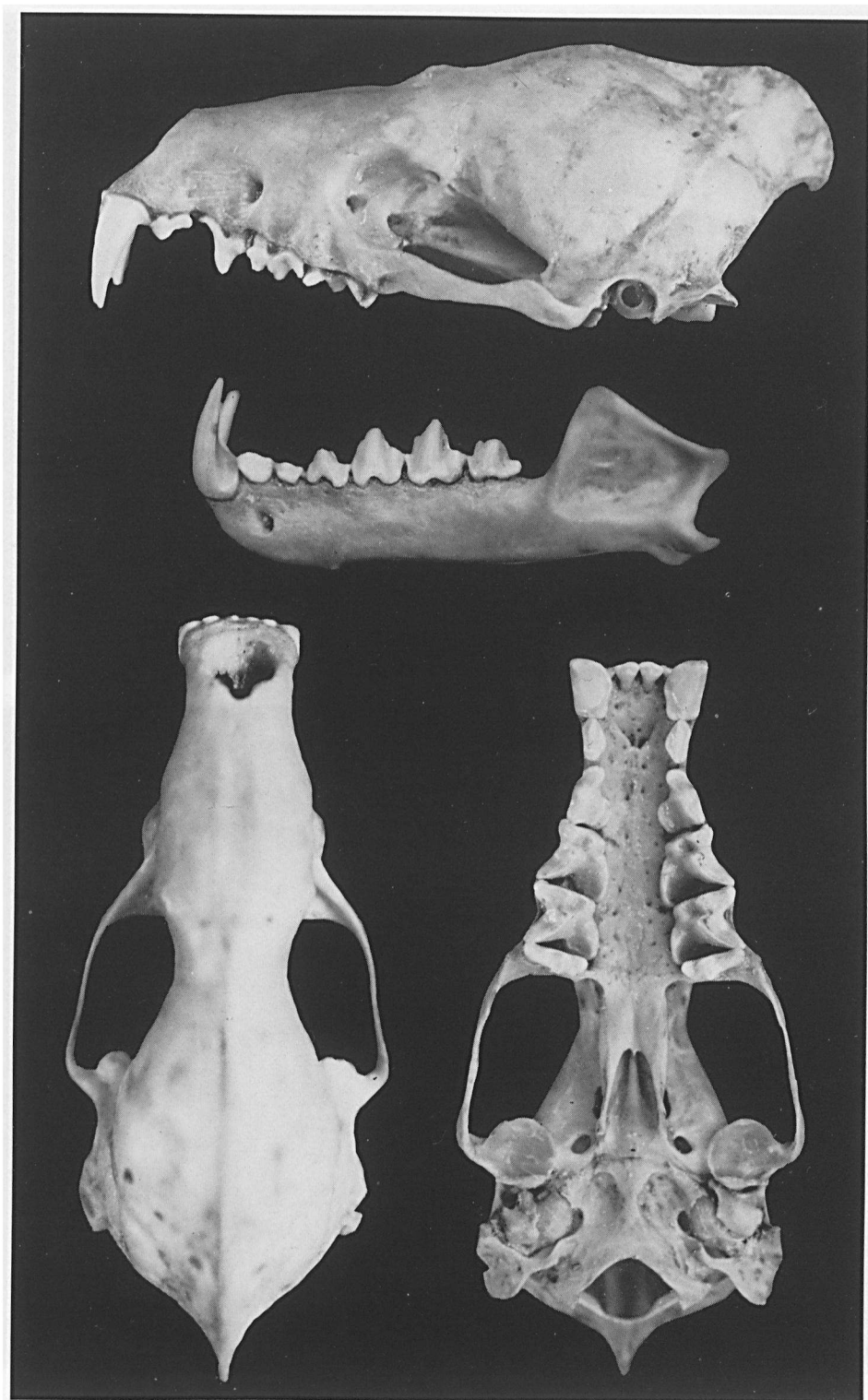


Phyllostomus elongatus (E. Geoffroy), ZMB no. 3217



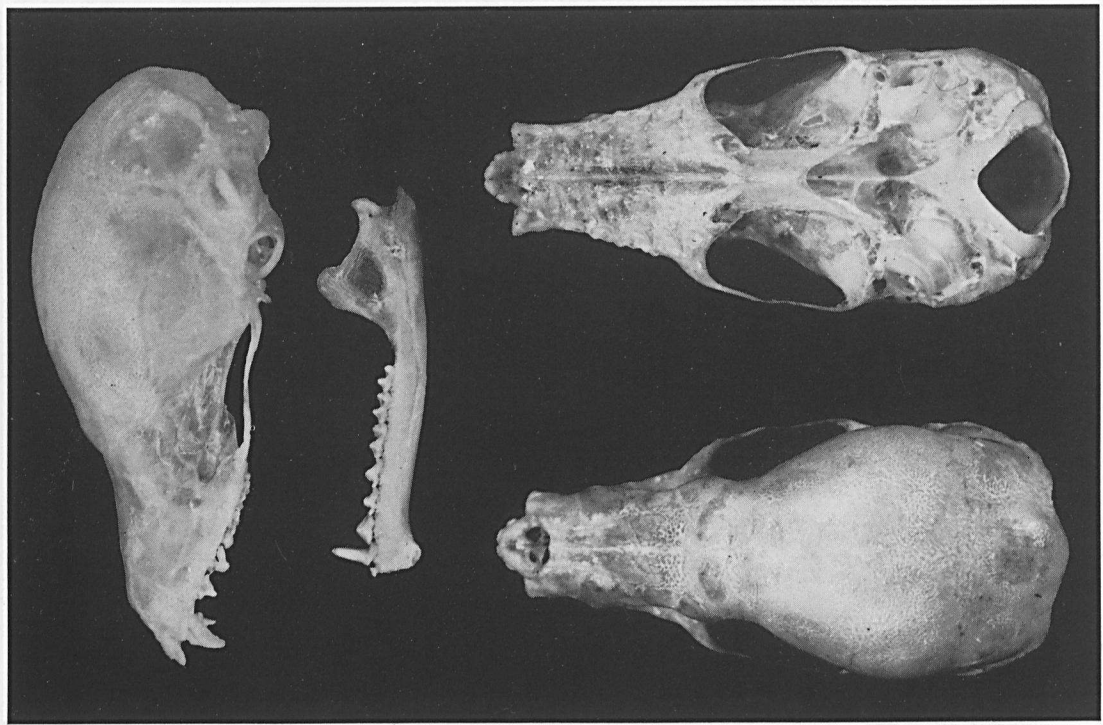
Phyloderma stenops (Peters), holotype, no. 16843

PLATE 23

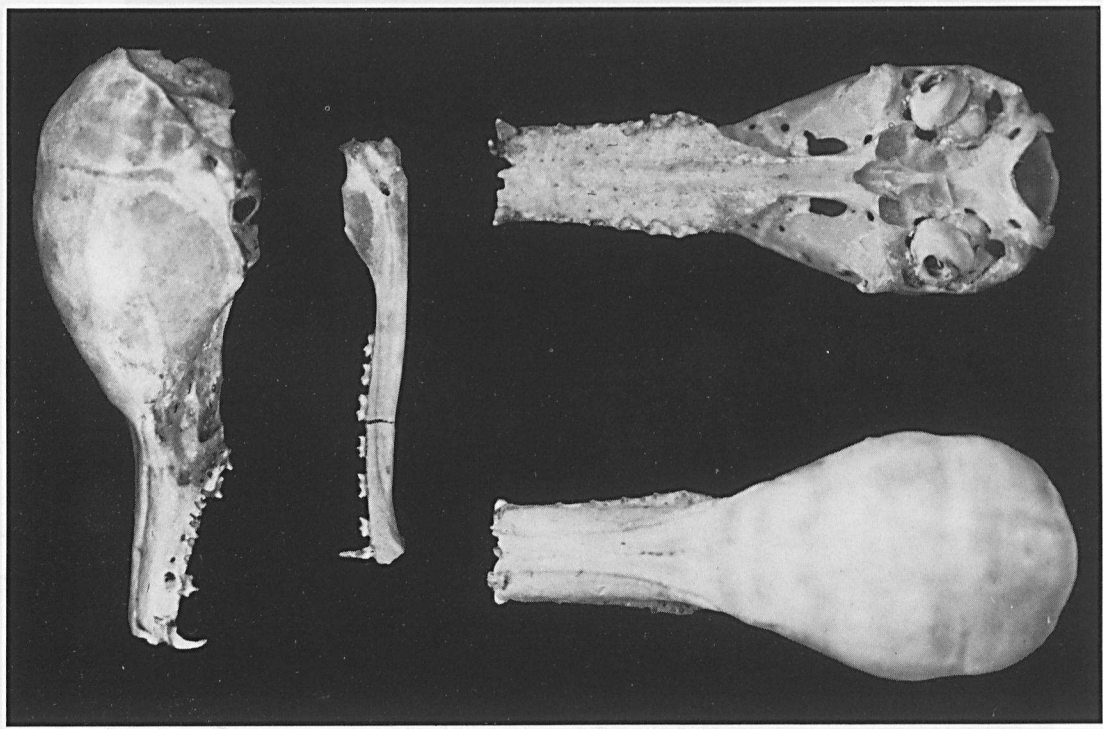


Vampyrum spectrum (L.), no. 15909

PLATE 24

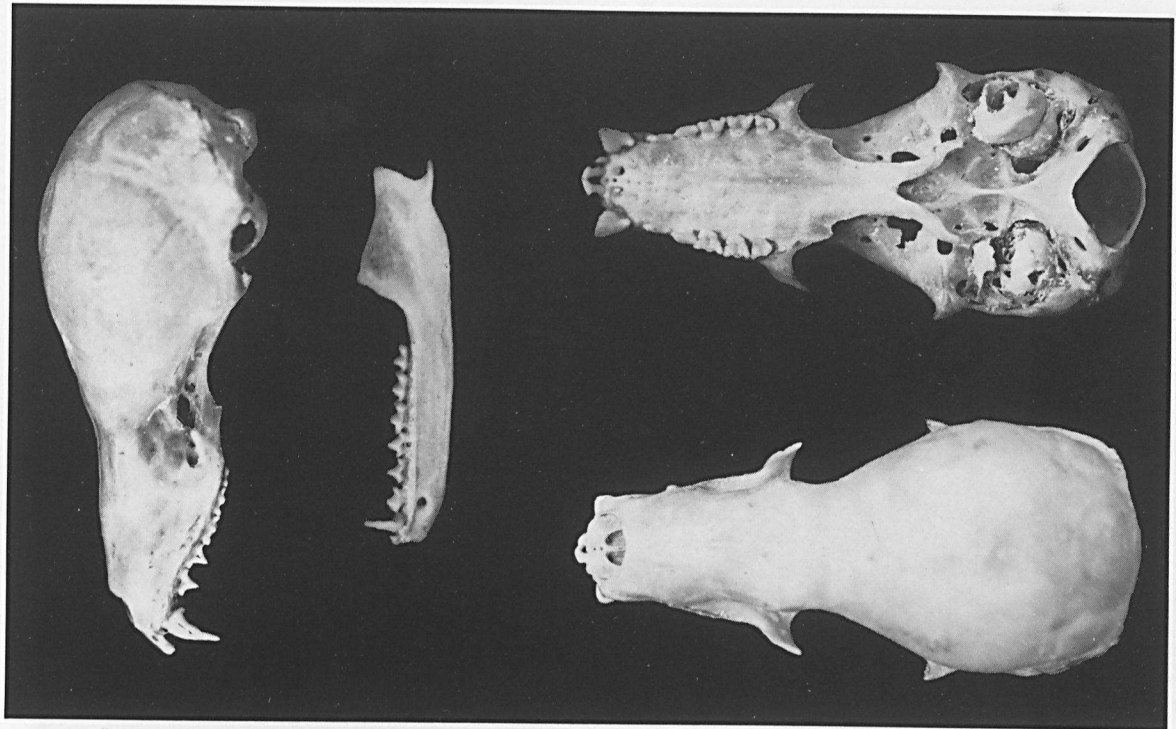


Glossophaga soricina soricina (Pallas), no. 13505

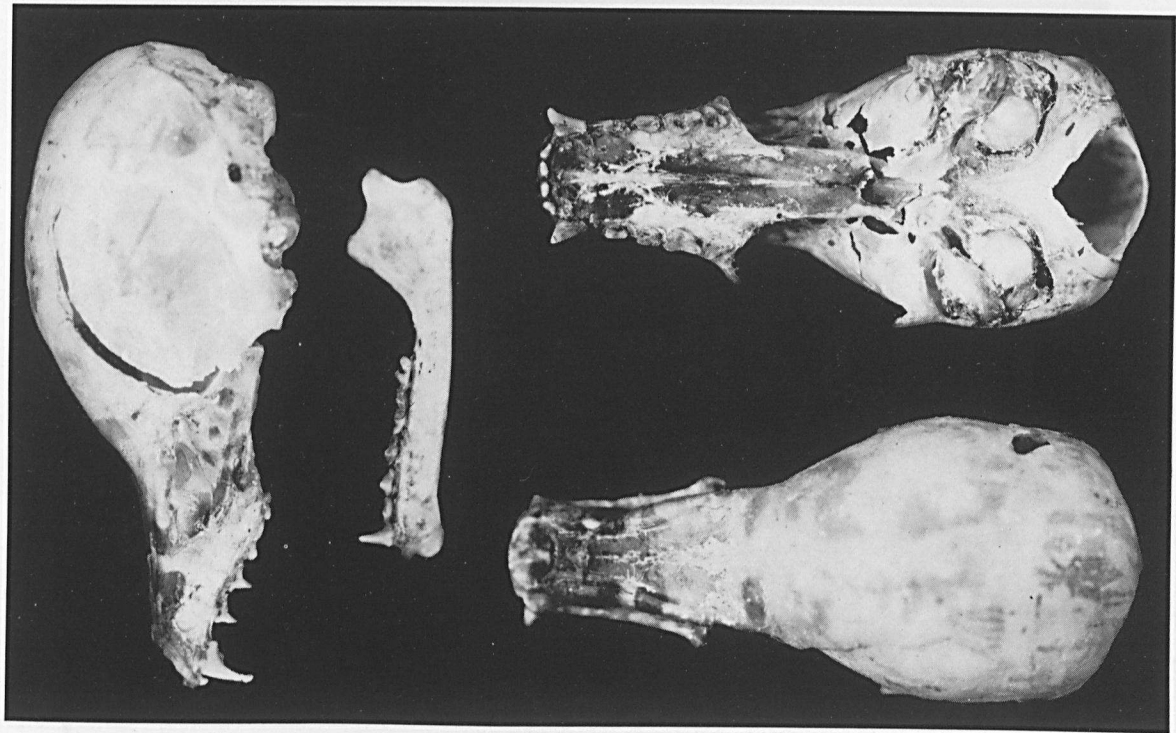


Chaeromiscus minor (Peters), SMN no. 441

PLATE 25

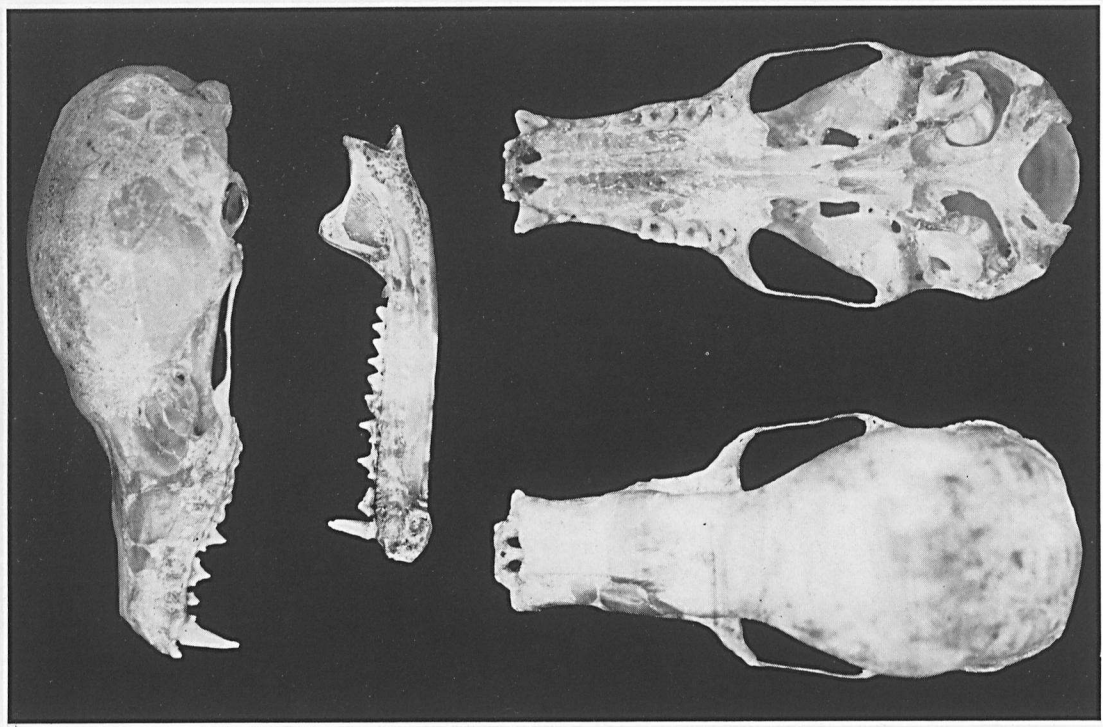


Lonchophylla thomasi J. A. Allen, SMN no. 264-1410b

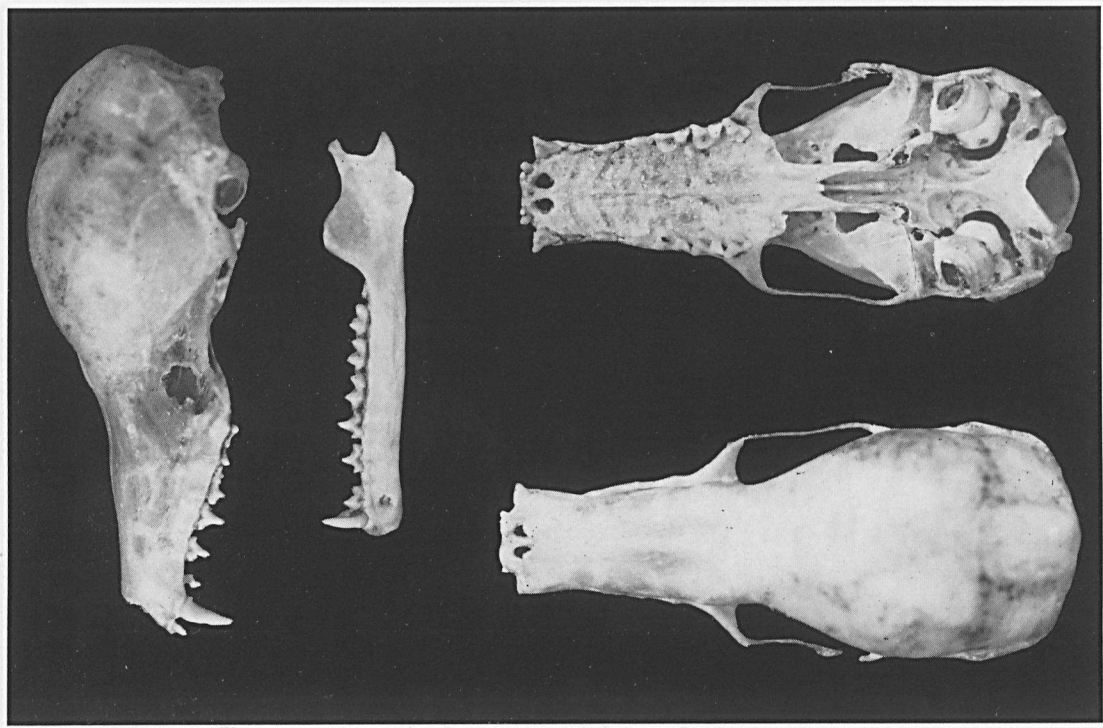


Lichonycteris obscura Thomas, BMNH no. 96.10.1.20

PLATE 26

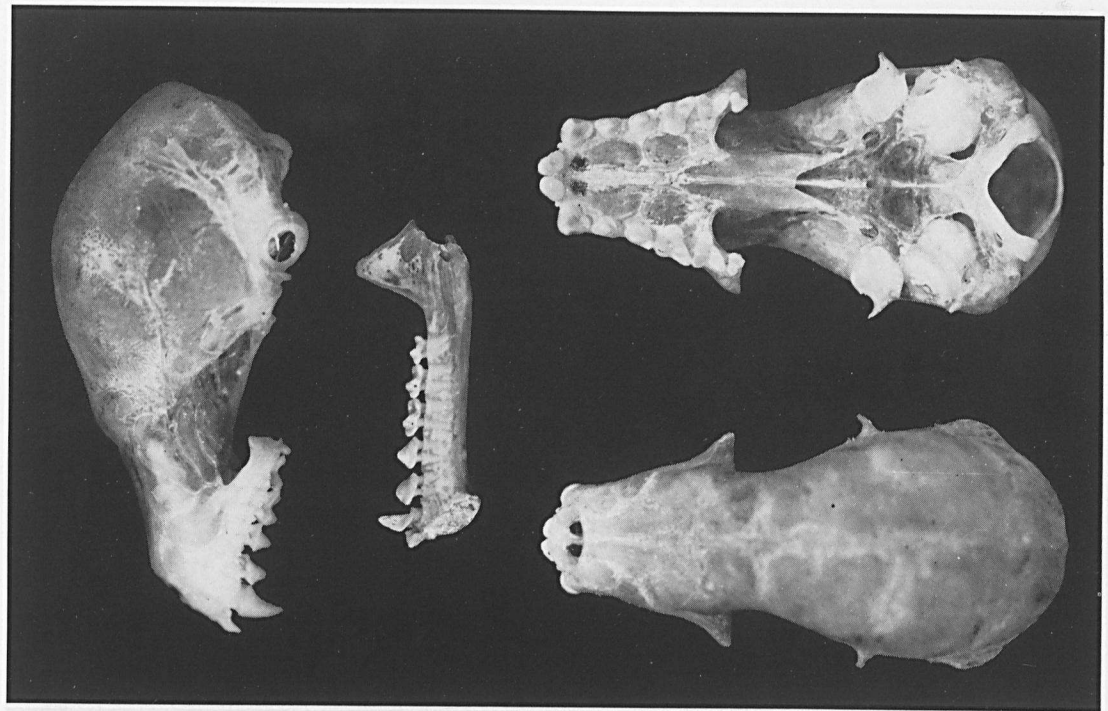


Anoura Geoffroyi Geoffroyi Gray, no. 16416

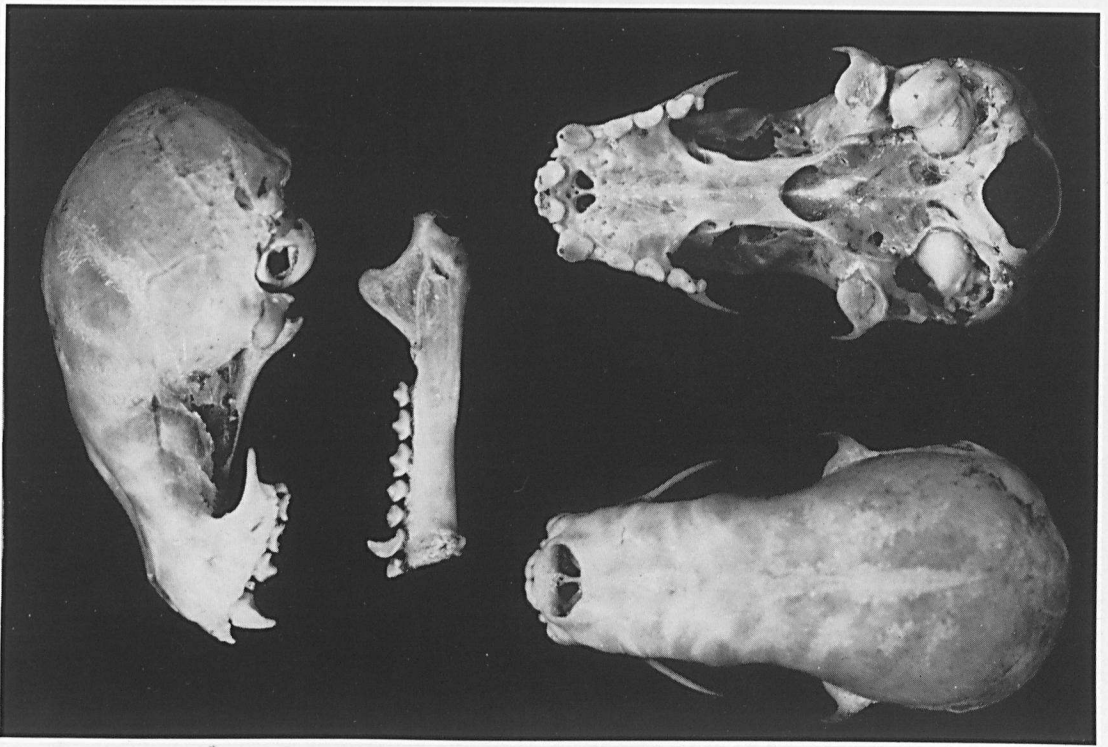


Anoura caudifer caudifer (E. Geoffroy), no. 13487

PLATE 27

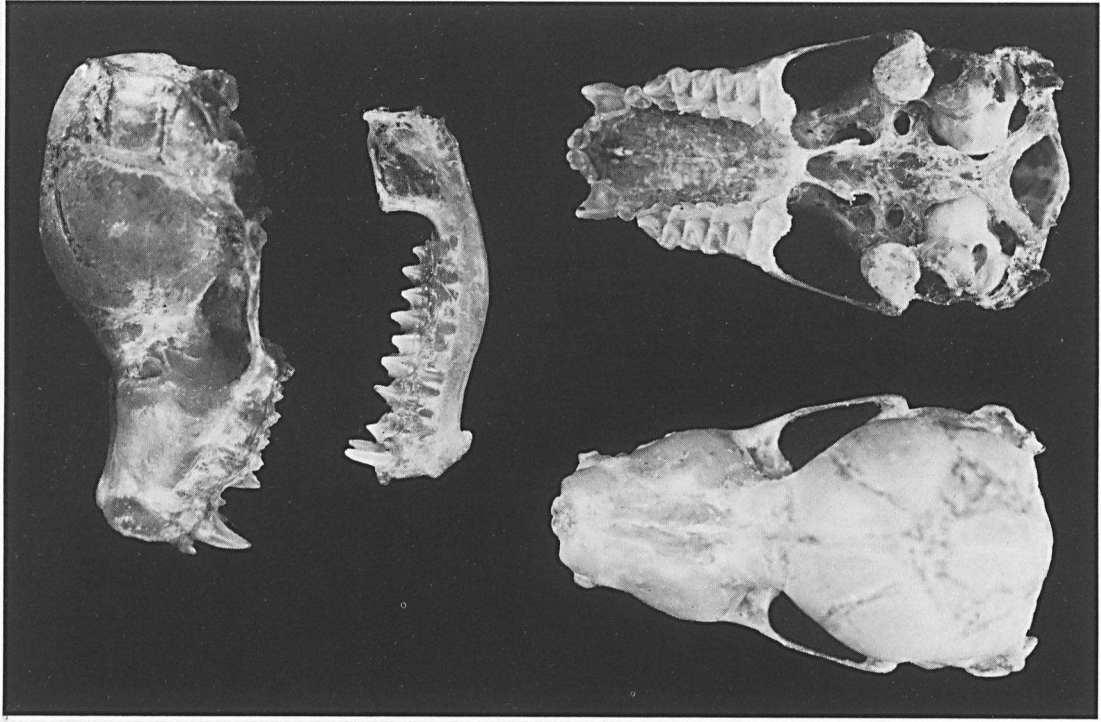


Carollia perspicillata perspicillata (L.), no. 12085

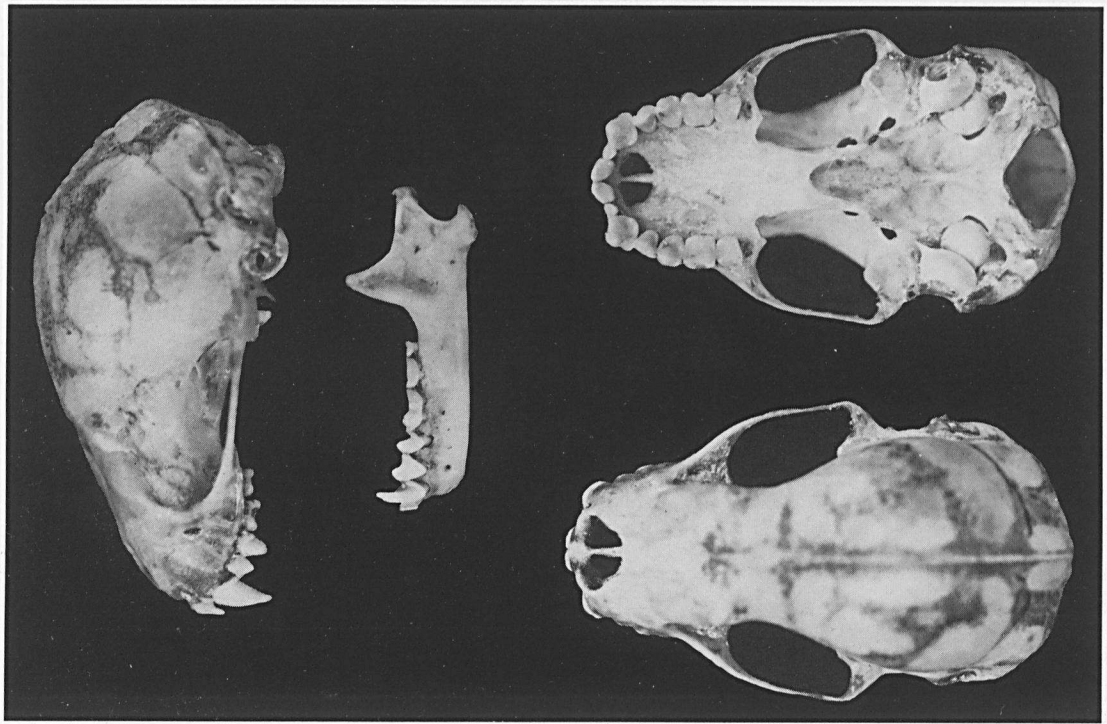


Rhinophylla pumilio Peters, SMN no. 289-1

PLATE 28

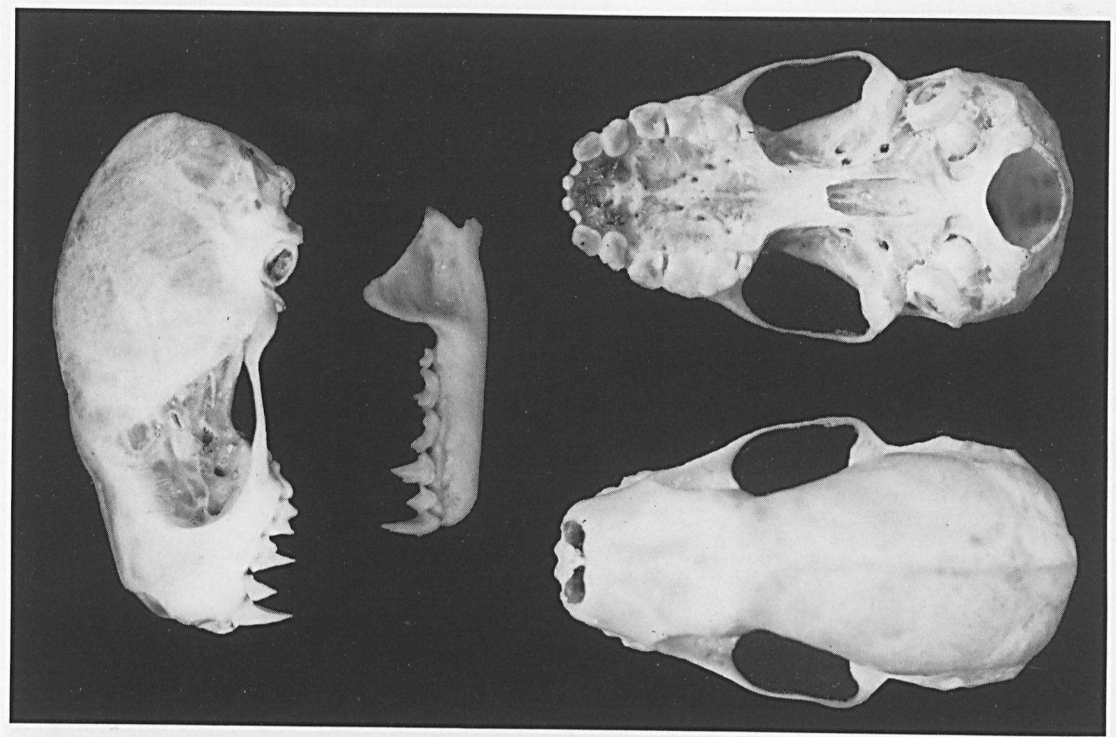


Chilonycteris rubiginosa rubiginosa Wagner, no. 16420

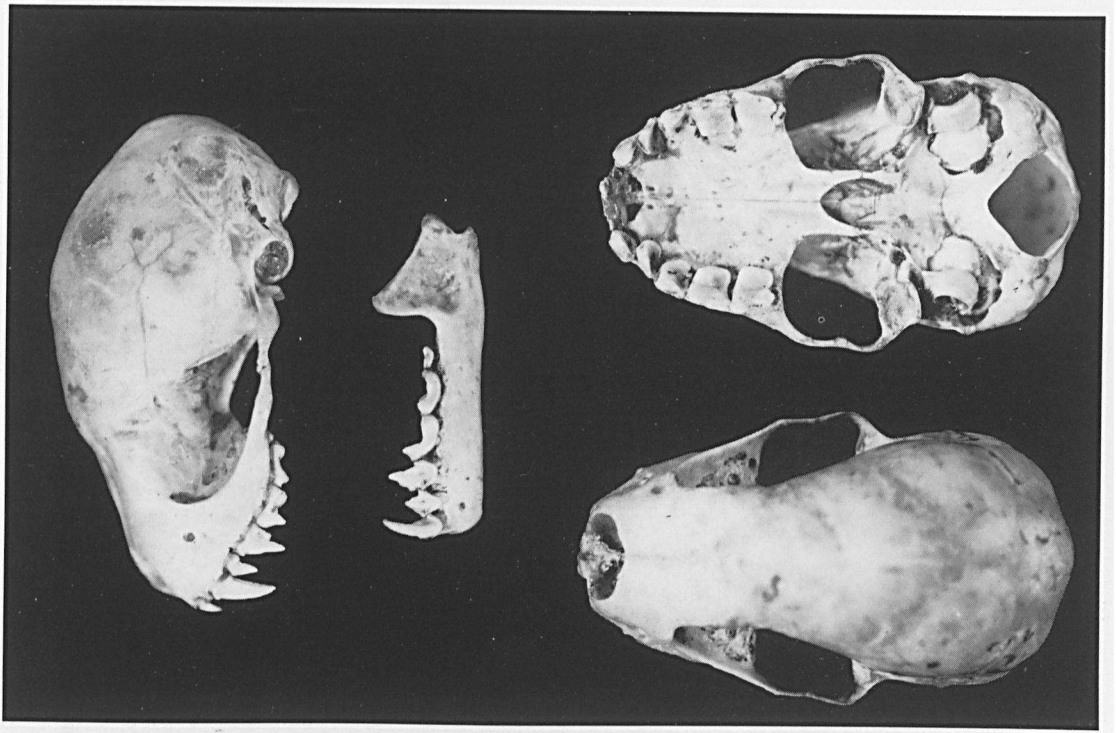


Sturnira lilium lilium (E. Geoffroy), CNHM no. 93206

PLATE 29

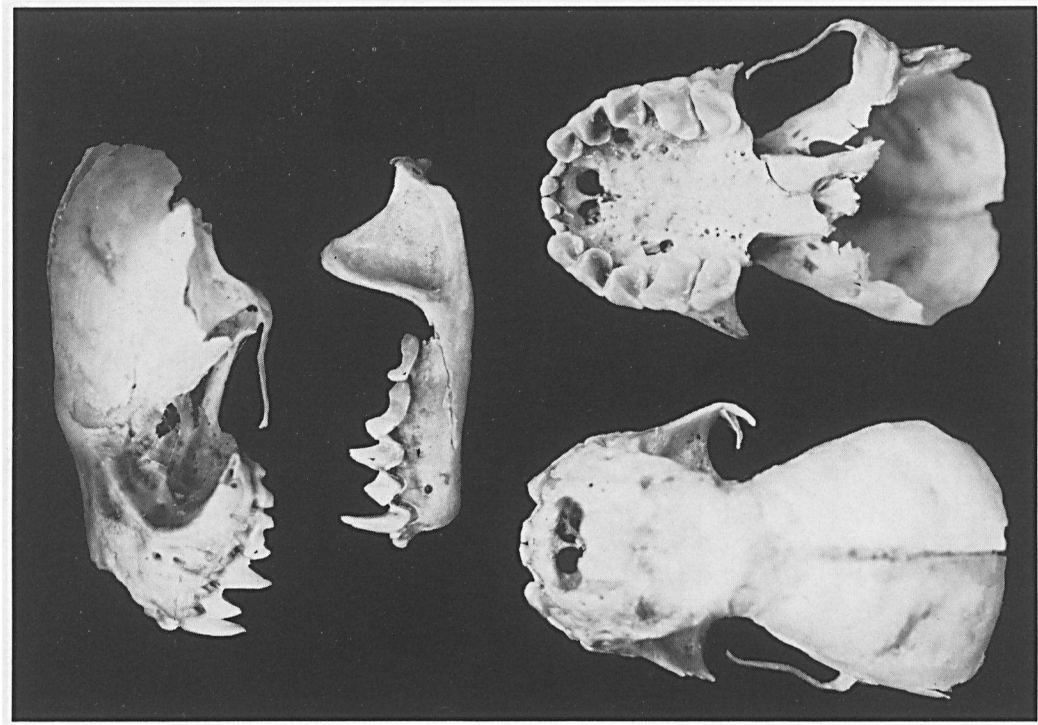


Uroderma bilobatum bilobatum Peters, no. 13080

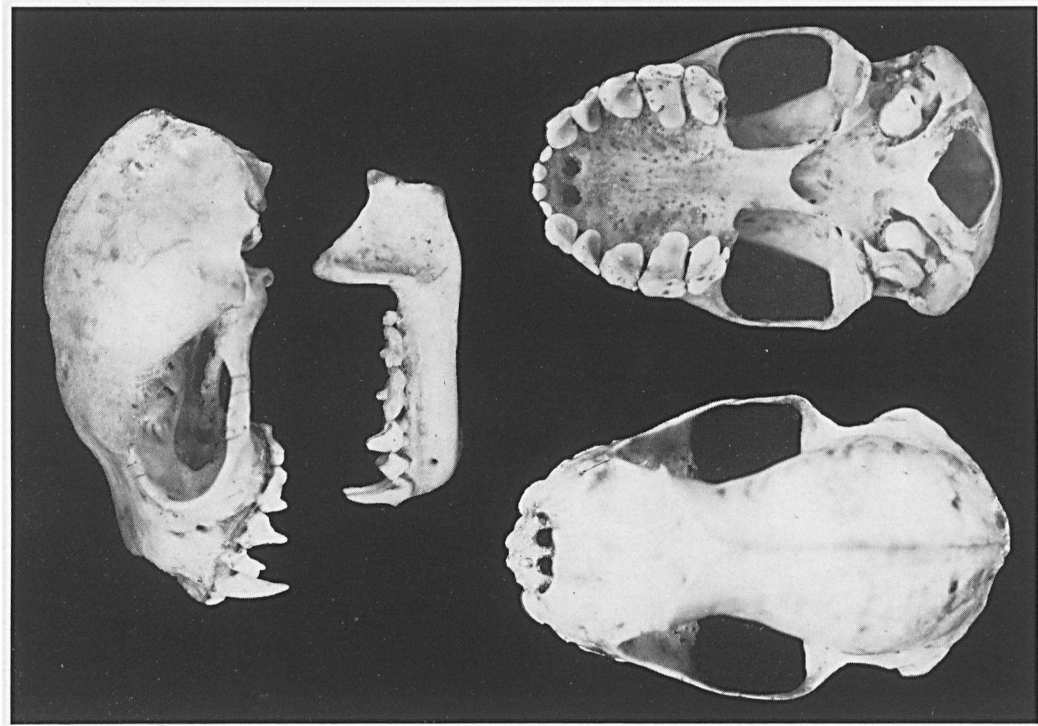


Vampyrops helleri Peters, no. 12087

PLATE 30

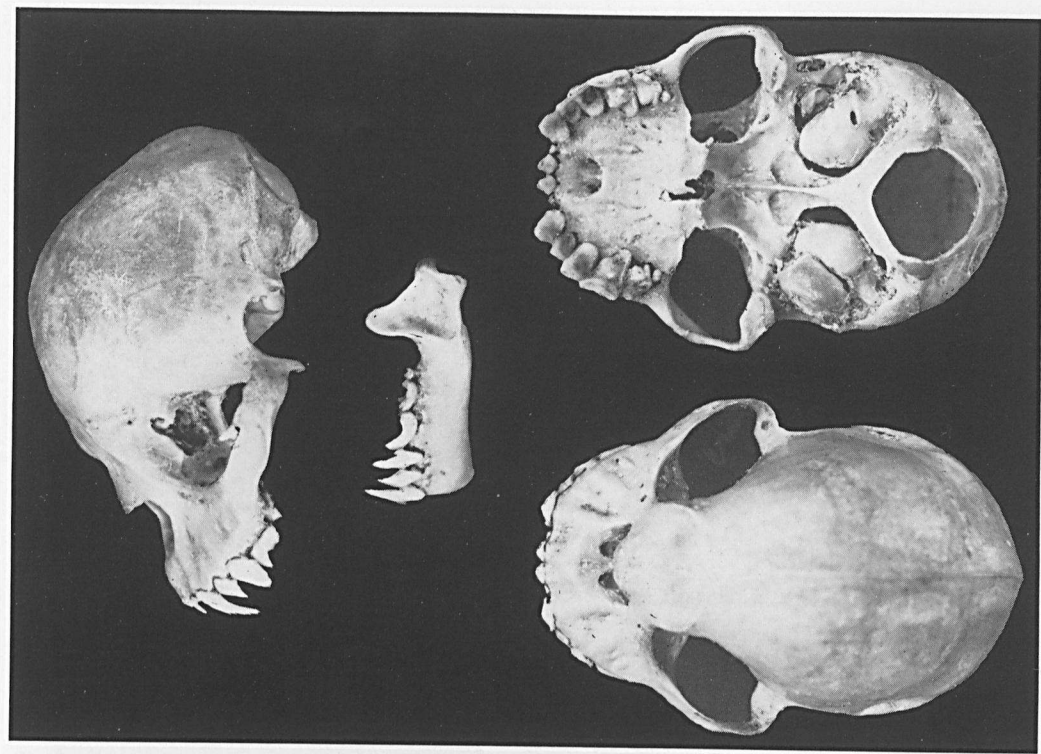


Artibeus cinereus cinereus (Cervais), holotype of *A. quadrivittatus* Peters, no. 13114

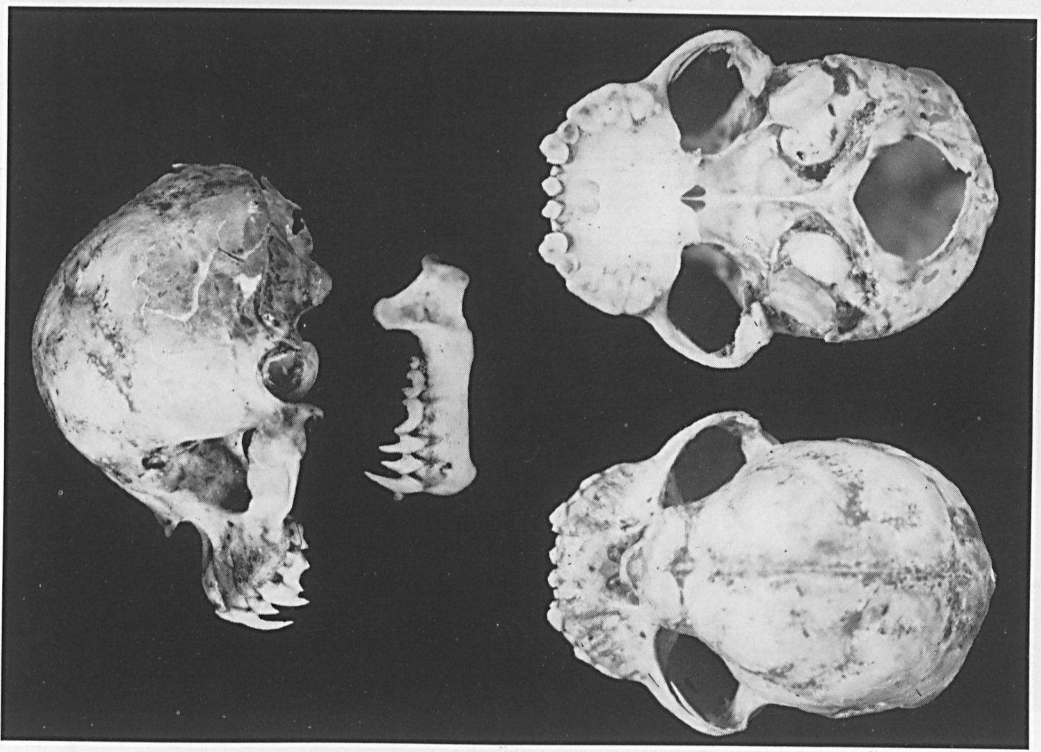


Artibeus lituratus fallax Peters, lectotype, no. 13083

PLATE 3I

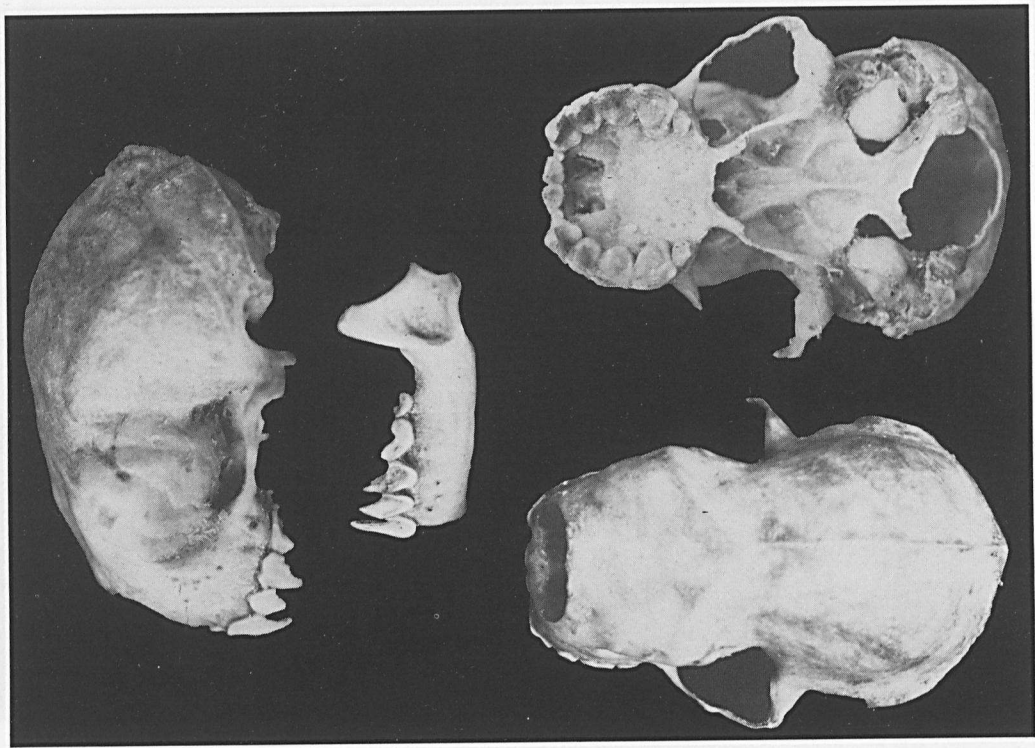


Ametrida centurio Gray, ♀, SMN no. 1633

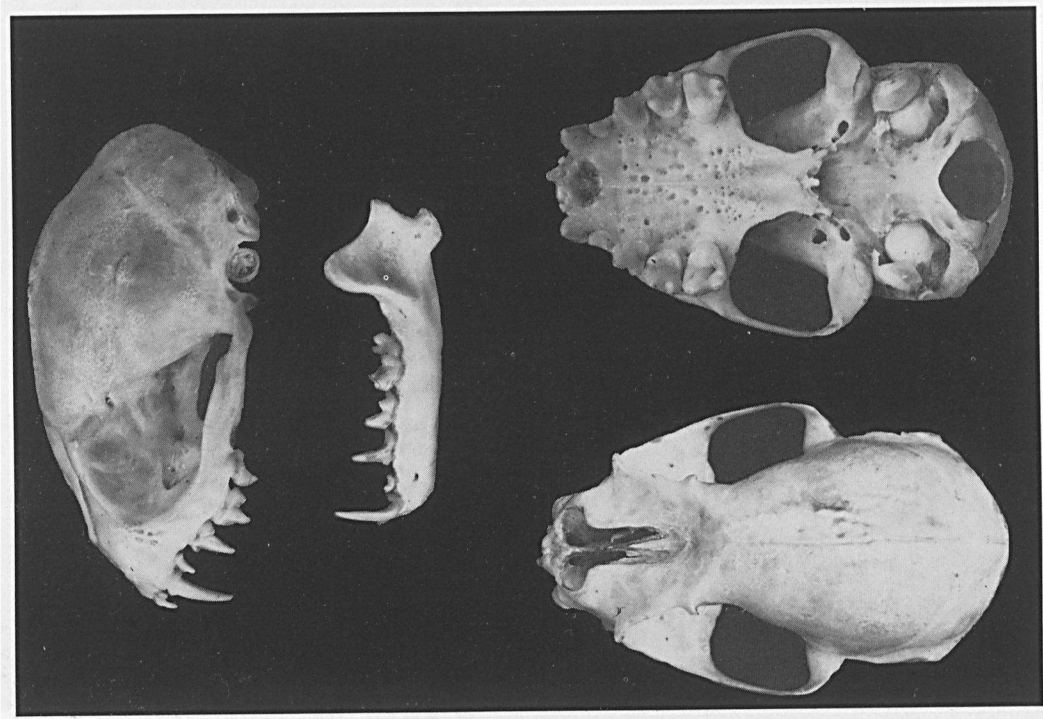


Ametrida centurio Gray, ♂, CNHM no. 93204

PLATE 32

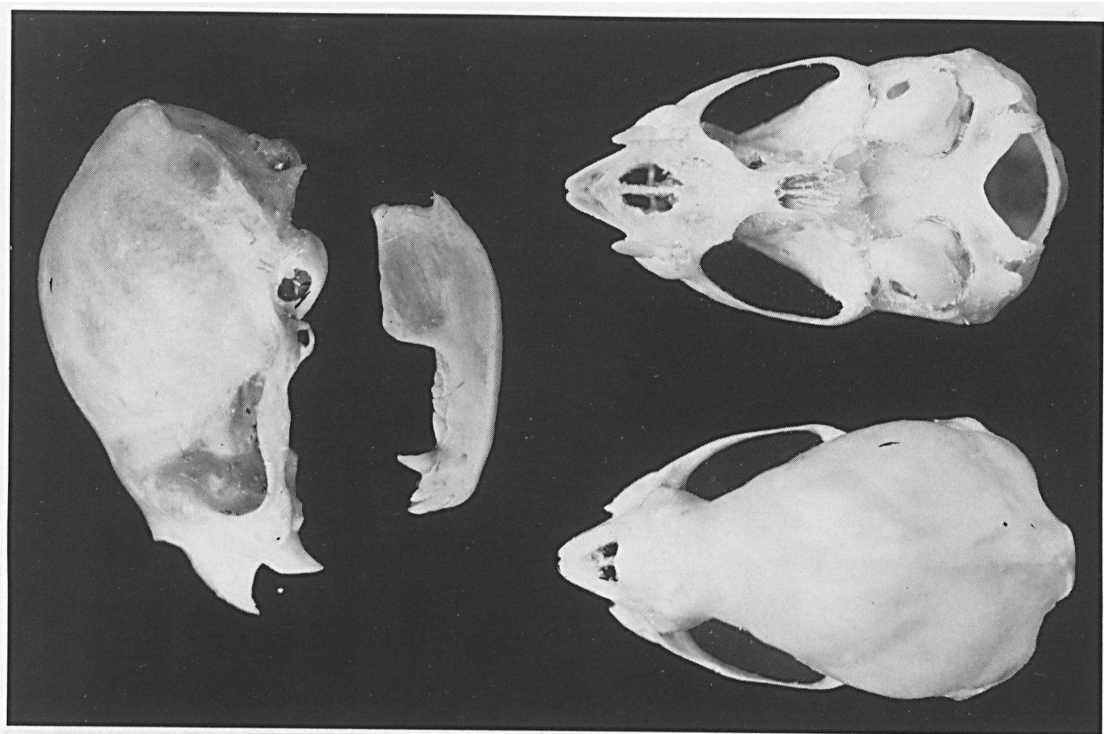


Pygoderma bilabiatum (Wagner), no. 17391

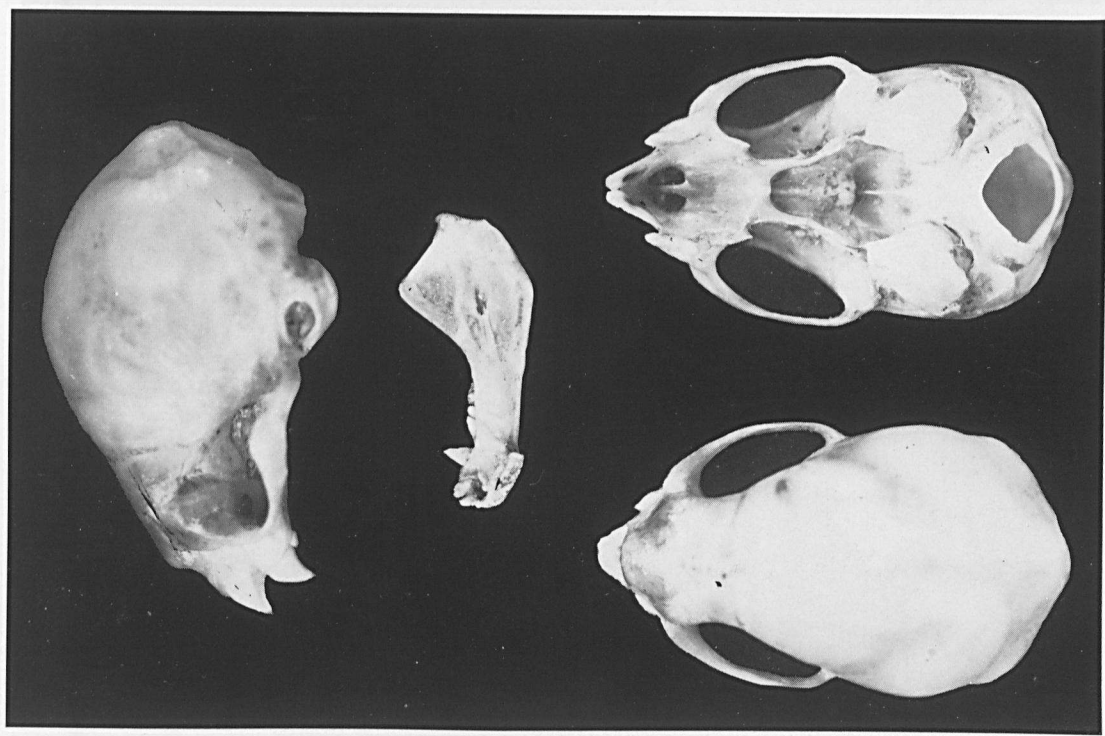


Chiroderma villosus Peters, SMN no. 1450

PLATE 33

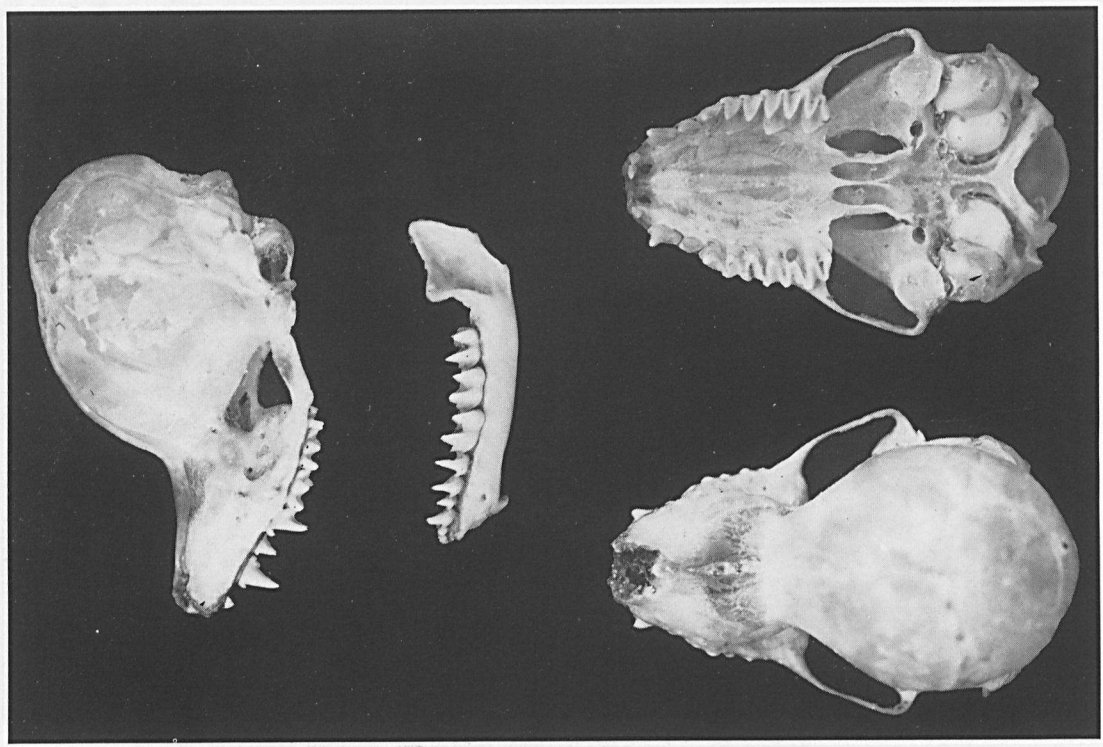


Desmodus rotundus rotundus (E. Geoffroy), SMN no. 3538-1

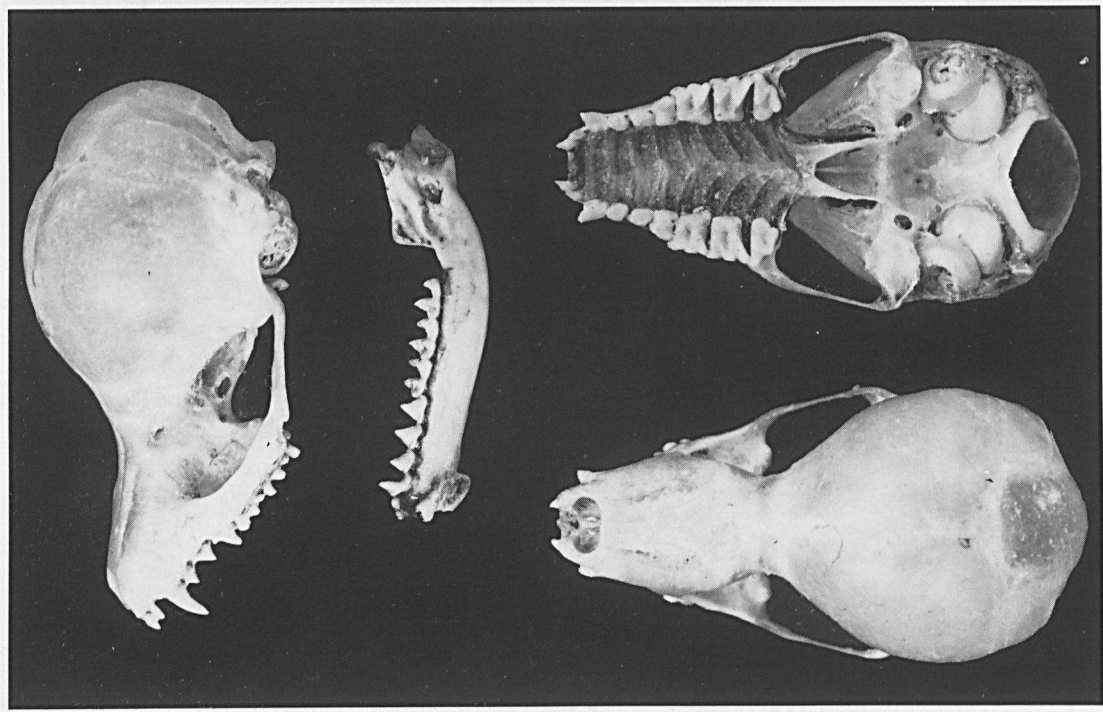


Diaemus youngii youngii (Jentink), holotype, no. 12088

PLATE 34

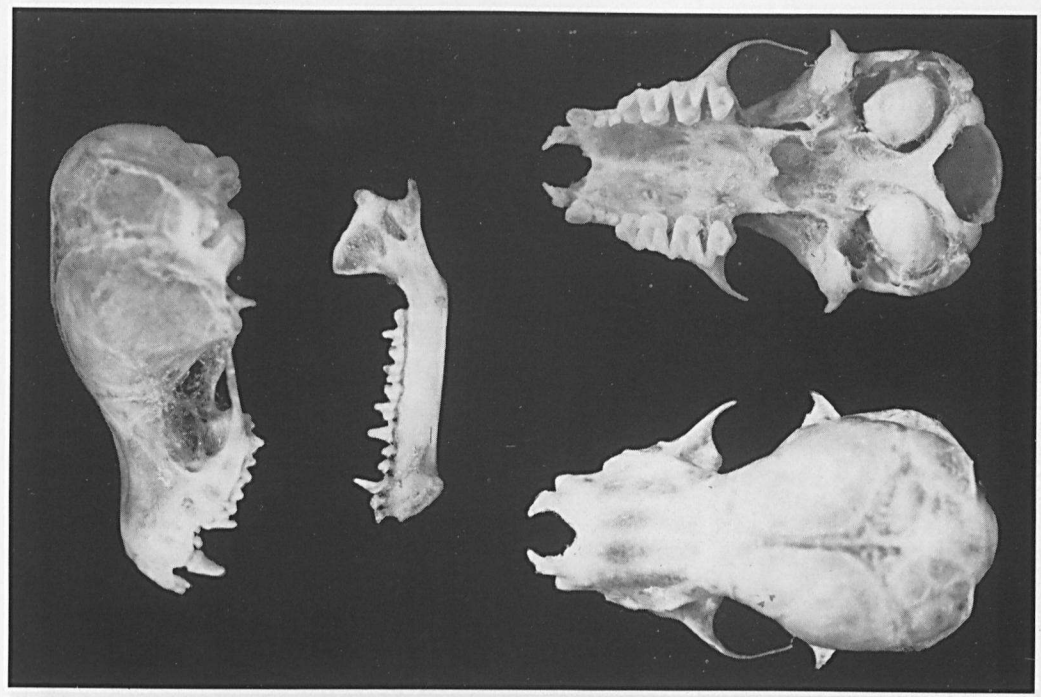


Furipterus horrens (F. Cuvier), no. 13488

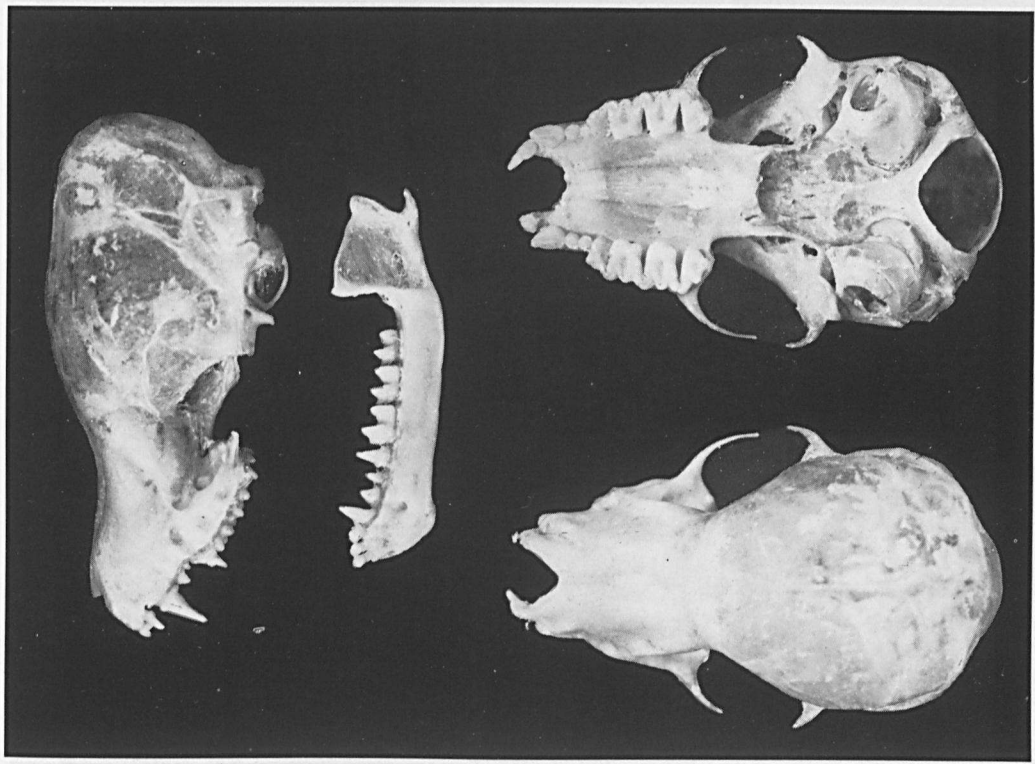


Thyroptera tricolor tricolor Spix, SMN no. 1301-3

PLATE 35

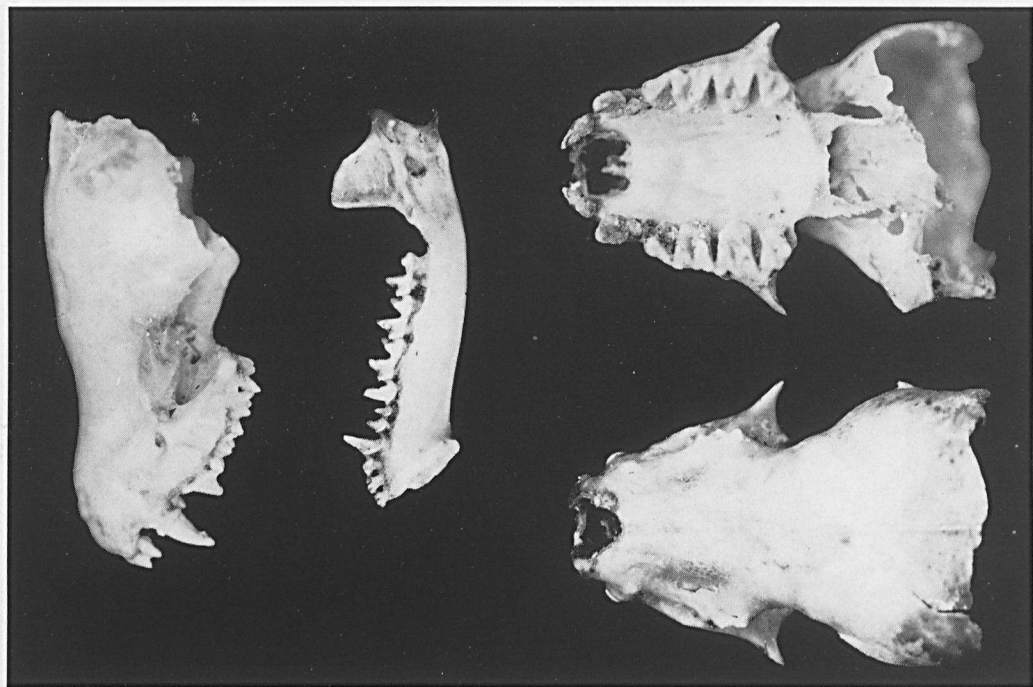


Myotis nigricans nigricans (Schinz), no. 17103

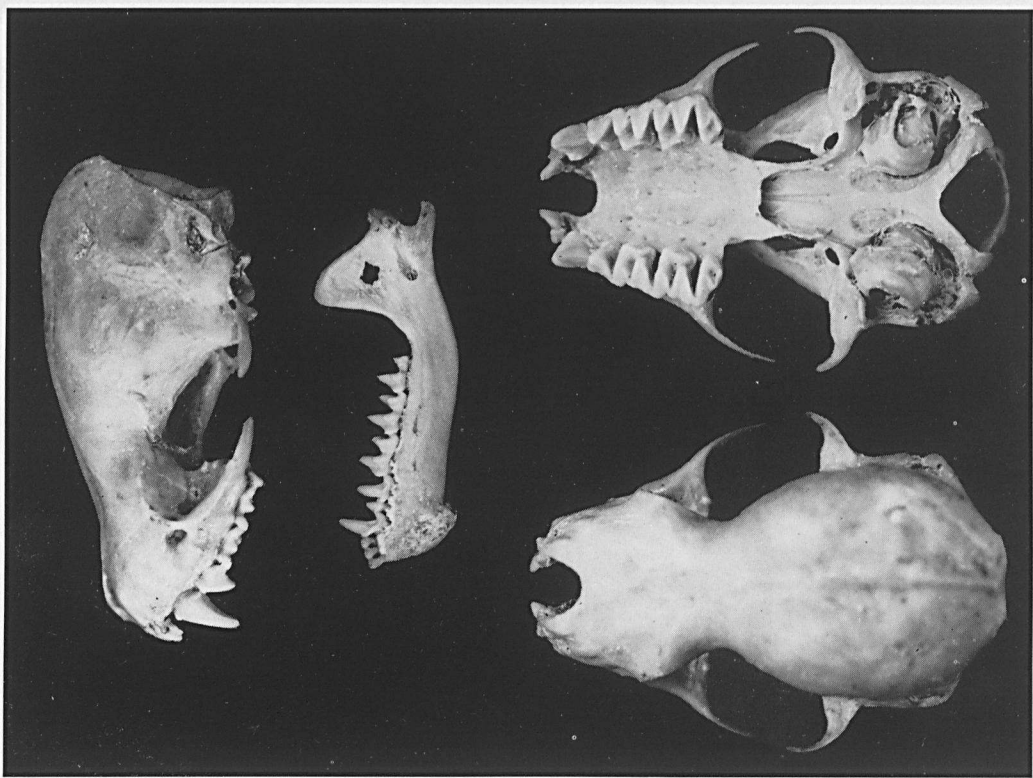


Myotis albescens (E. Geoffroy), SMN no. 264a, 861 1/2-2

PLATE 36

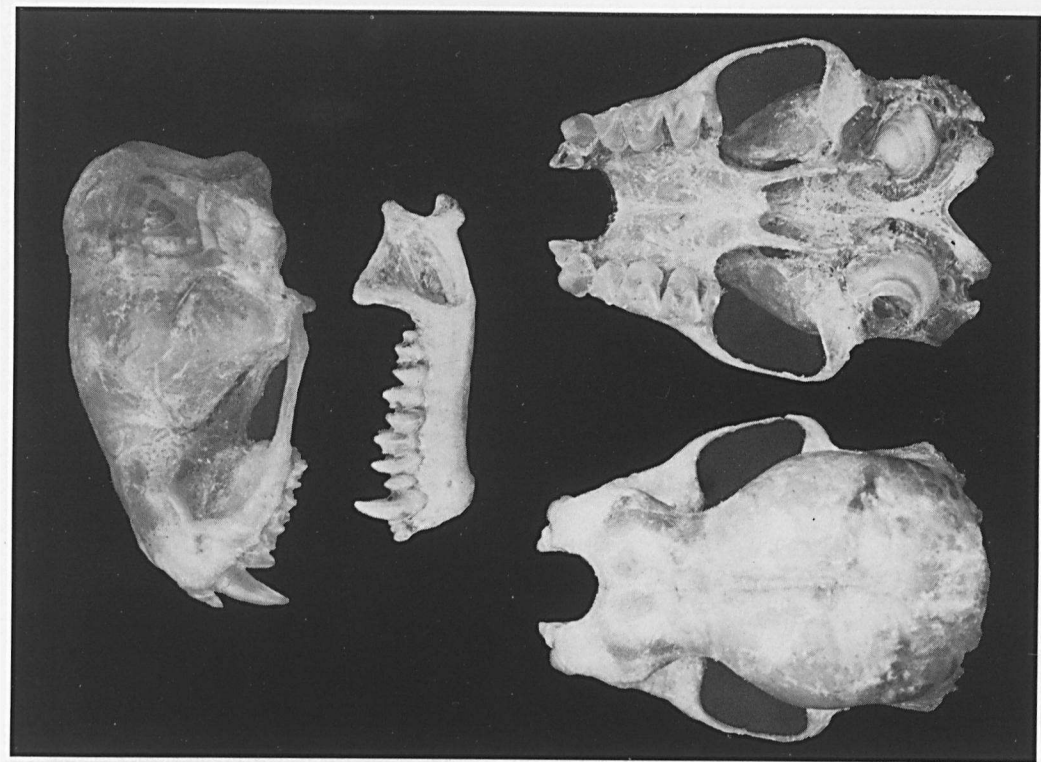


Myotis surinamensis Husson, holotype, no. 17363

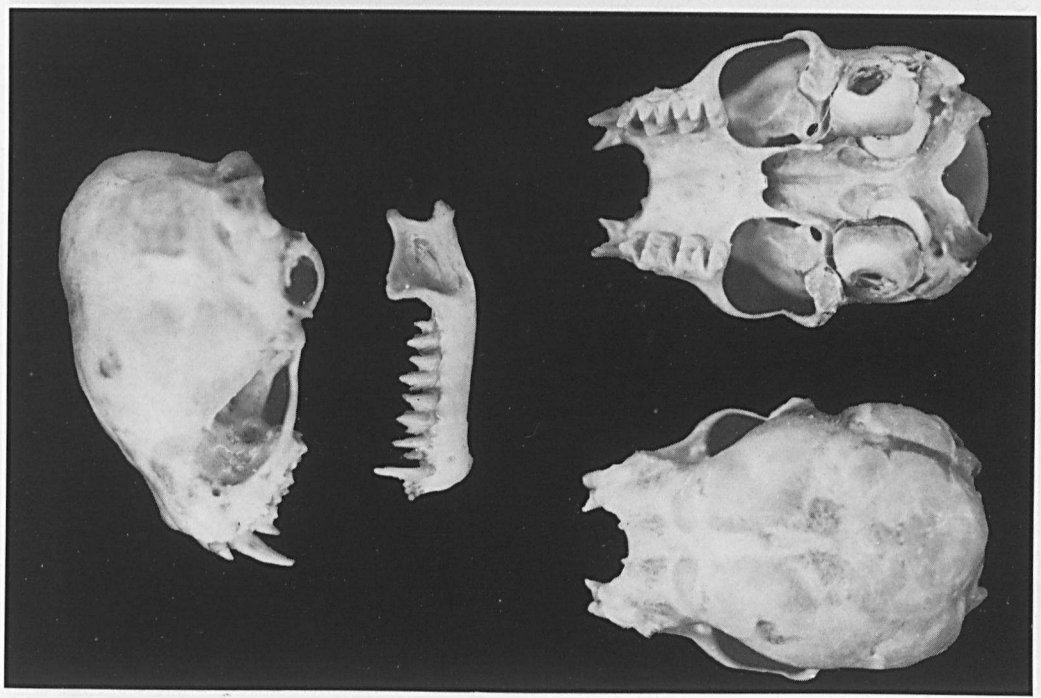


Eptesicus melanopterus (Jentink), SMN no. 264a

PLATE 37

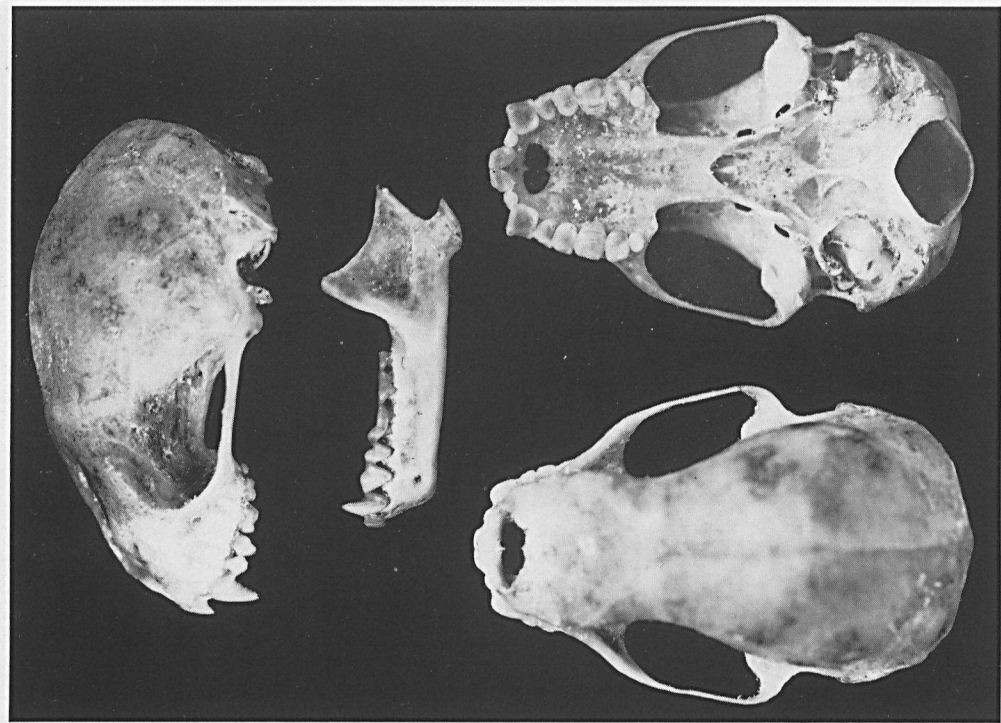


Dasypterus ega ega (Gervais), no. 17371

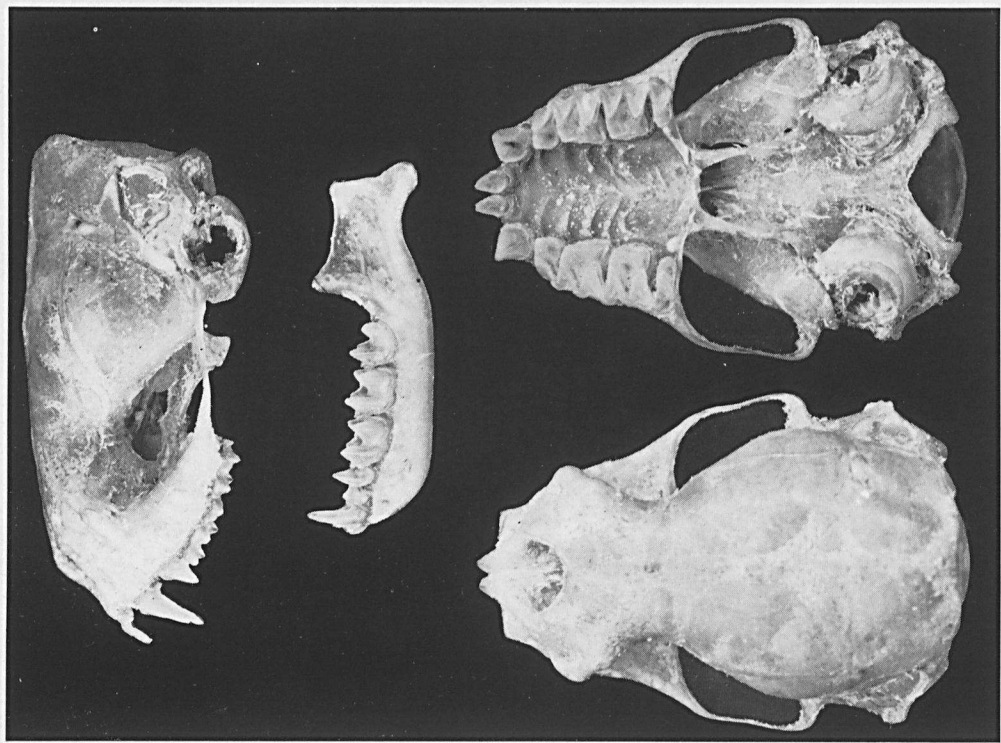


Lasius borealis frantzi (Peters), no. 17282

PLATE 38

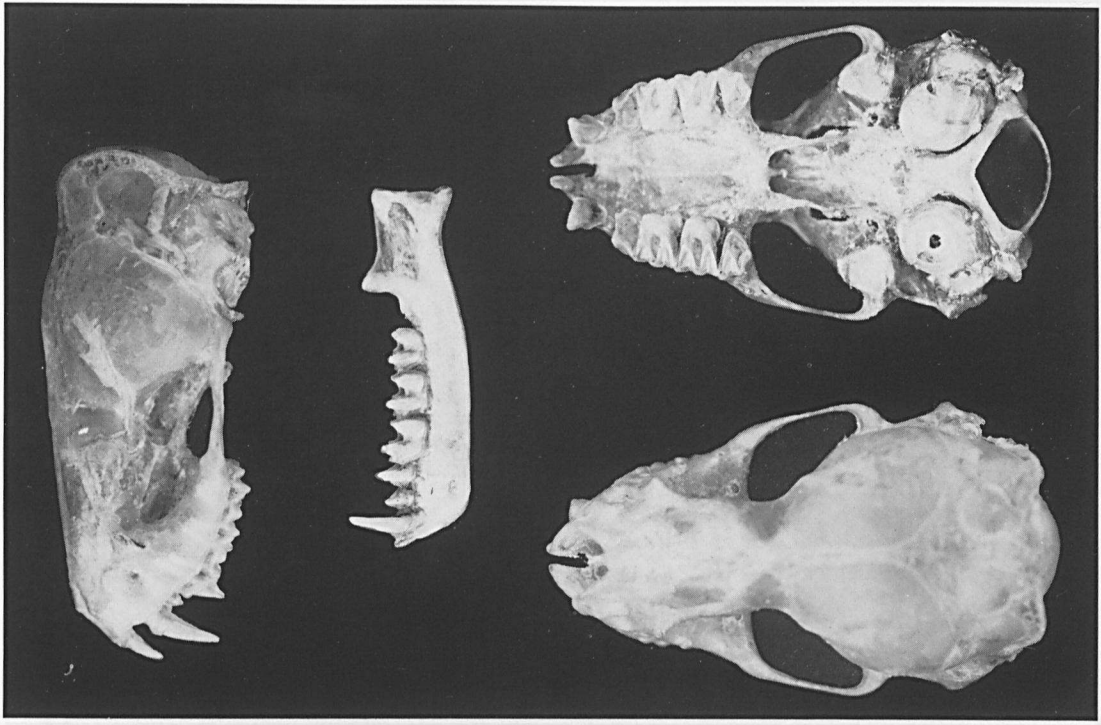


Sturnira tildae De La Torre, ZMA no. 4469

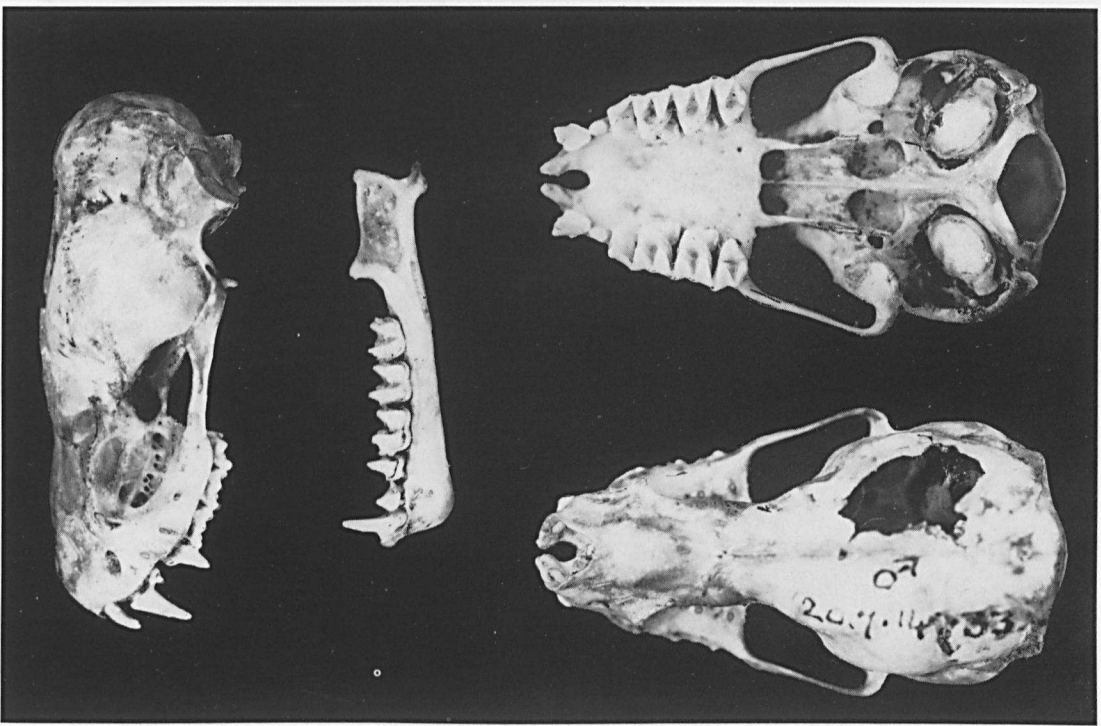


Molossops planirostris (Peters), no. 12900

PLATE 39

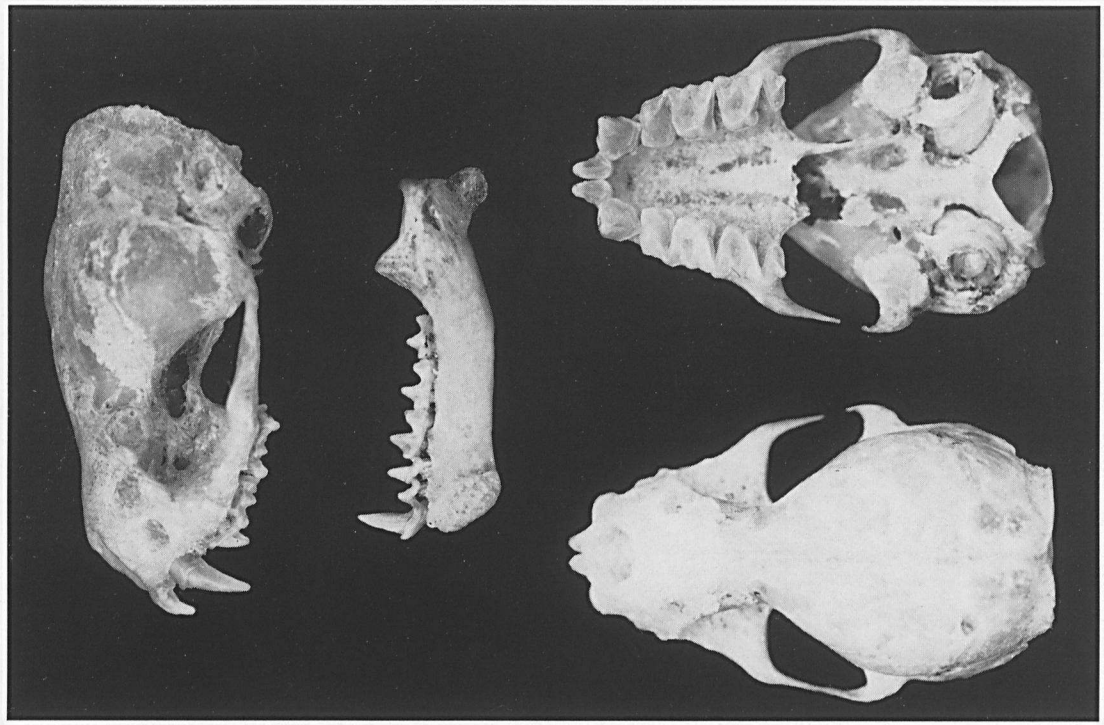


Tadarida europis (H. Allen), no. 15919

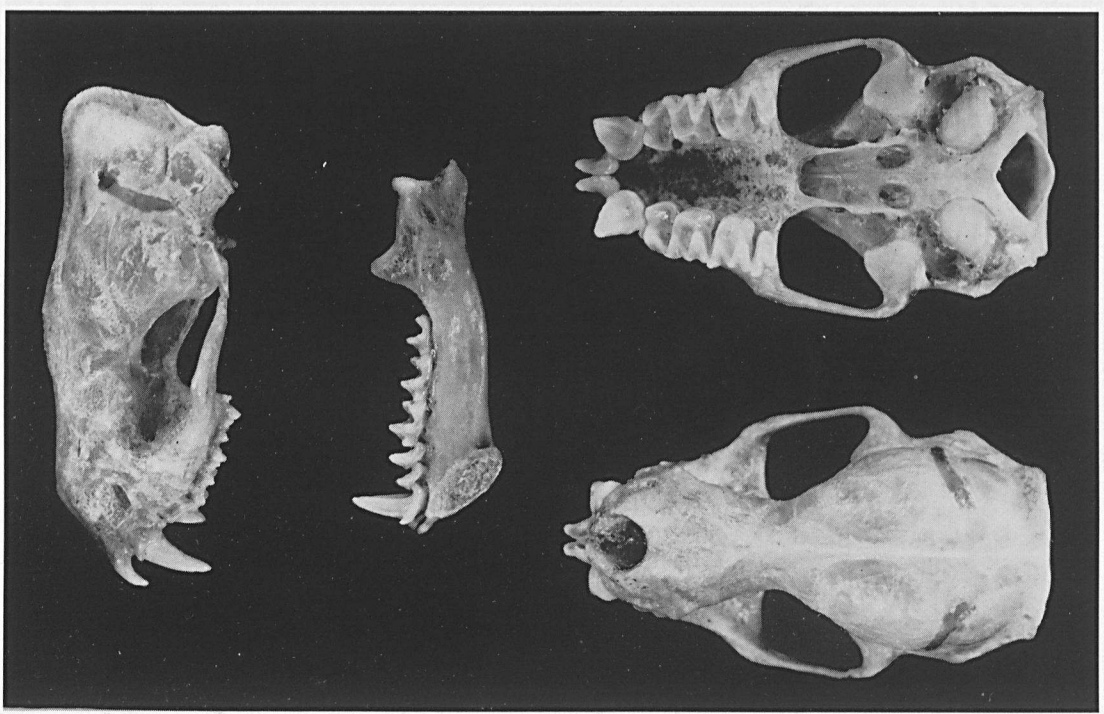


Tadarida macrotis (Gray), BMNH no. 20.7.14.33

PLATE 40

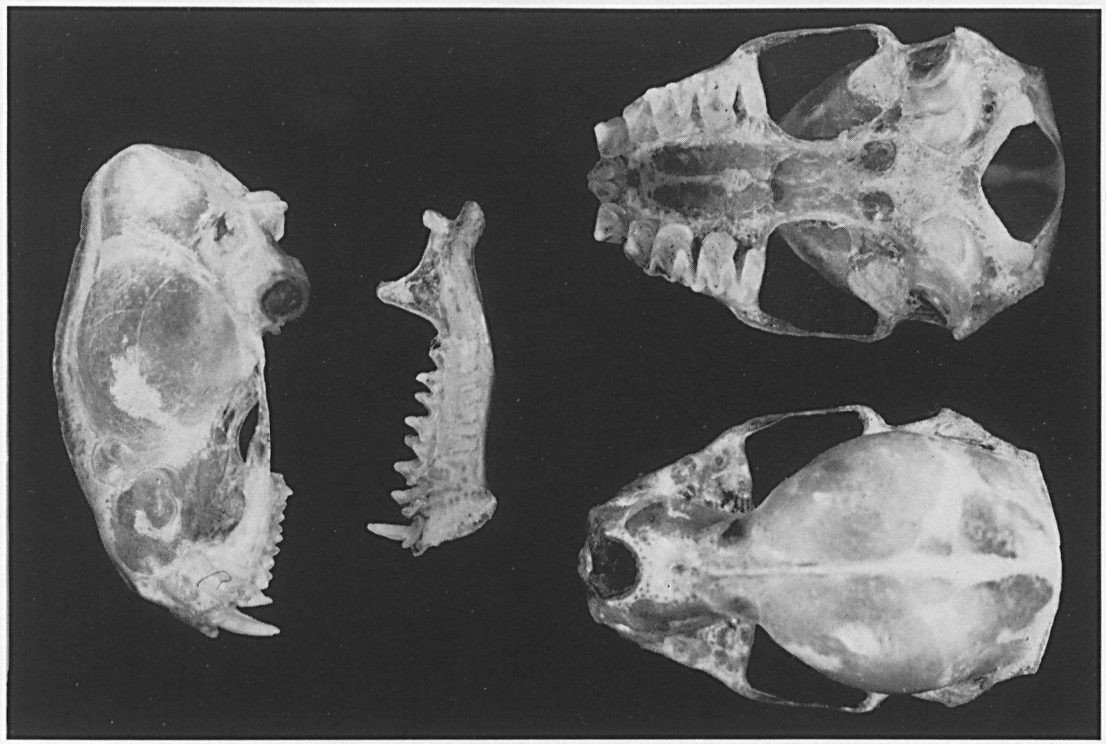


Eumops geijskesi Husson, holotype, no. 12943

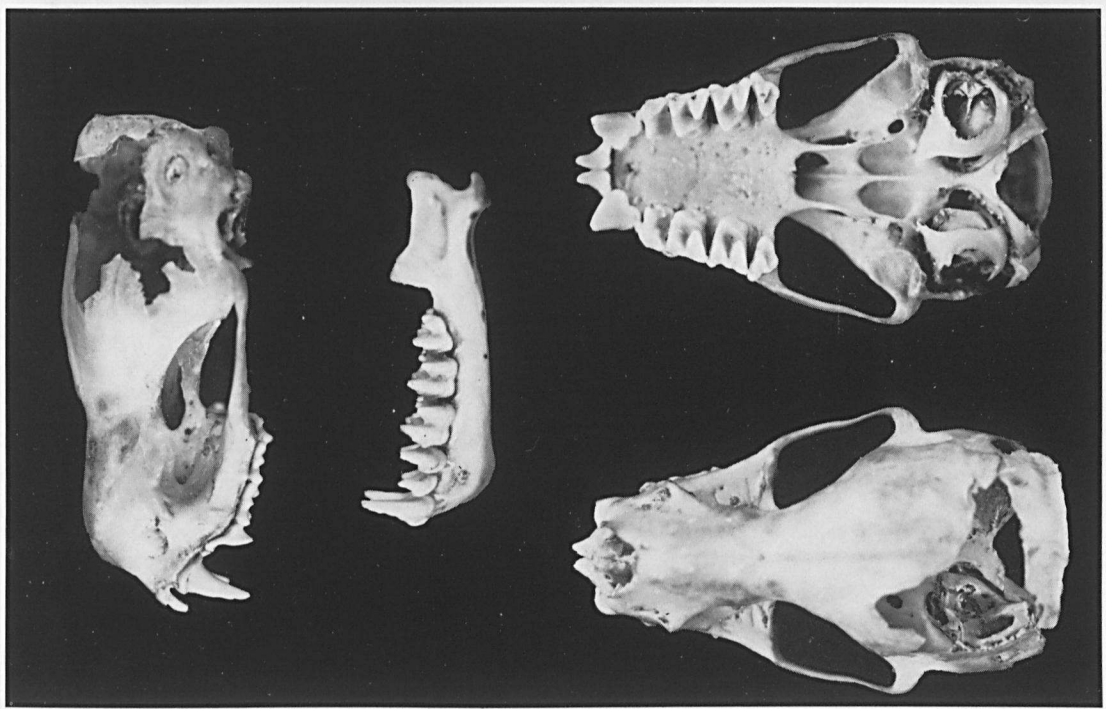


Eumops auripendulus auripendulus (Shaw), no. 12907

PLATE 4I

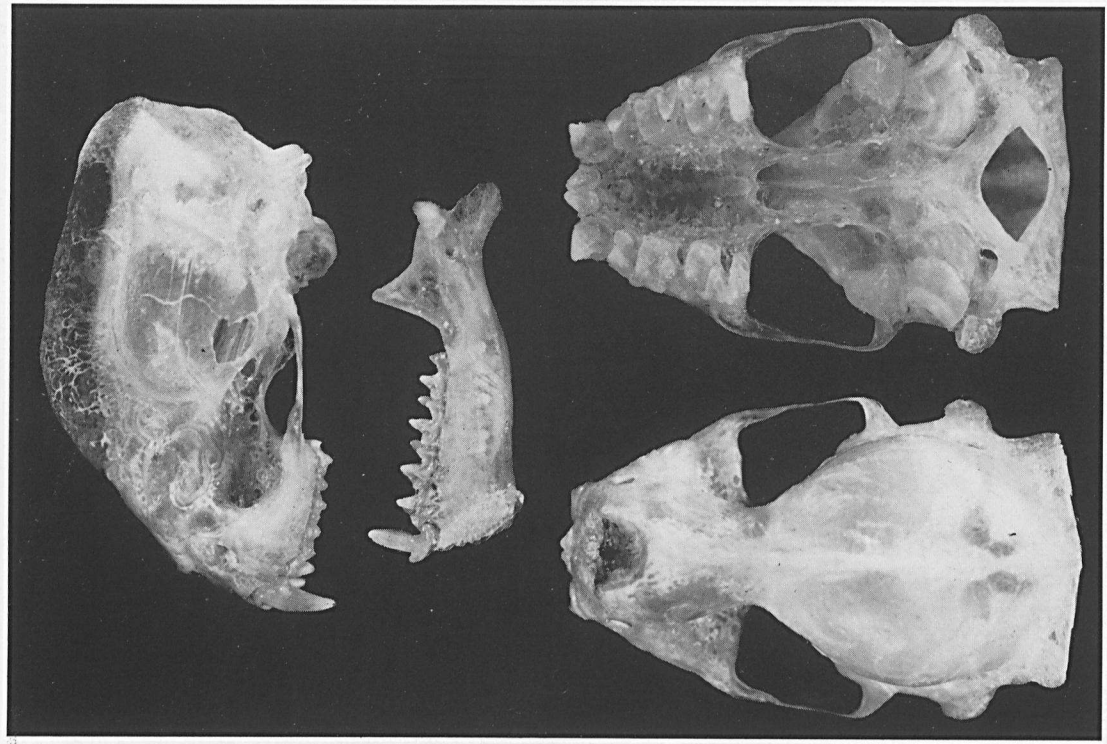


Molossus molossus (Pallas), no. 12997

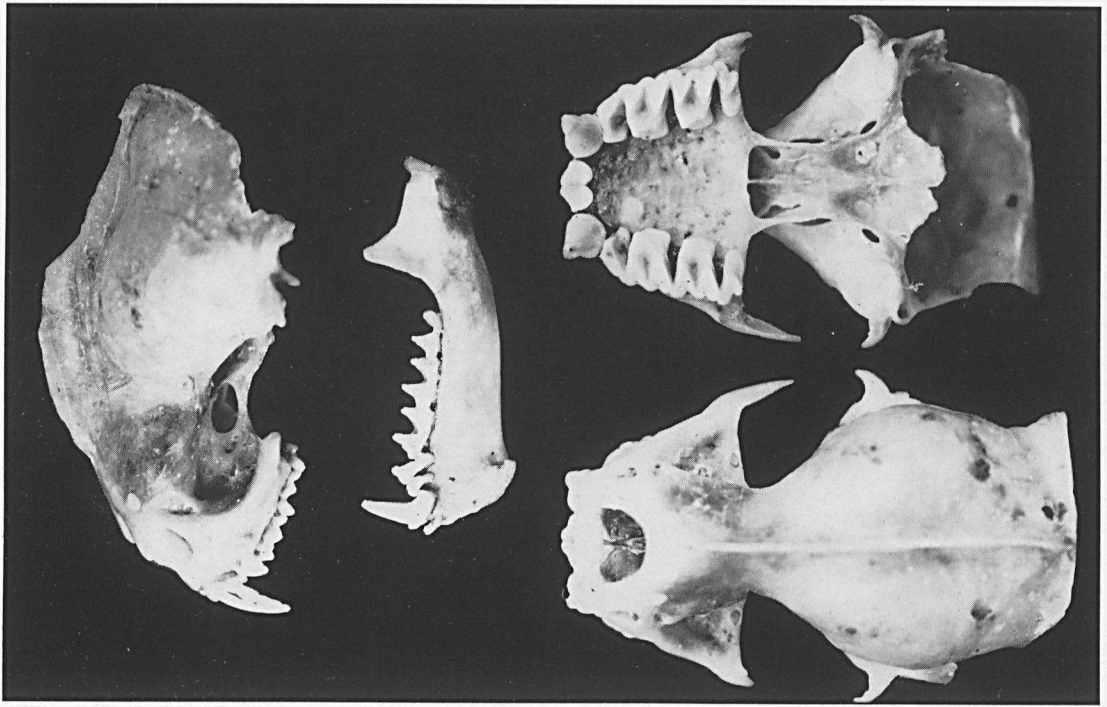


Eumops trumbulli (Thomas), SMN no. 293

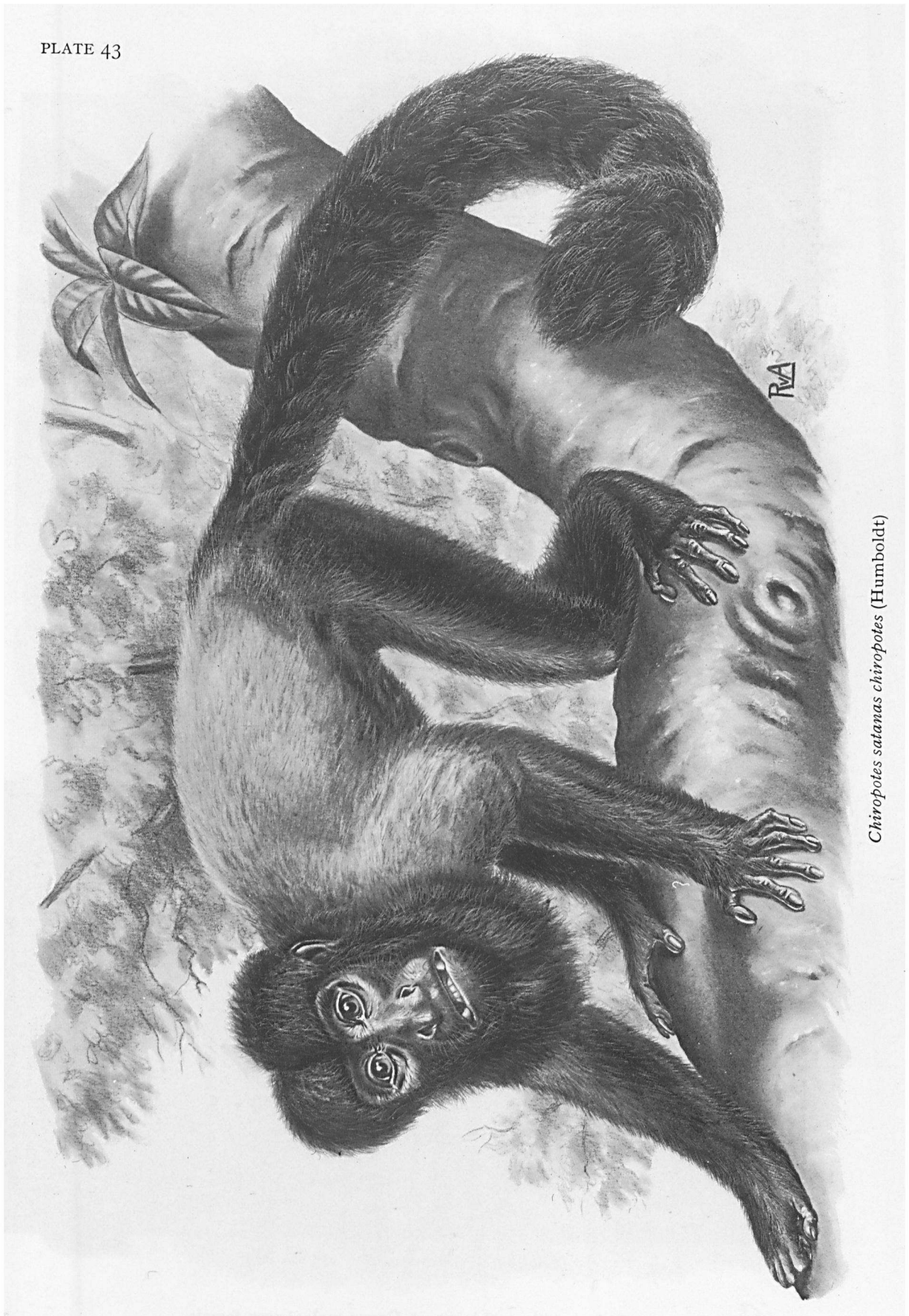
PLATE 42



Molossus ater ater E. Geoffroy, no. 13002



Molossus ater ater E. Geoffroy, holotype of *Dyscopes alecto*
Temminck, no. 13023



Chiropotes satanas chiropotes (Humboldt)

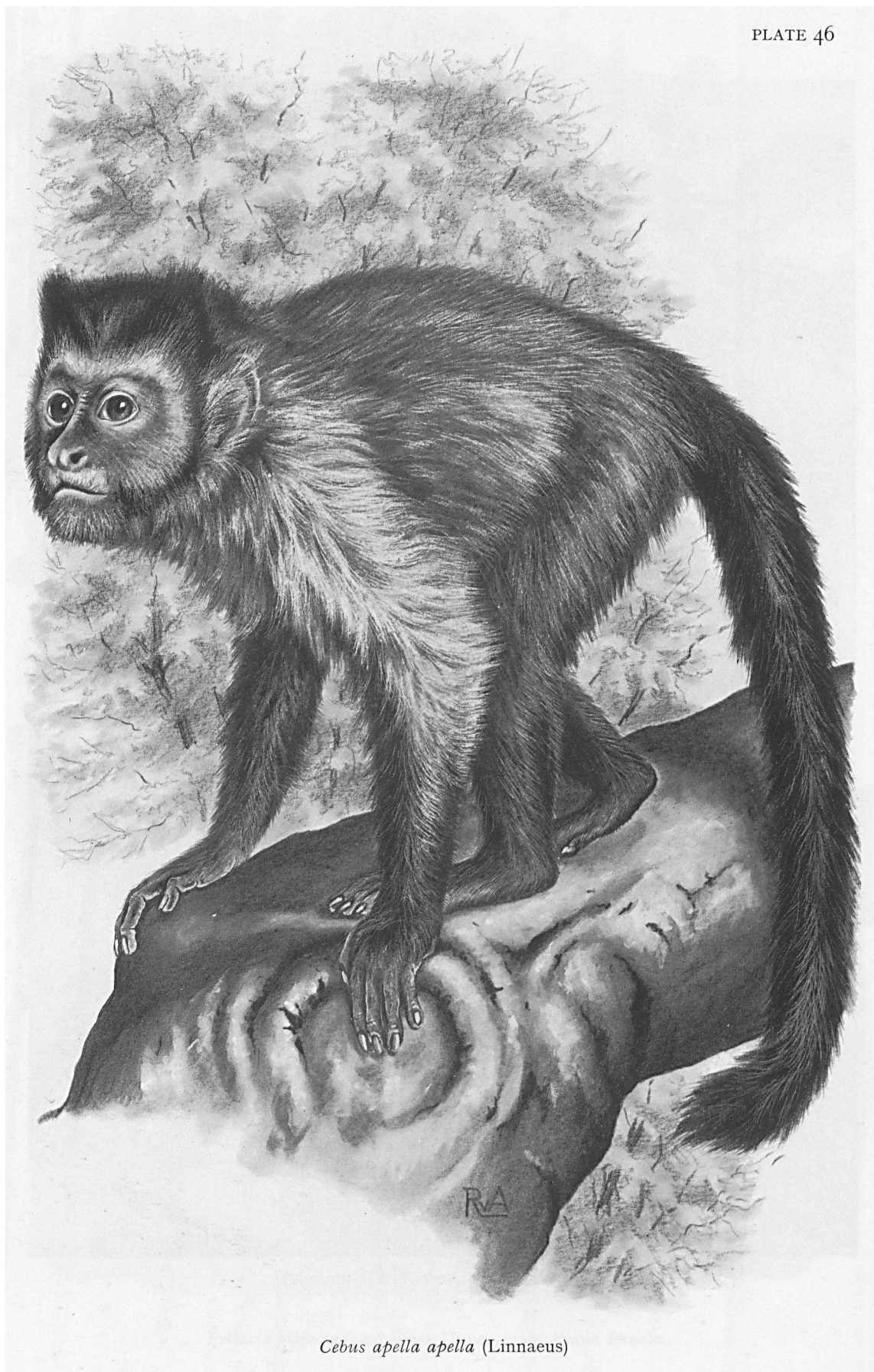


Pithecia pithecia (Linnaeus). Upper, male; lower, female.

PLATE 45



Alouatta seniculus straminea (Humboldt)



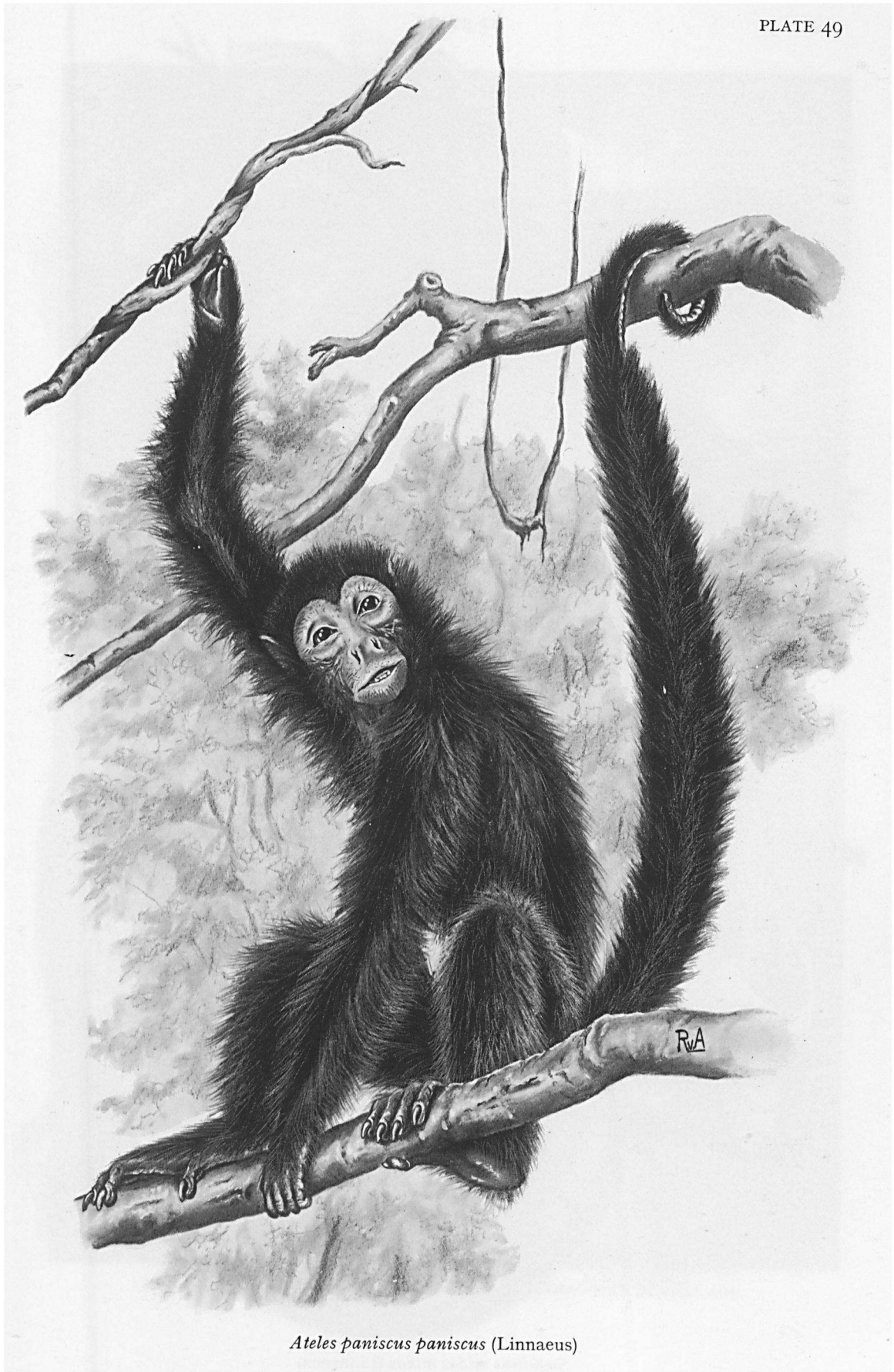
Cebus apella apella (Linnaeus)



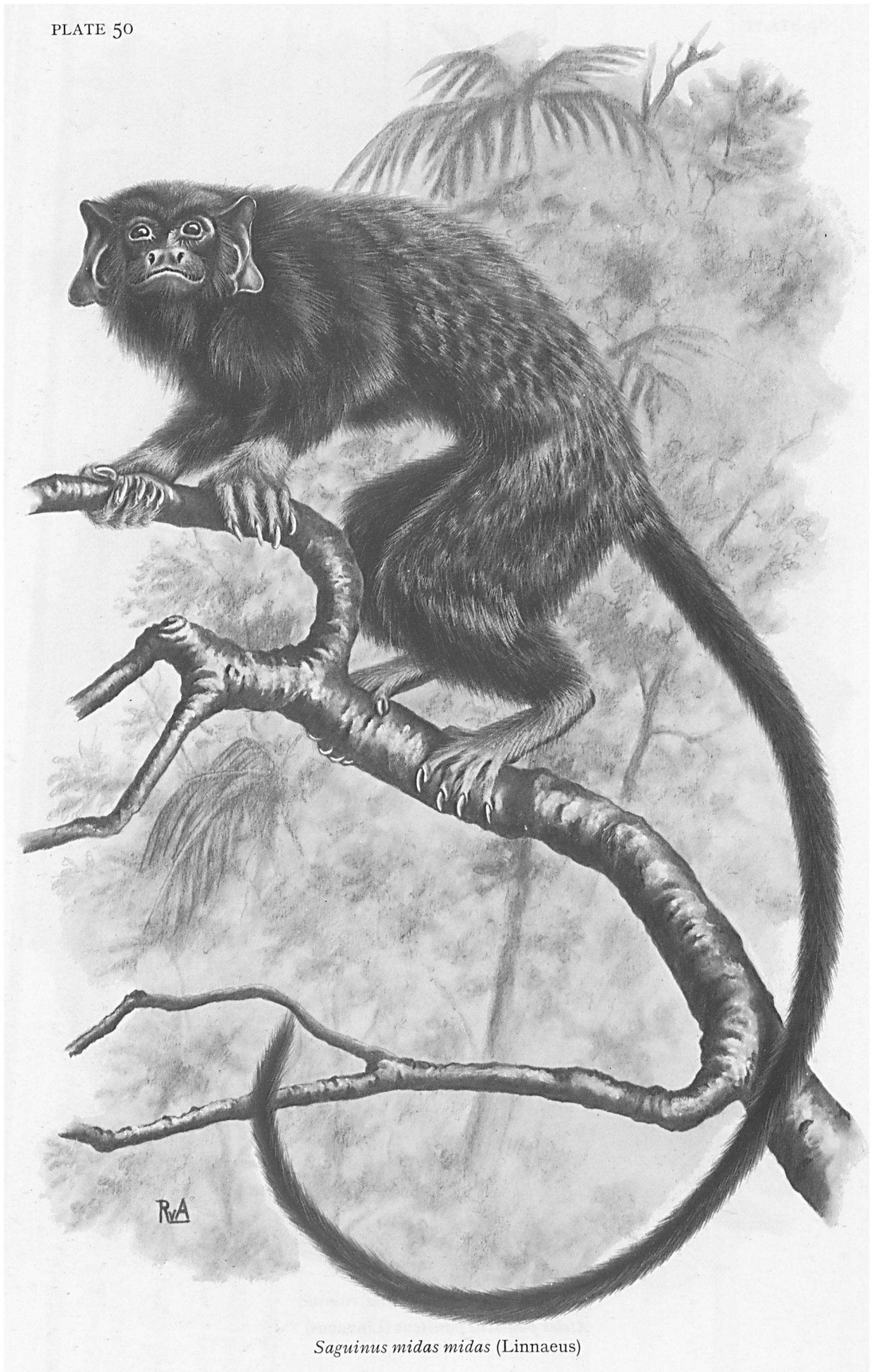
Cebus olivaceus Schomburgk



Saimiri sciureus sciureus (Linnaeus)

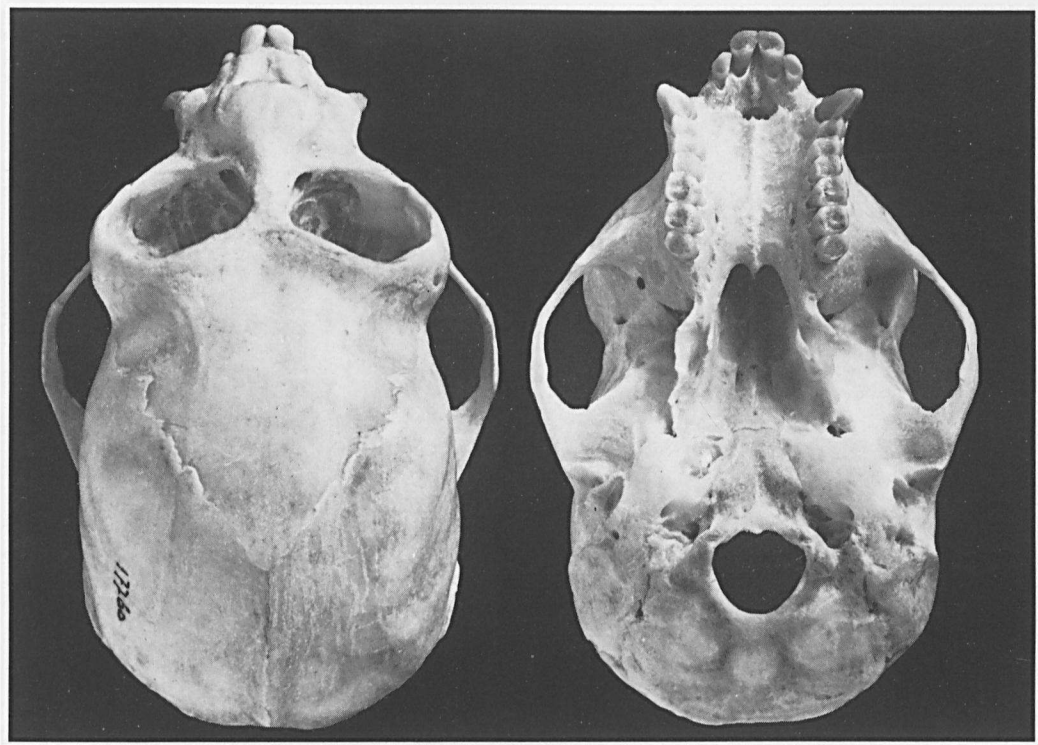


Ateles paniscus paniscus (Linnaeus)

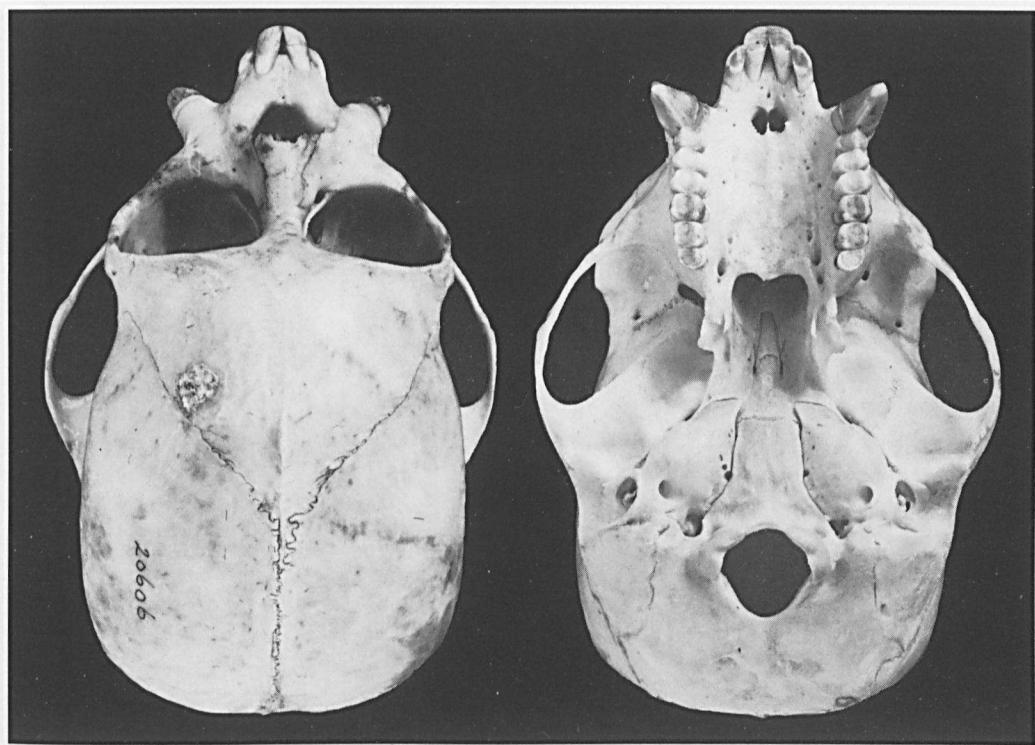


Saguinus midas midas (Linnaeus)

PLATE 51

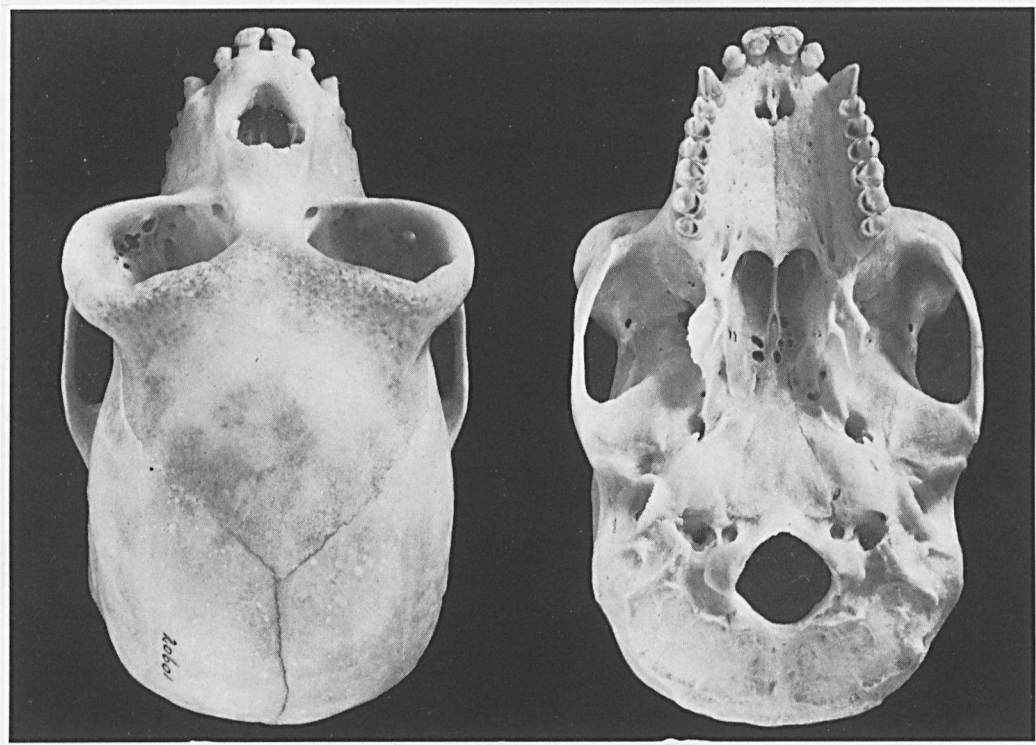


Pithecia pithecia (Linnaeus), ♂, no. 17760; zyg. br., 50.5 mm.

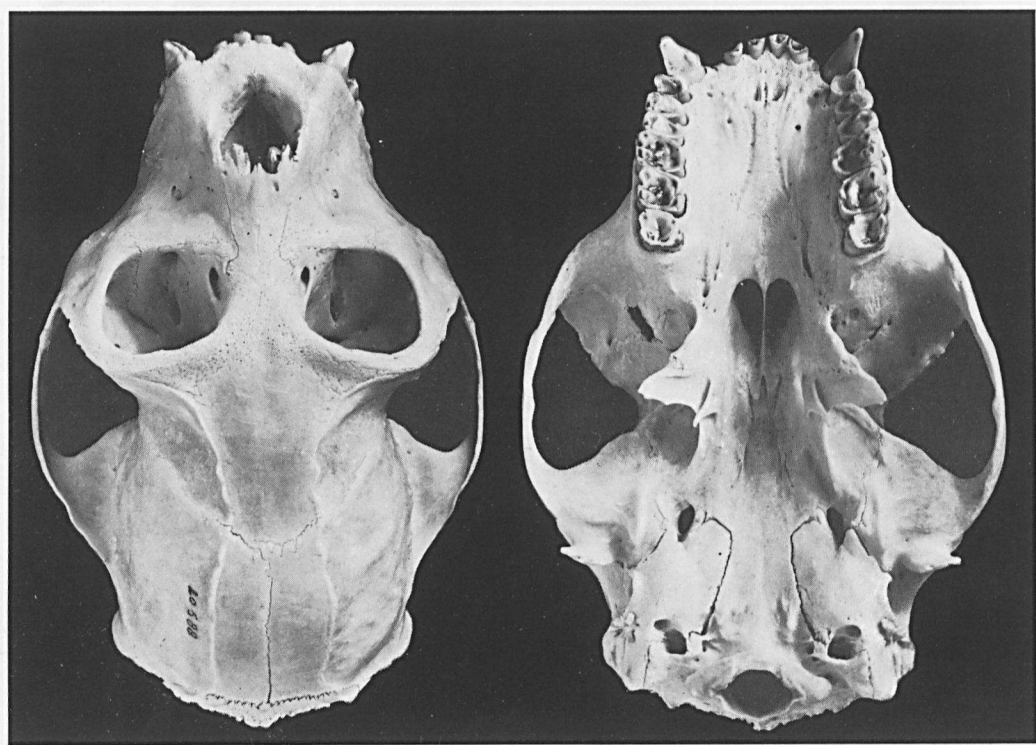


Chiropotes satanas chiropotes (Humboldt), ♂, no. 20606; zyg. br., 59.8 mm.

PLATE 52

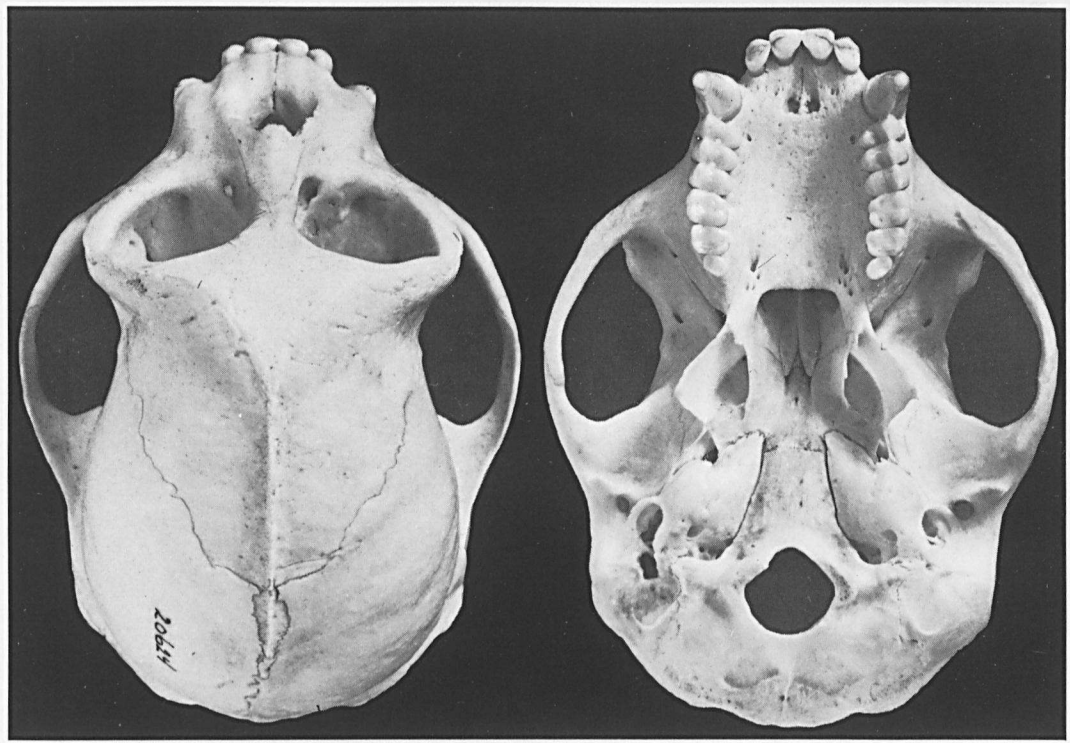


Ateles paniscus paniscus (Linnaeus), ♀, no. 20601; zyg. br., 70.4 mm.

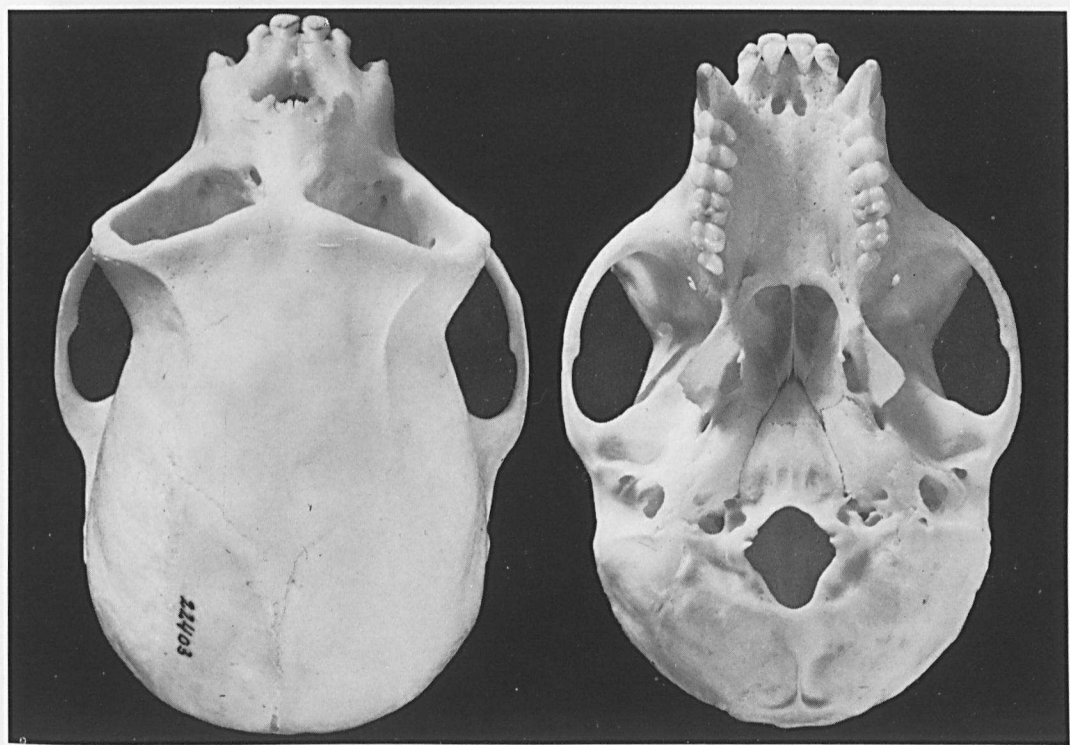


Alouatta seniculus straminea (Humboldt), ♂, no. 20588; zyg. br., 83.6 mm.

PLATE 53

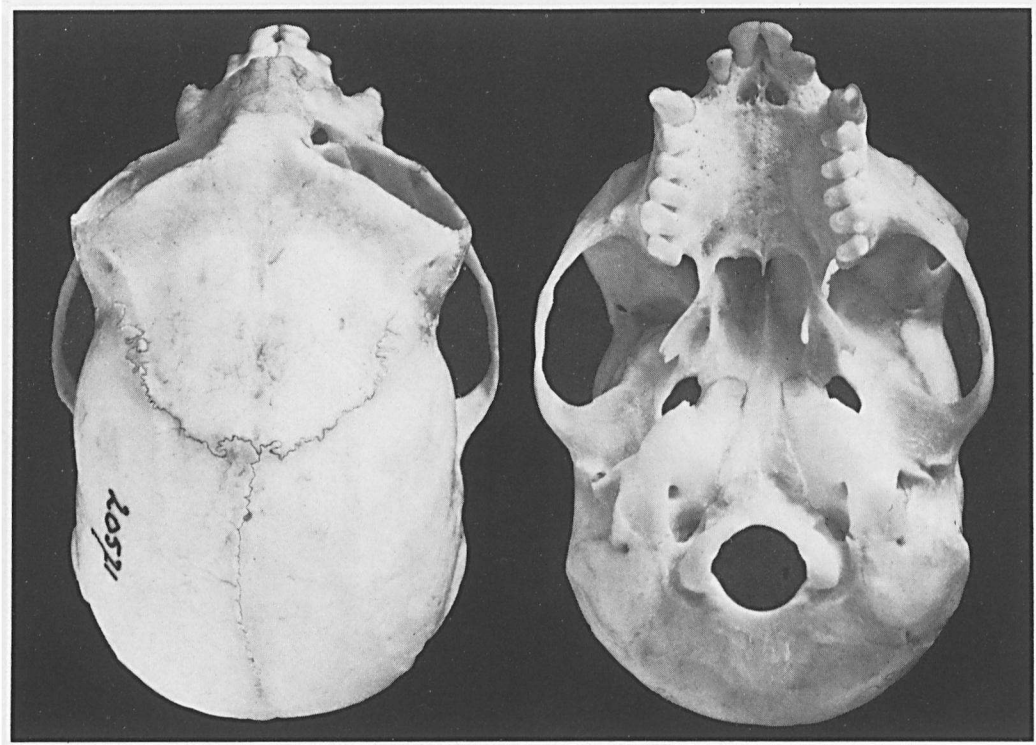


Cebus apella apella (Linnaeus), ♂, no. 20624; zyg. br., 74.1 mm.

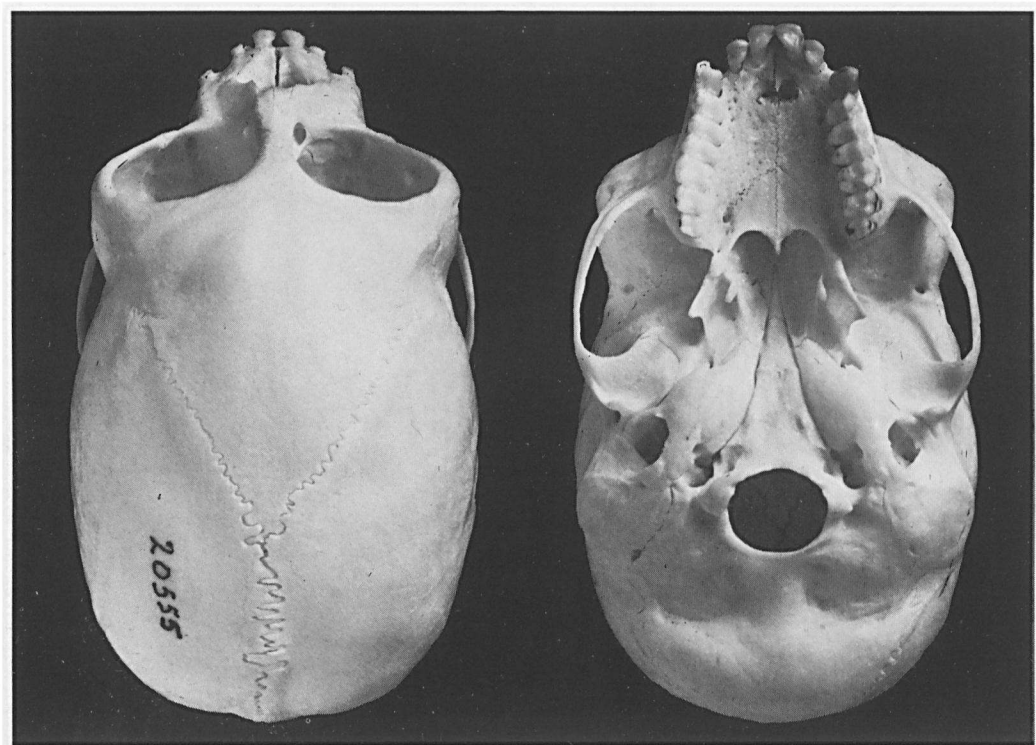


Cebus olivaceus Schomburgk, ♂, no. 22403; zyg. br., 67.3 mm.

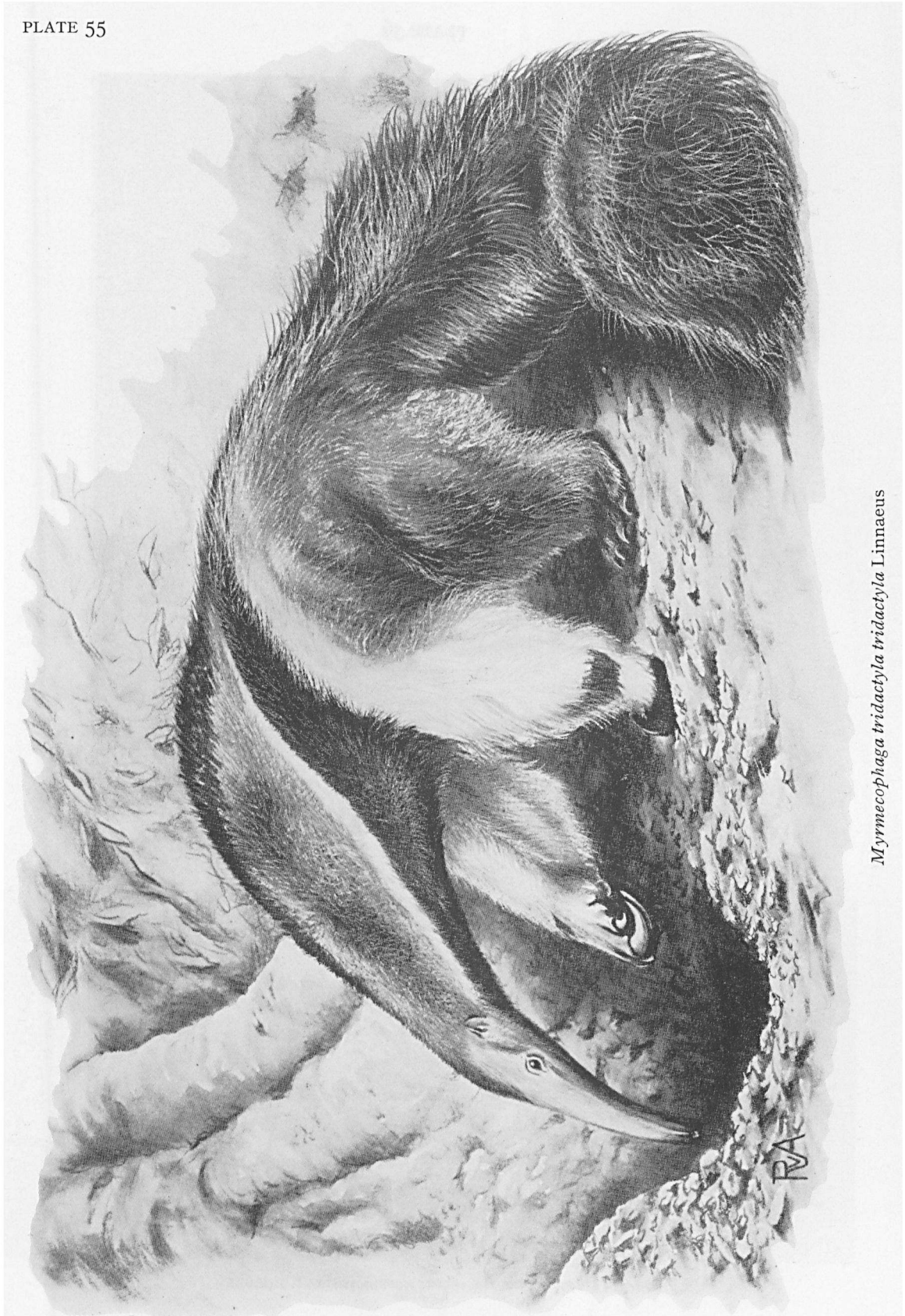
PLATE 54



Saguinus midas midas (Linnaeus), ♂, no. 20571; zyg. br., 33.2 mm.



Saimiri sciureus sciureus (Linnaeus), ♀, no. 20555; zyg. br., 35.2 mm.

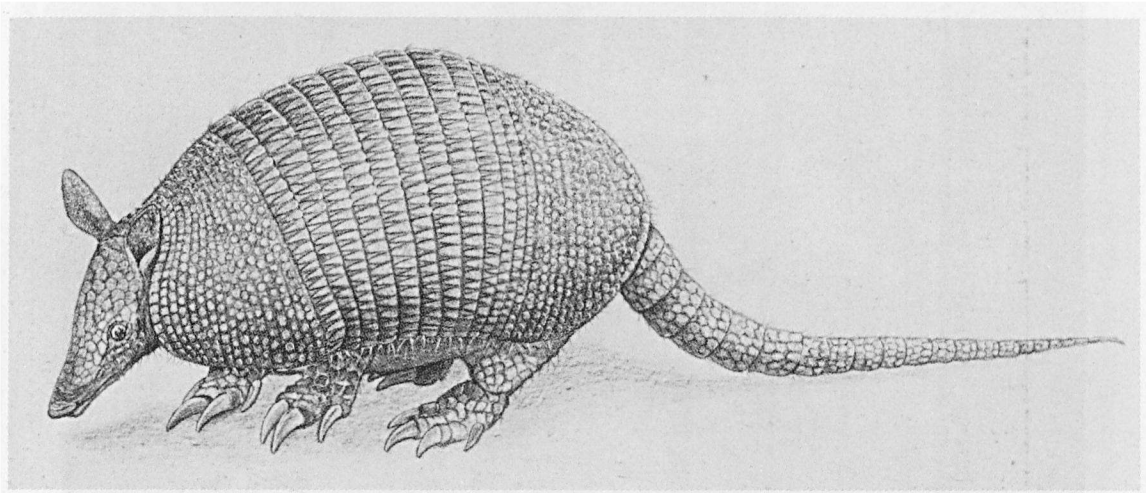


Myrmecophaga tridactyla tridactyla Linnaeus

PLATE 56



Tamandua longicaudata longicaudata (Wagner)

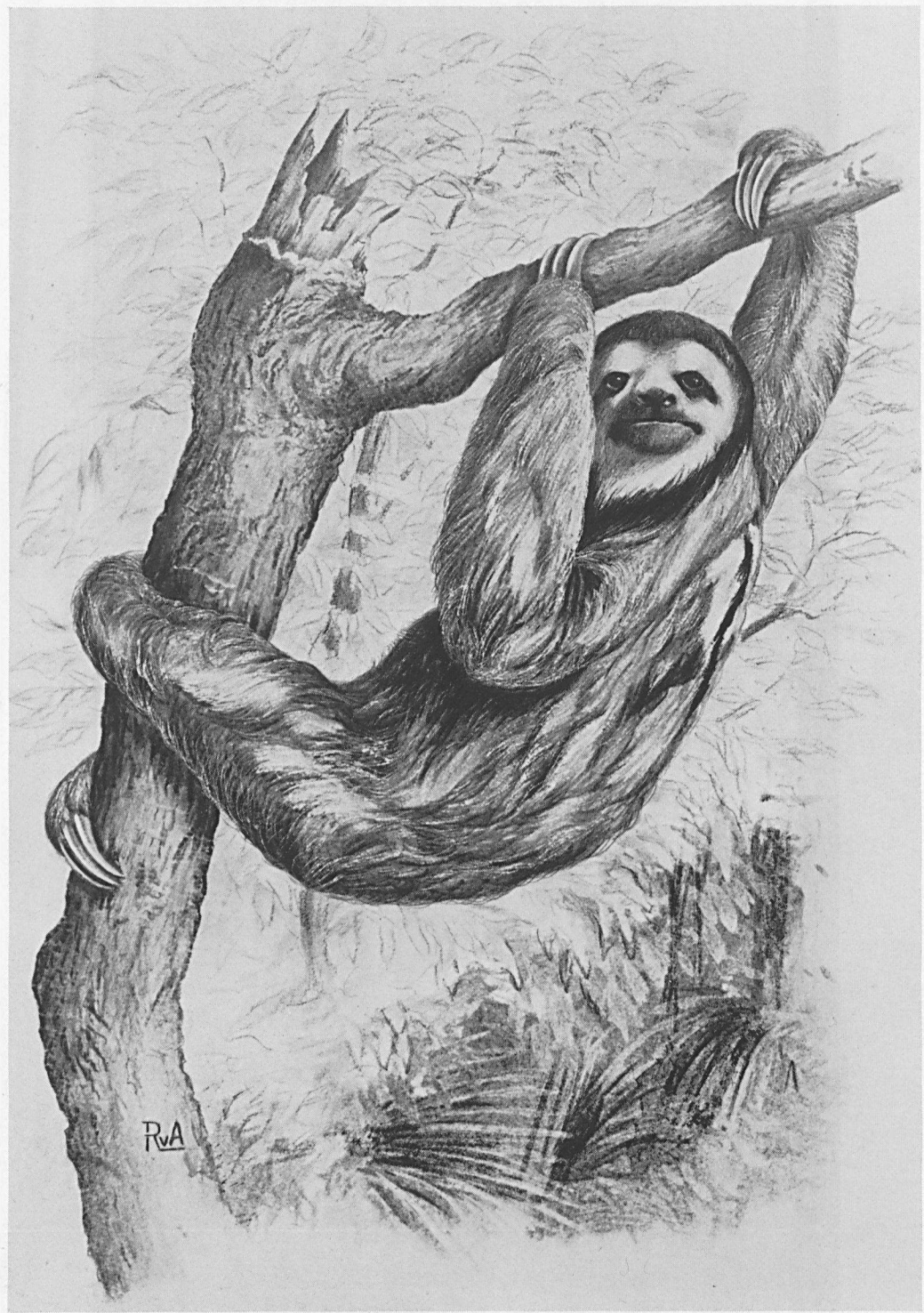


Dasypus novemcinctus novemcinctus Linnaeus

PLATE 57



Cyclopes didactylus didactylus (Linnaeus), Ma Retraite north of Paramaribo.

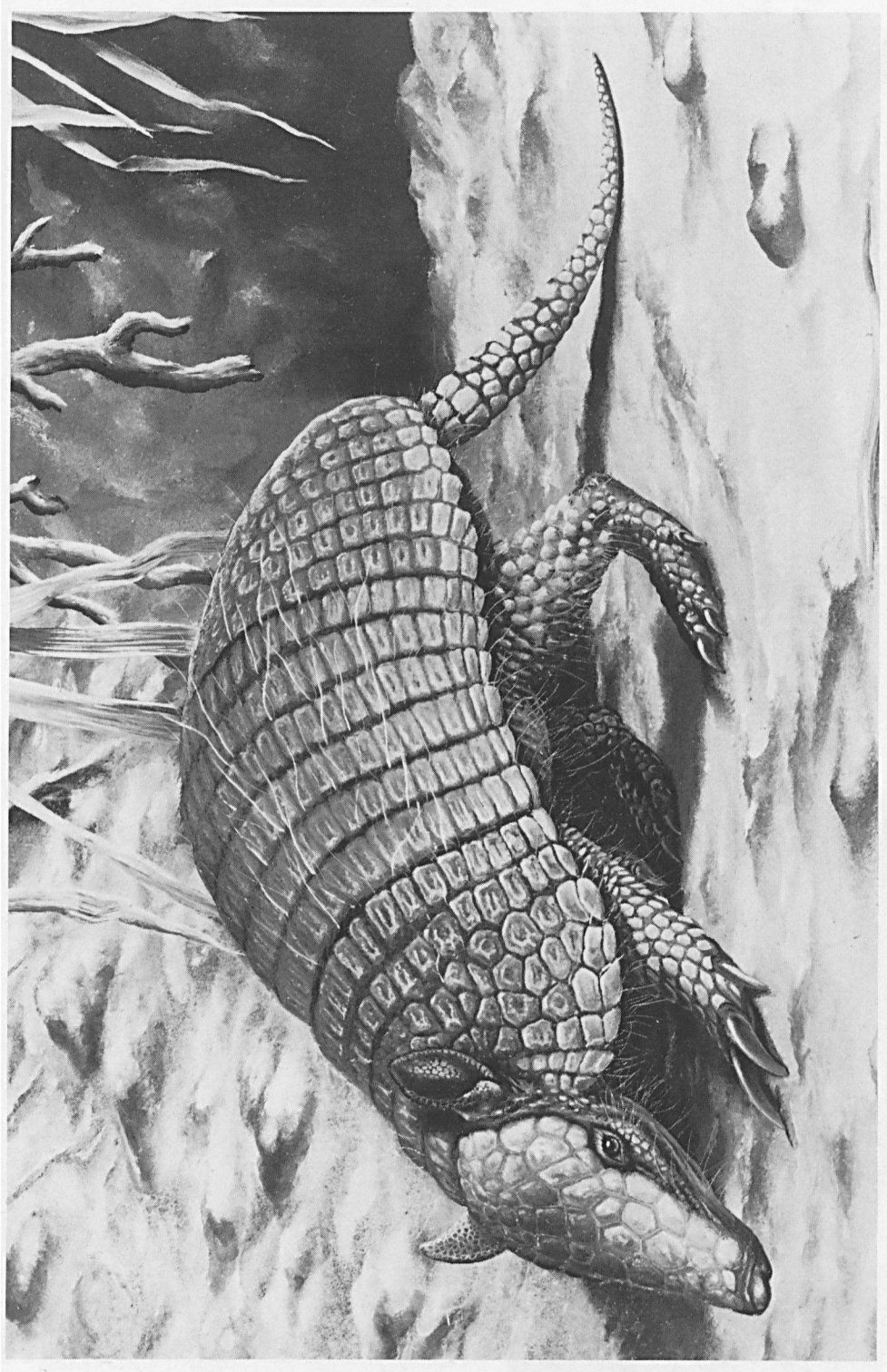


Bradypus tridactylus Linnaeus



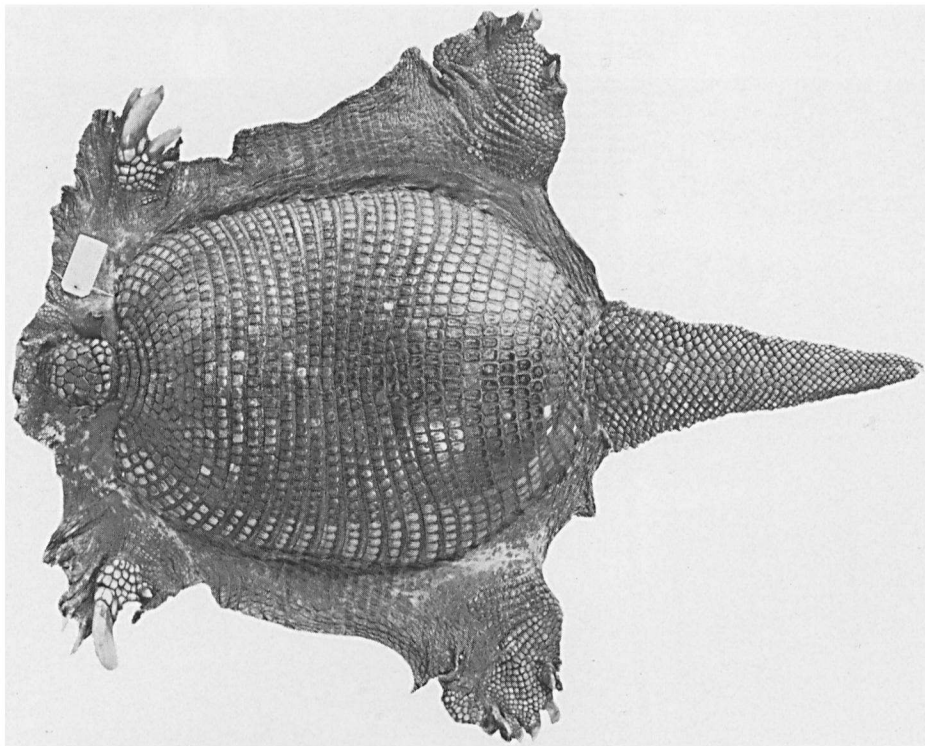
Choloepus didactylus (Linnaeus)

PLATE 60

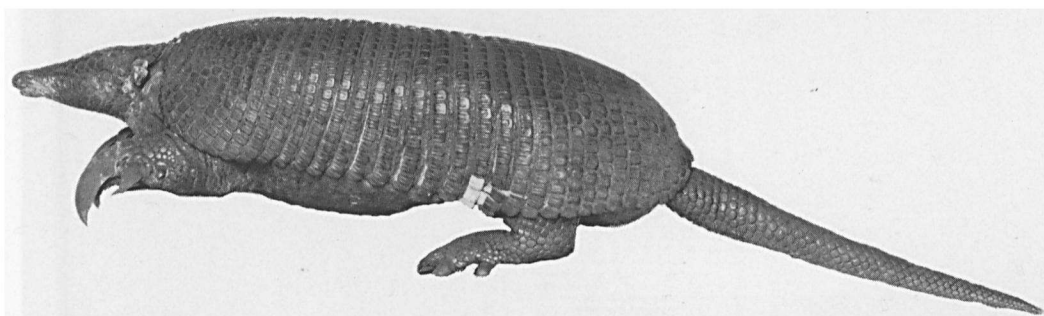


Ephraactus sexcinctus sexcinctus (Linnaeus)

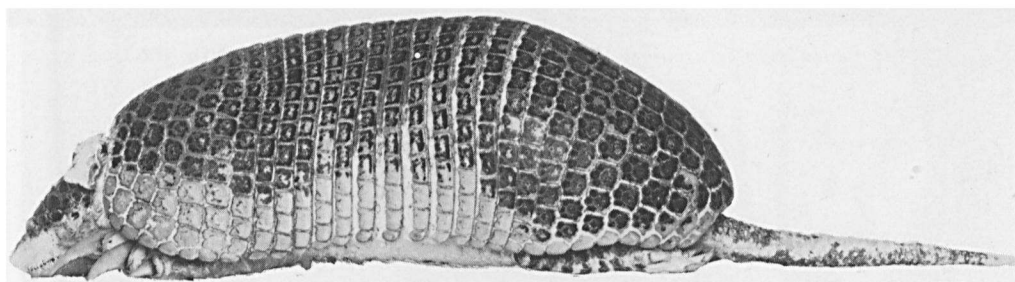
PLATE 61



Priodontes giganteus (E. Geoffroy), Paraguay, no. 11375; total length, 135.5 cm.

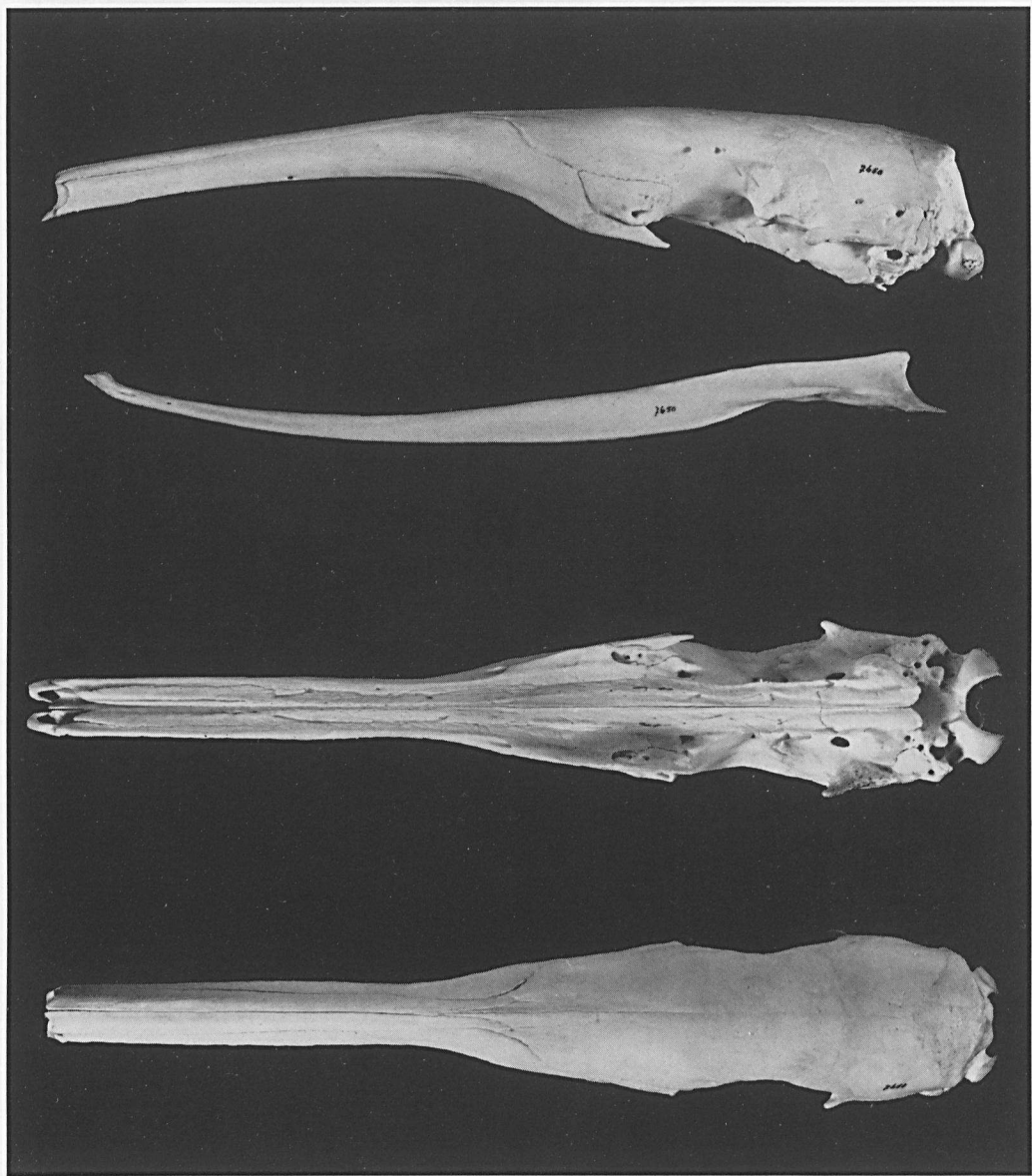


Priodontes giganteus (E. Geoffroy), ♂, no. 13269; total length, 135 cm.



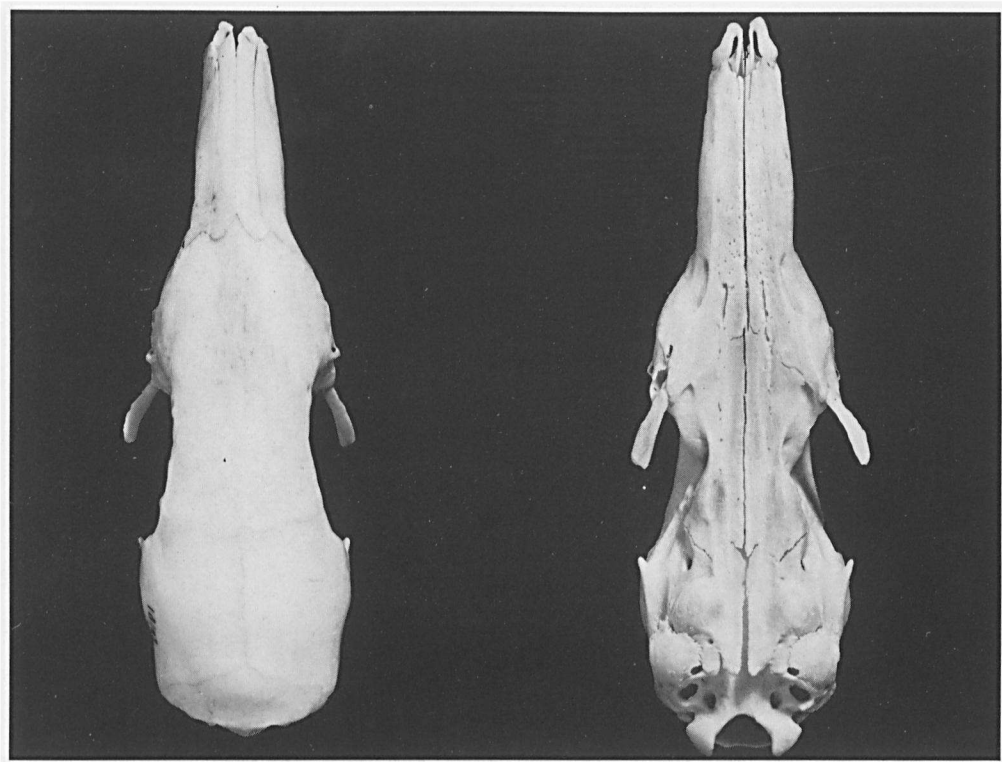
Cabassous unicinctus (Linnaeus), ♀, no. 18219; length head and body, 40 cm.

PLATE 62

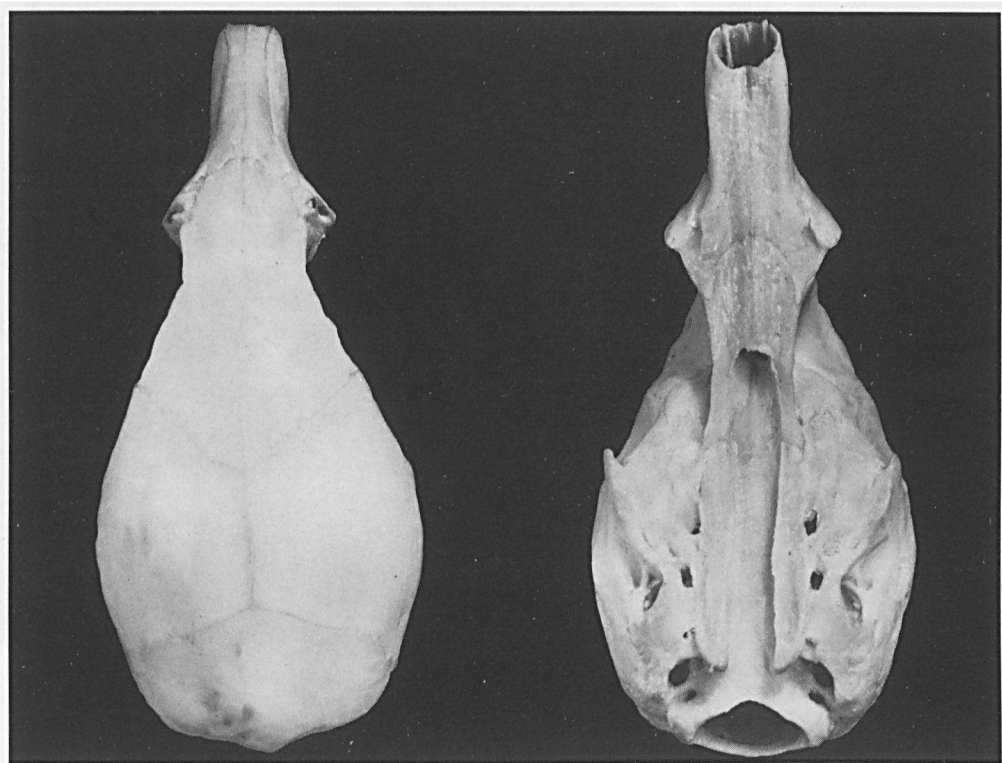


Myrmecophaga tridactyla tridactyla Linnaeus, ♂, no. 7650; greatest length, 360 mm.

PLATE 63

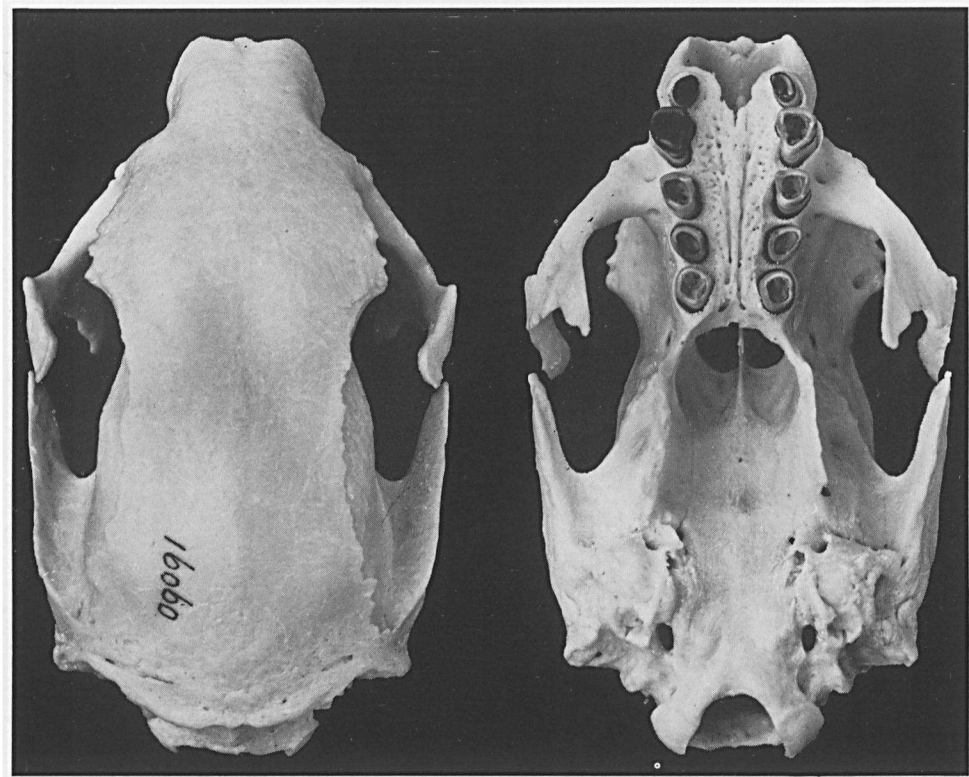


Tamandua longicaudata longicaudata (Wagner), ♀, no. 18192; condylob. length, 135.0 mm.

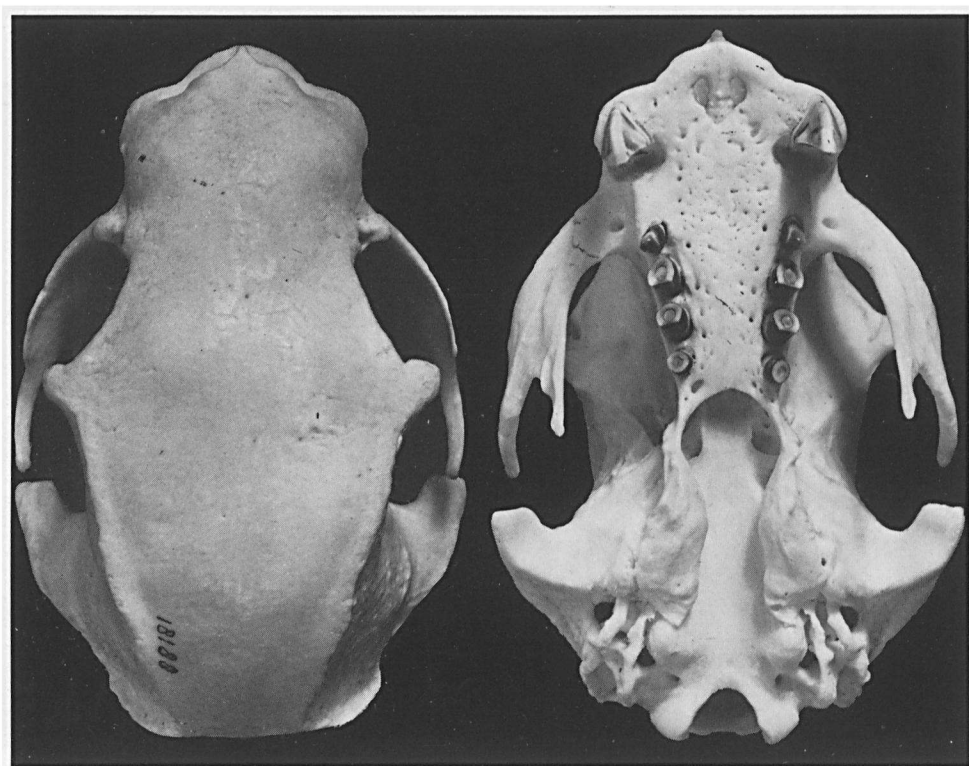


Cyclopes didactylus didactylus (Linnaeus), ♀, no. 17288; condylob. length, 48.1 mm.

PLATE 64

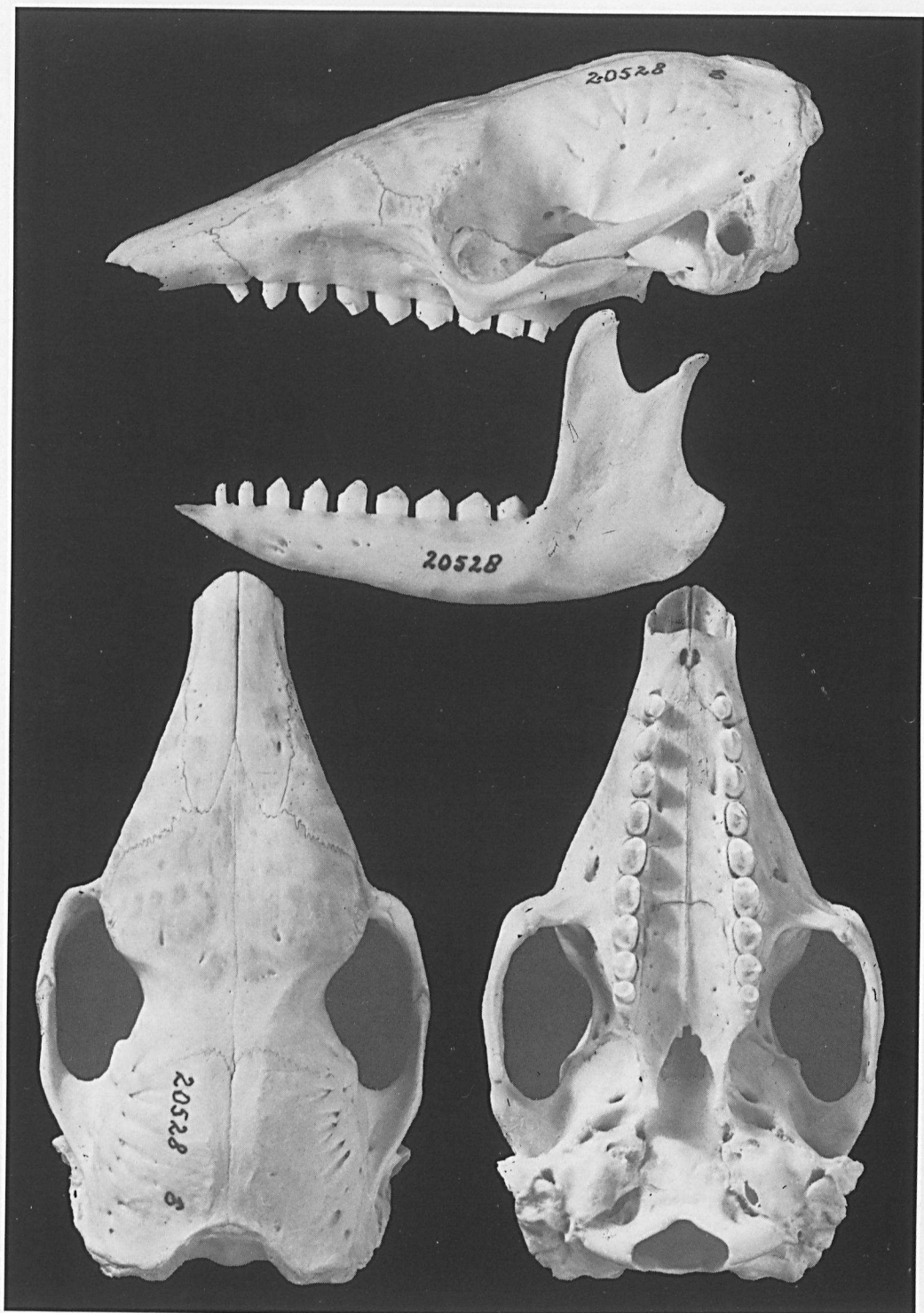


Bradypus tridactylus Linnaeus, ♀, no. 16060; zyg. br., 46.5 mm.



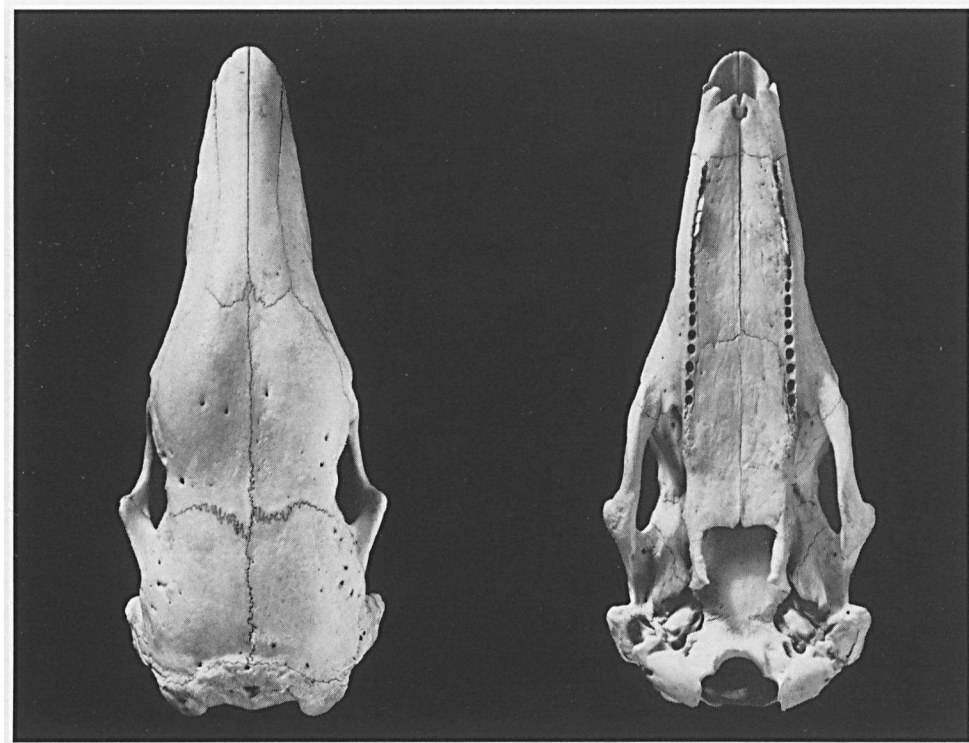
Choloepus didactylus (Linnaeus), ♂, no. 18188; zyg. br., 73.7 mm.

PLATE 65

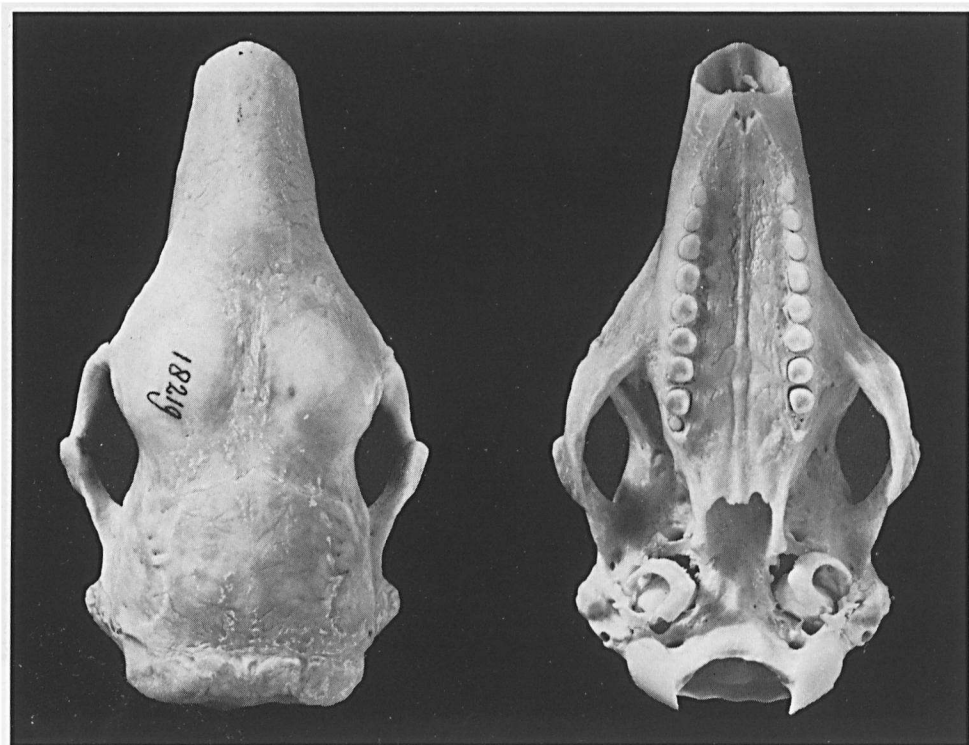


Euphractus sexcinctus sexcinctus (Linnaeus), ♂, no. 20528; zyg. br., 50.4 mm.

PLATE 66

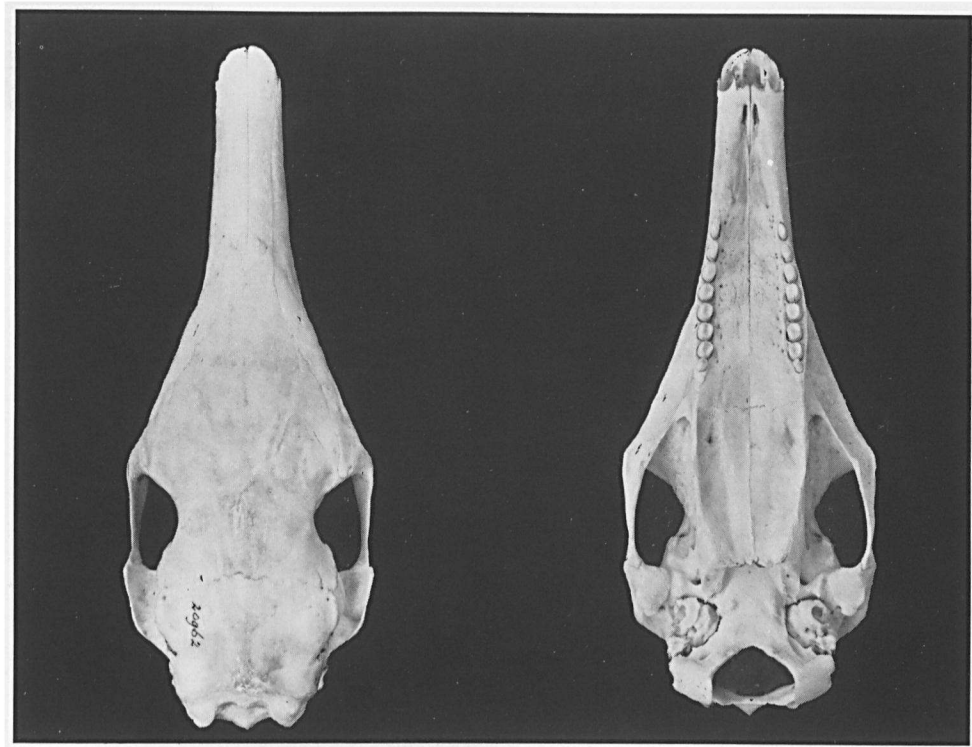


Prionotes giganteus (E. Geoffroy), ♀, SMN no. 1760; greatest length, 197.5 mm.



Cabassous unicinctus (Linnaeus), ♀, no. 18219; zyg. br., 48.8 mm.

PLATE 67

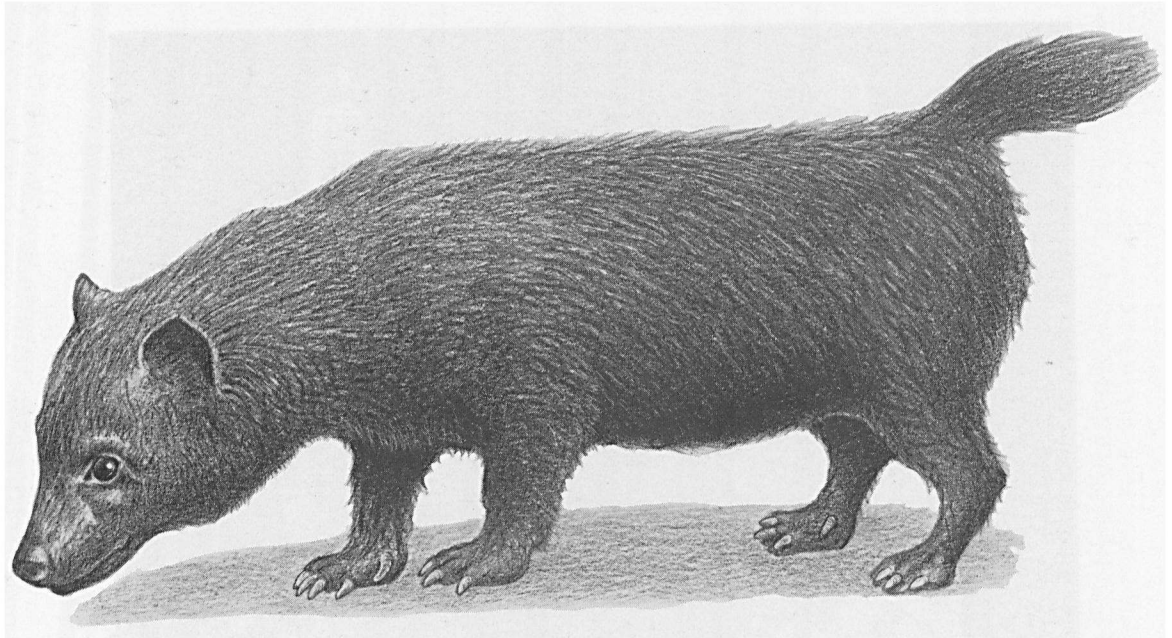


Dasypus kappleri kappleri Krauss, ♂, no. 20962; zyg. br., 49.4 mm.



Dasypus novemcinctus novemcinctus Linnaeus, ♀, no. 20958; zyg. br., 44.9 mm.

PLATE 68



Speothos venaticus venaticus (Lund)



Cerdocyon thous thous (Linnaeus)



Nasua nasua vittata Tschudi

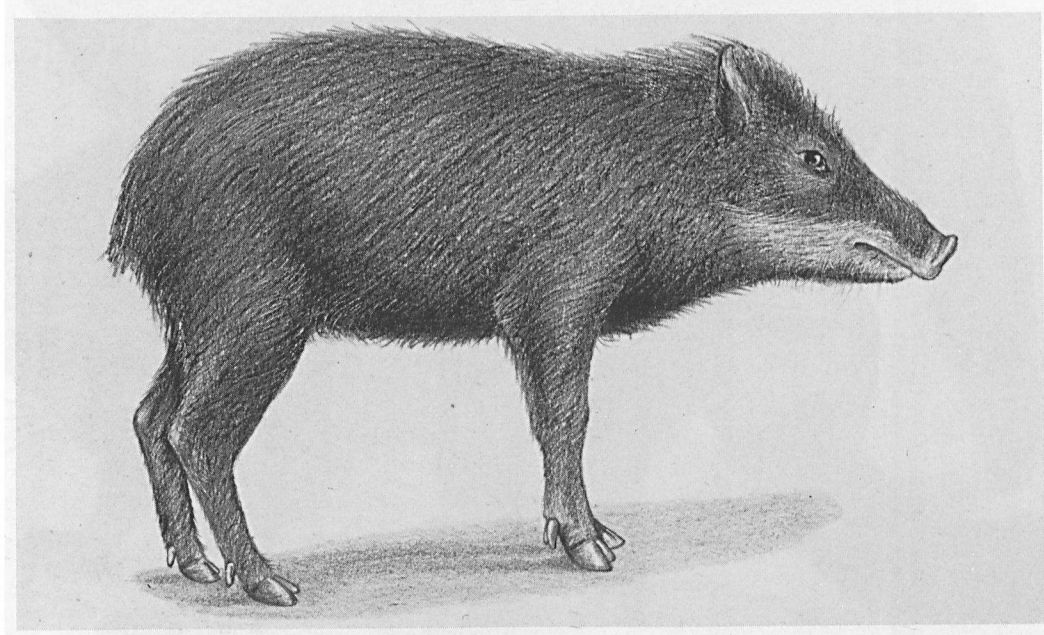


Procyon cancrivorus cancrivorus (G. Cuvier)

PLATE 70

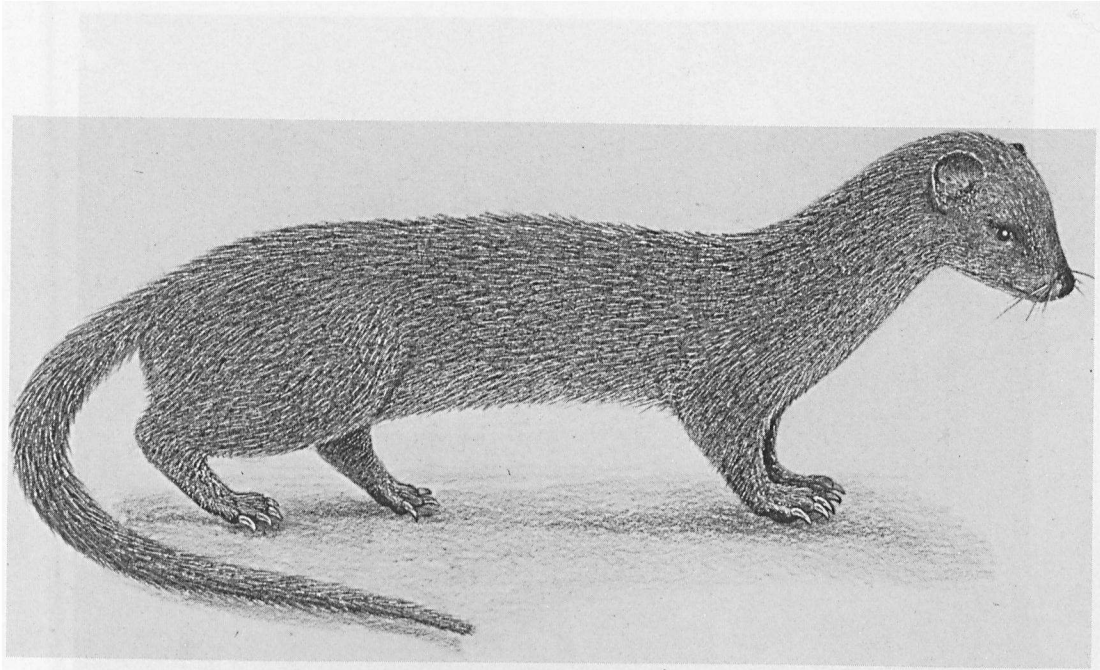


Potos flavus flavus (Schreber)



Dicotyles pecari (Link)

PLATE 7I

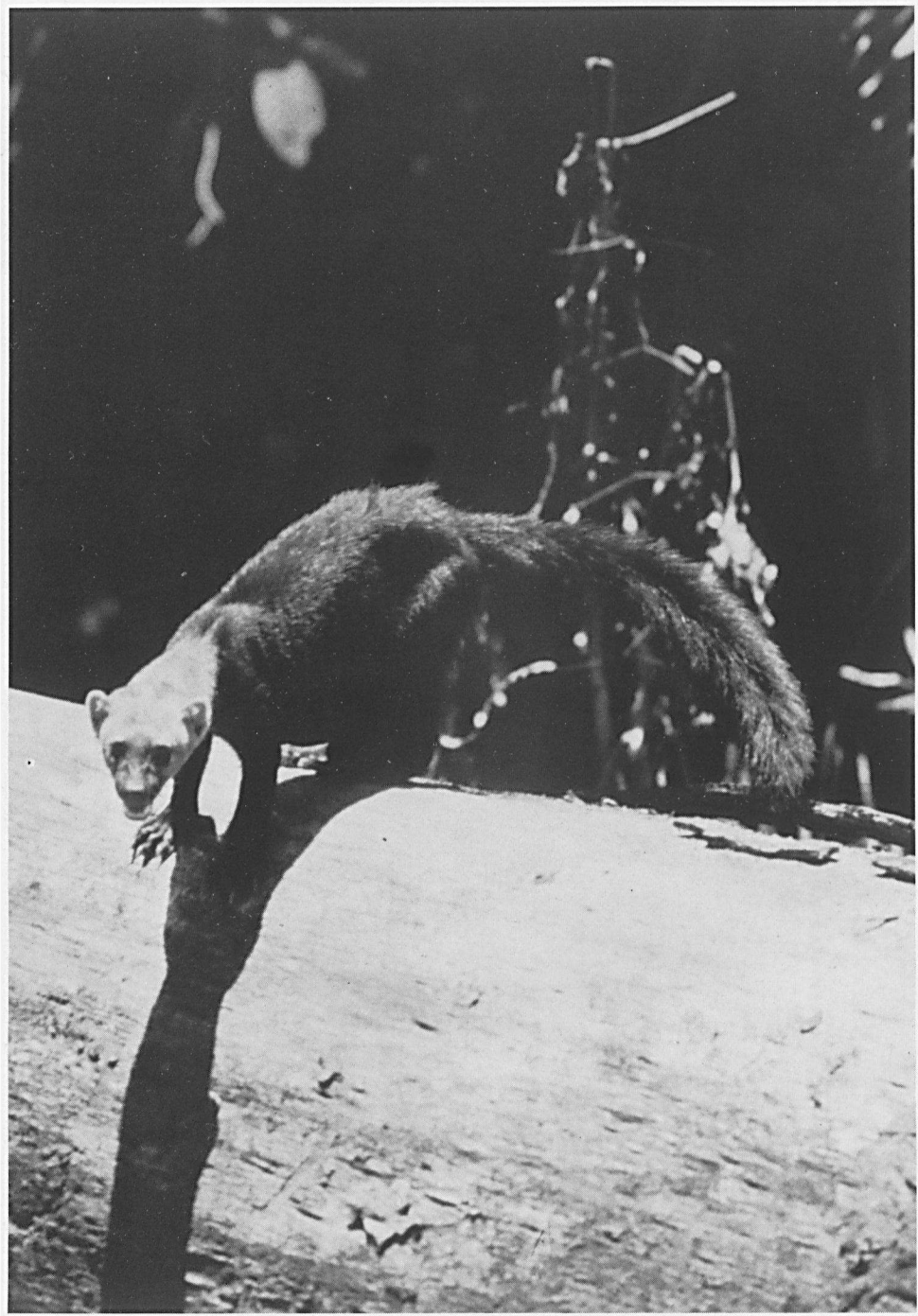


Herpestes auropunctatus (Hodgson)



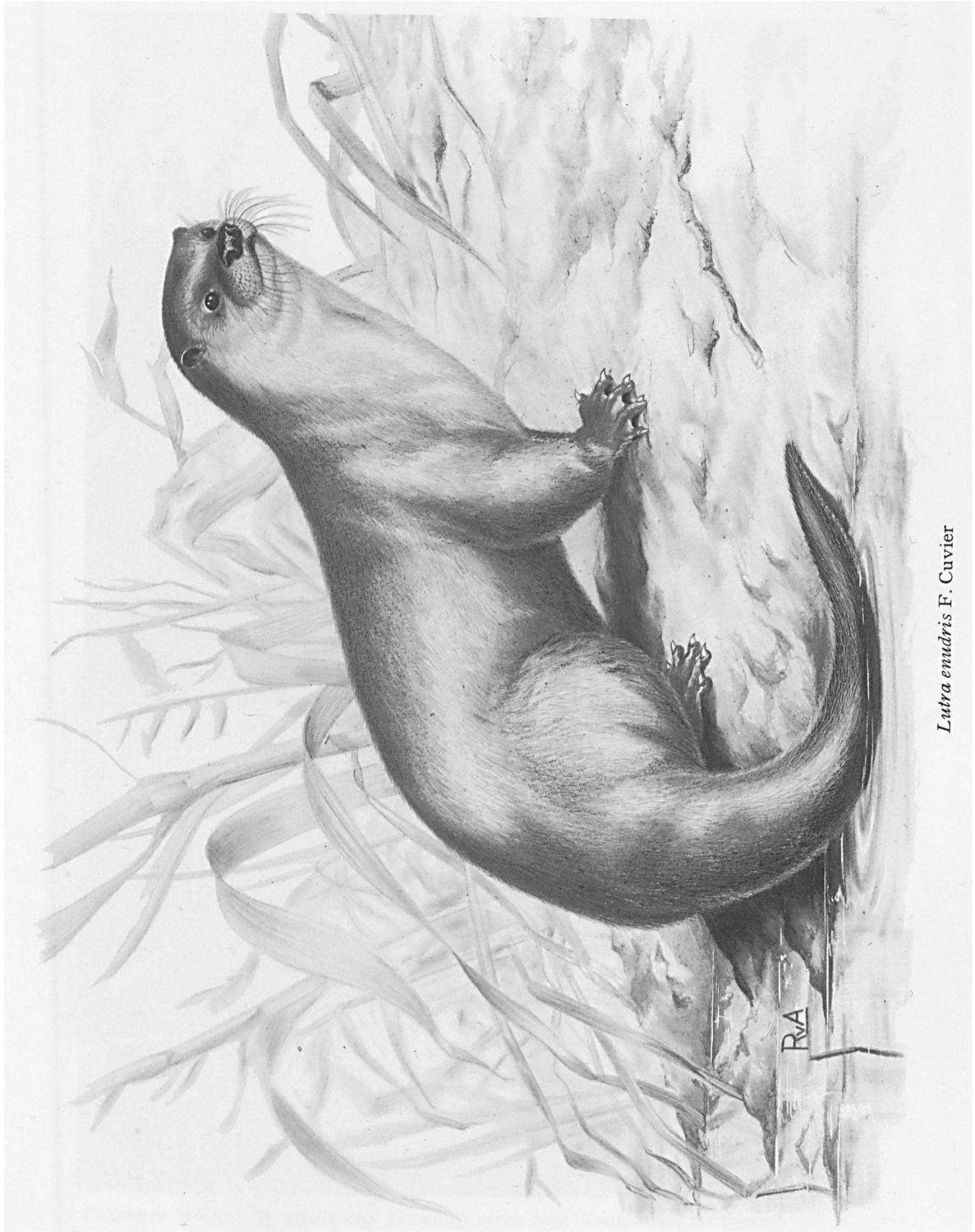
Galictis vittata vittata (Schreber)

PLATE 72

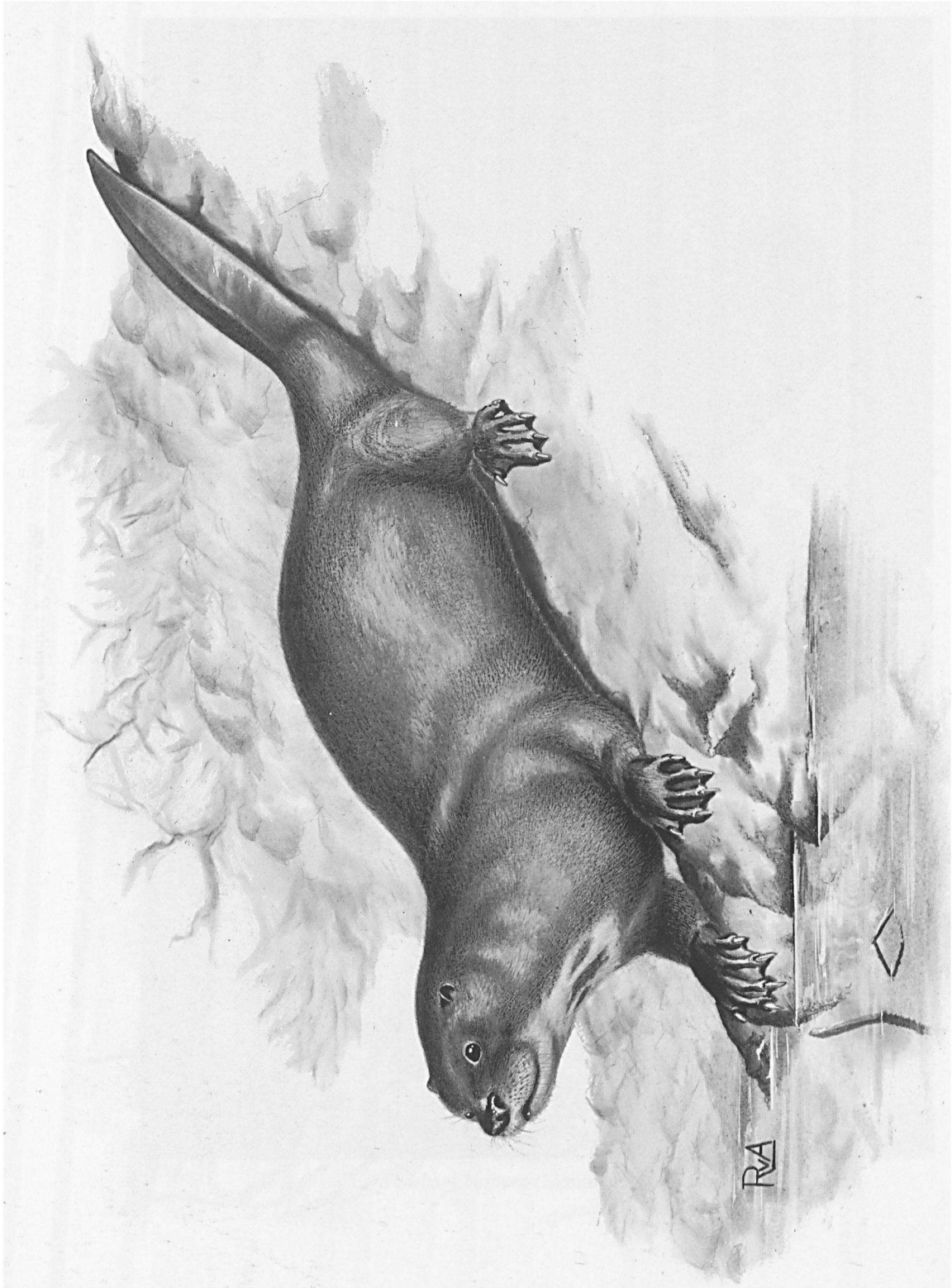


Eira barbara barbara (Linnaeus), Suriname

PLATE 73



Lutra enudris F. Cuvier



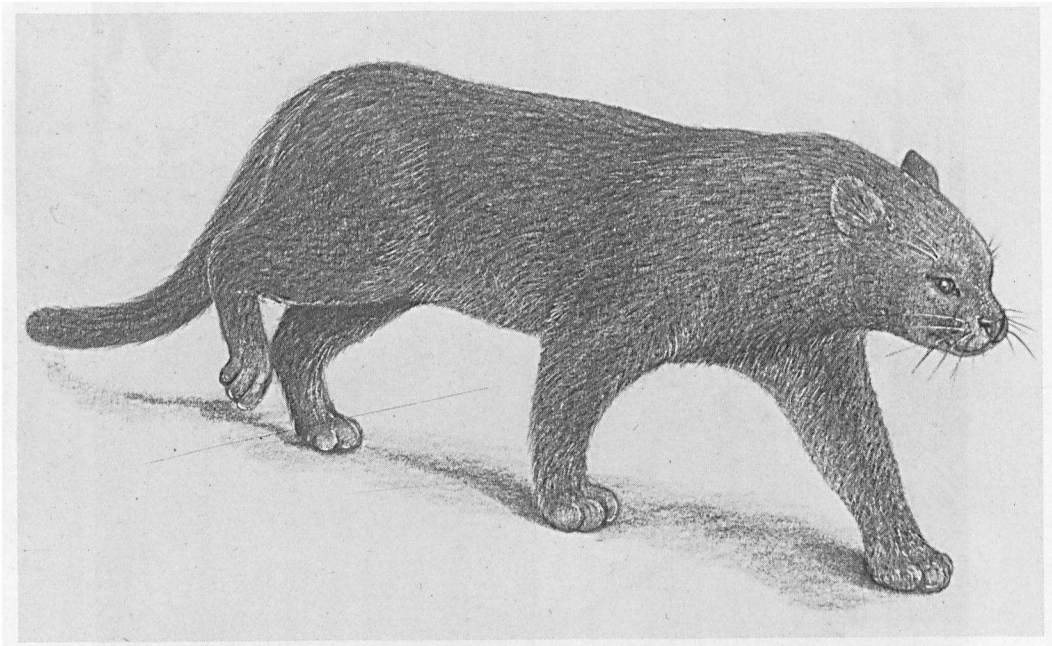
Pteronura brasiliensis brasiliensis (Gmelin)

PLATE 74A

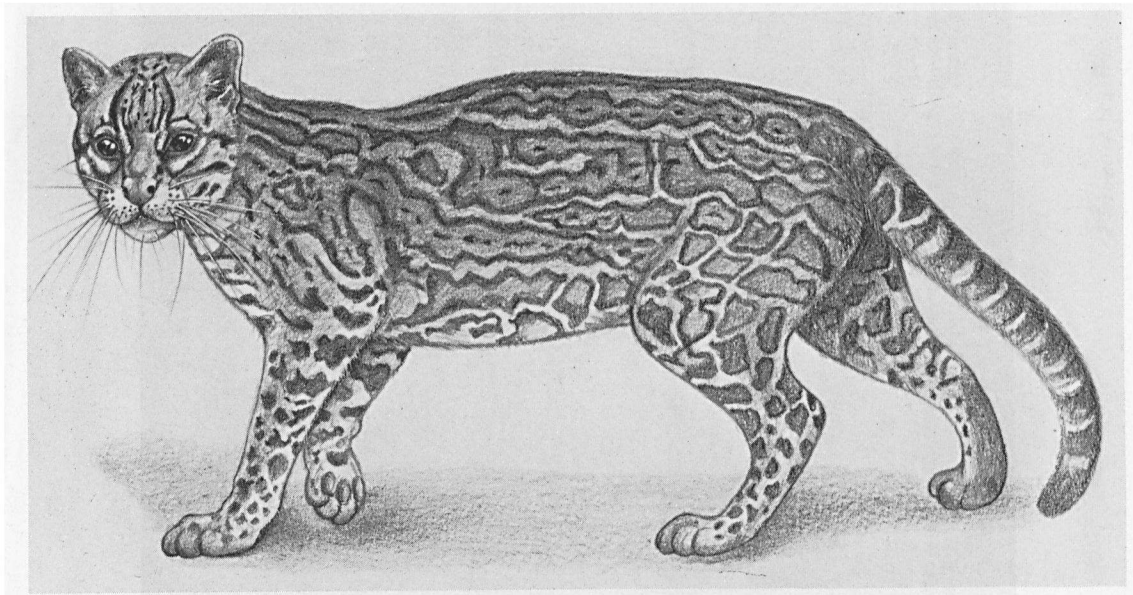


Pteronura brasiliensis brasiliensis (Gmelin), creek near Nannimeer, north-west Suriname, 11 May 1974.

PLATE 75



Herpailurus yagouaroundi yagouaroundi (E. Geoffroy)



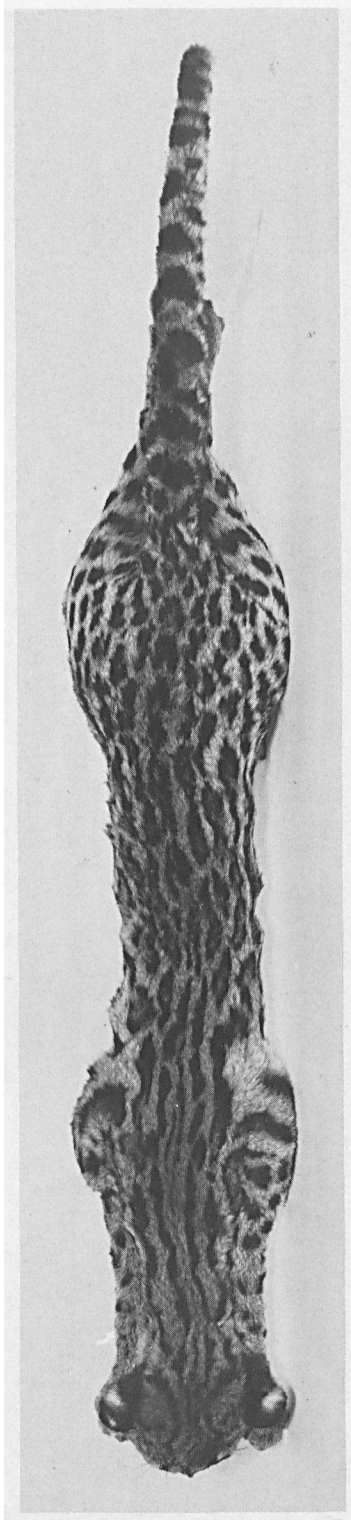
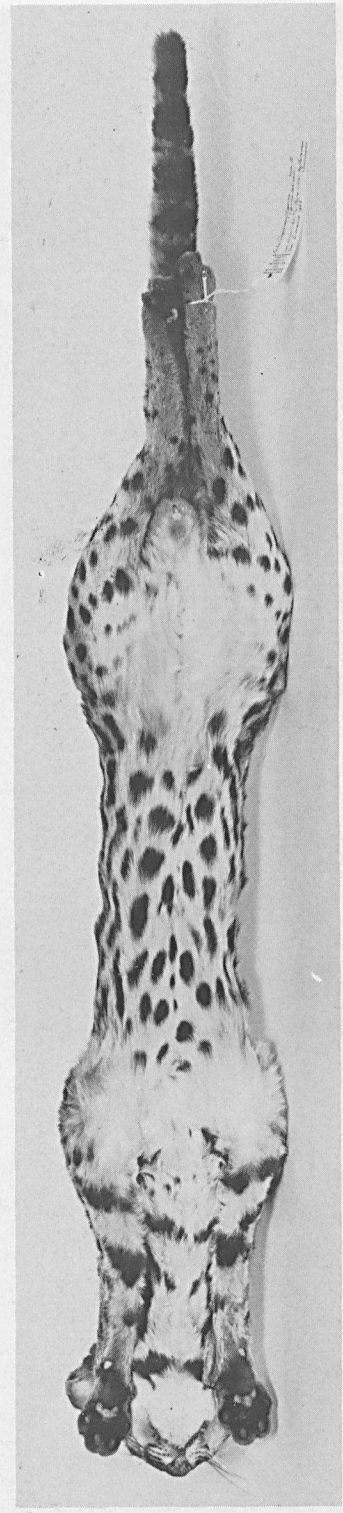
Leopardus pardalis melanurus (Ball)

PLATE 76



Leopardus tigrinus tigrinus (Schreber), damaged skin of male (tail missing),
about 10 km north of Zanderij, April 1972.

PLATE 77

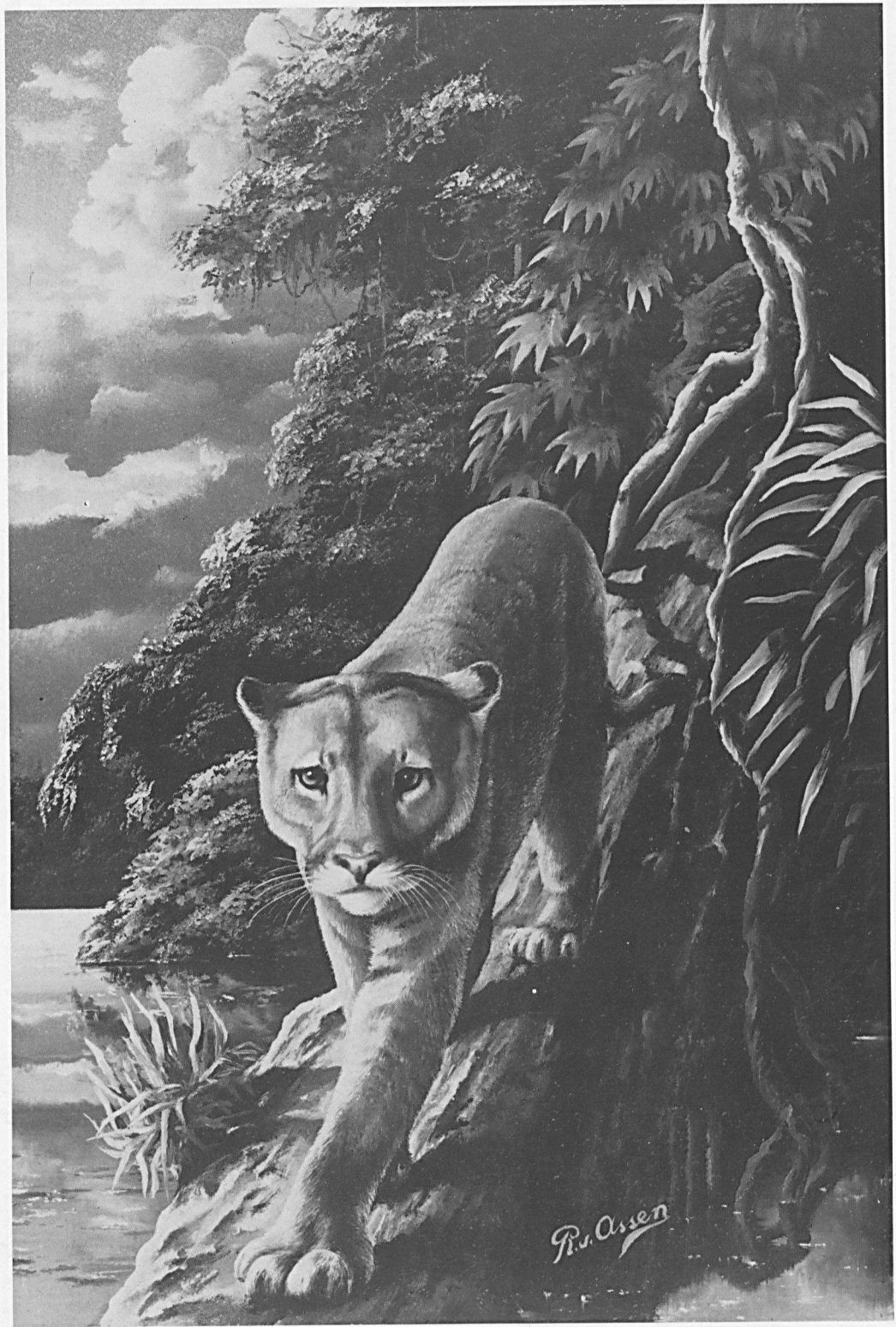


Leopardus tigrinus tigrinus (Schreber), ♂, no. 18221

PLATE 78

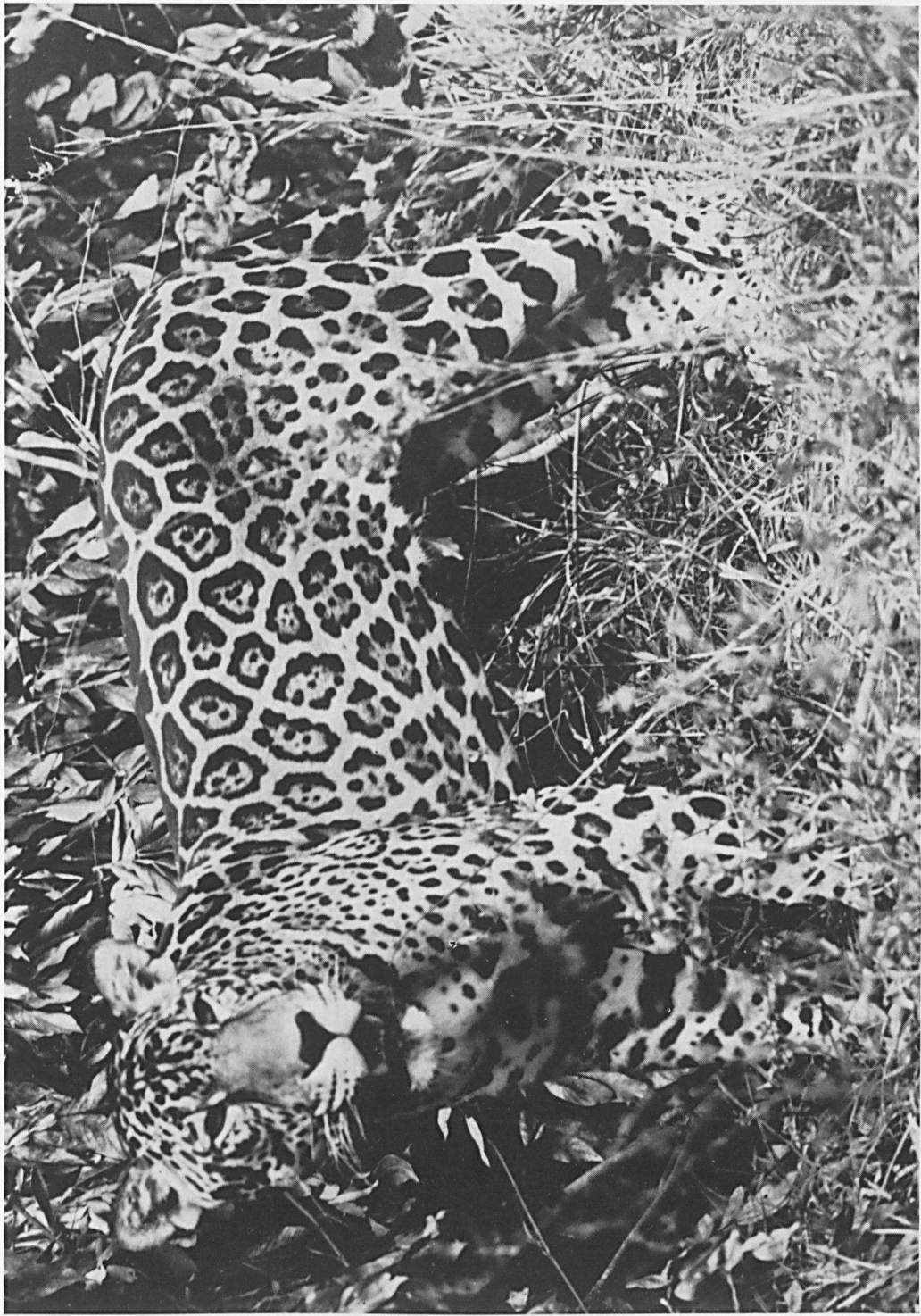


Puma concolor discolor (Schreber), female, Sipaliwini savanna, February 1961.



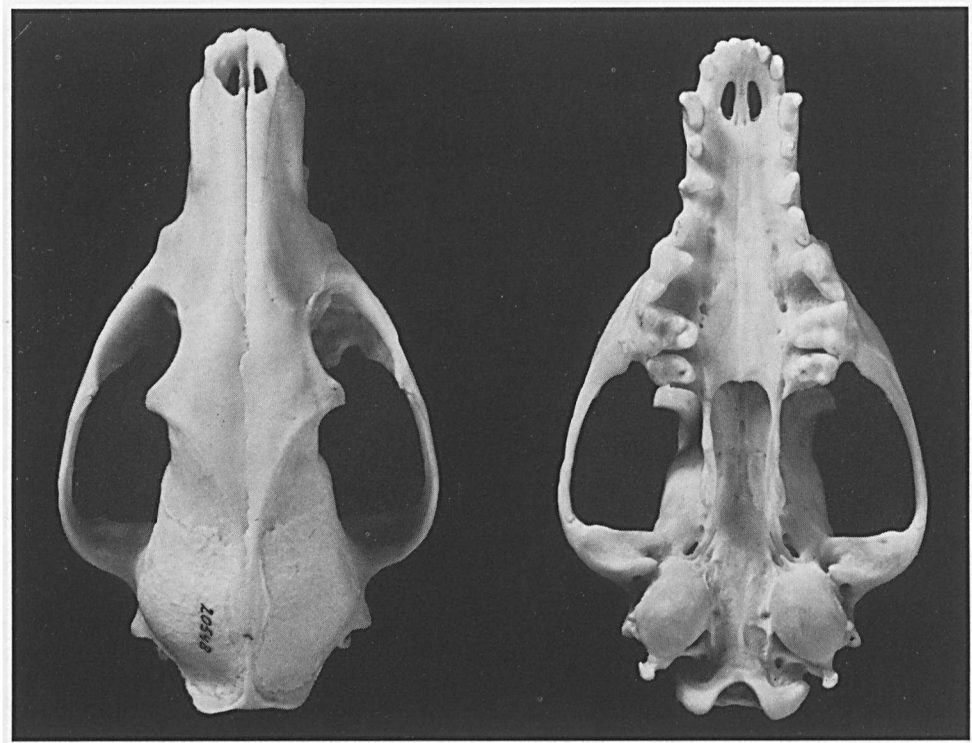
Puma concolor discolor (Schreber)

PLATE 80

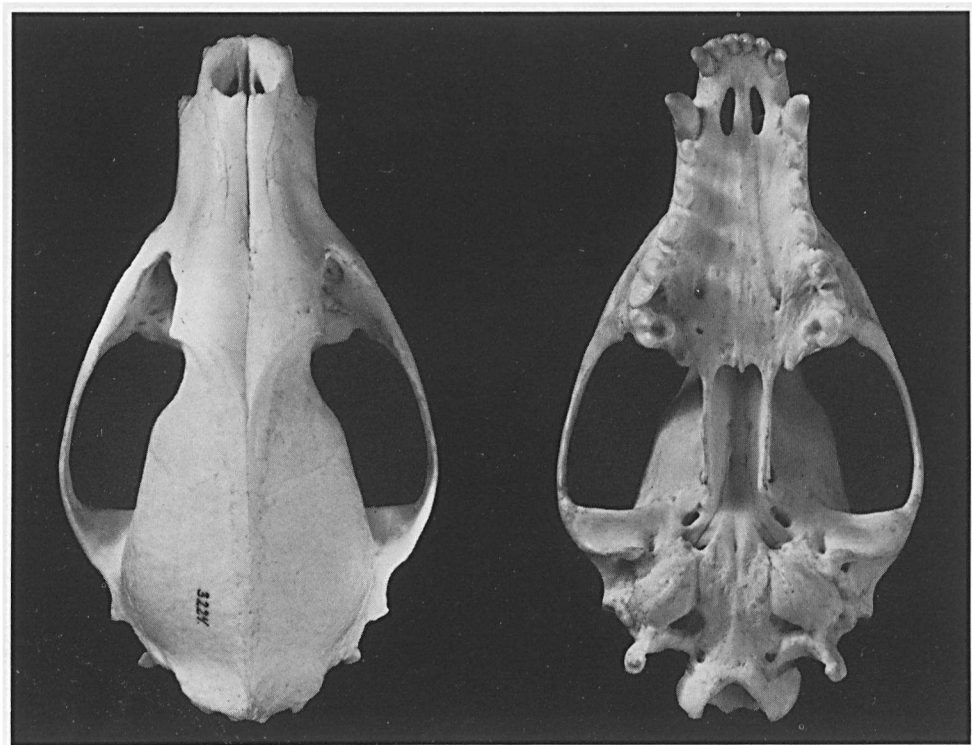


Panthera onca onca (Linnaeus), Suriname

PLATE 81

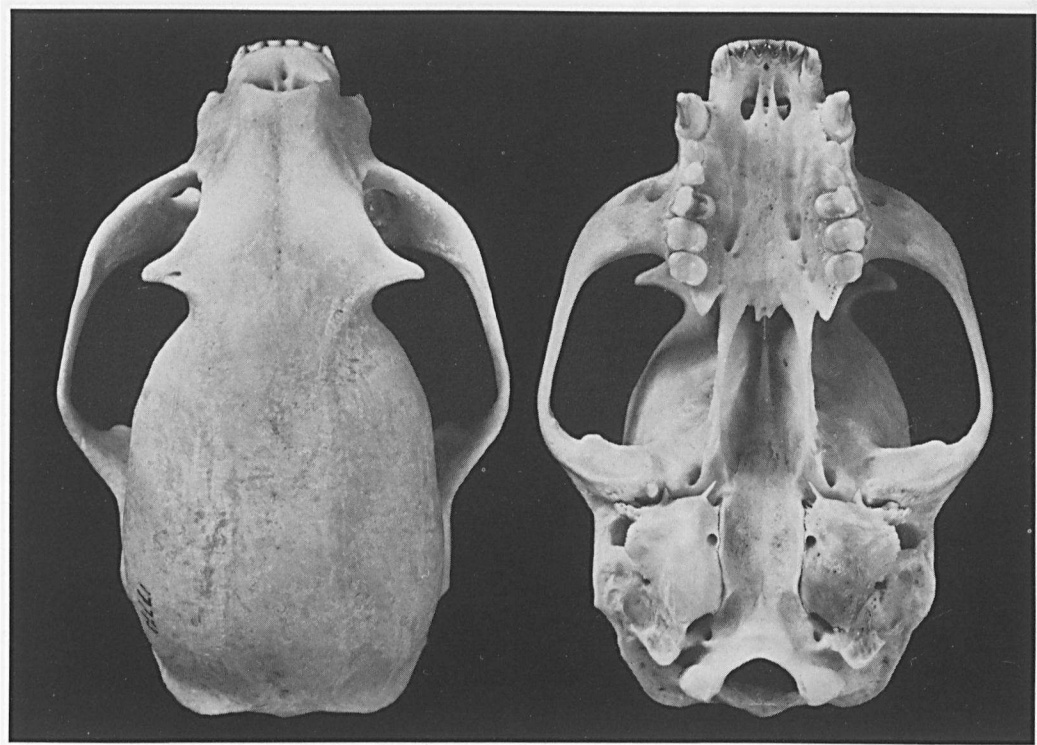


Cerdocyon thous thous (Linnaeus), ♀, no. 20548; zyg. br., 77.6 mm.



Speothos venaticus venaticus (Lund), ♀, Pará, Brazil, no. 3224; zyg. br., 71.2 mm.

PLATE 82

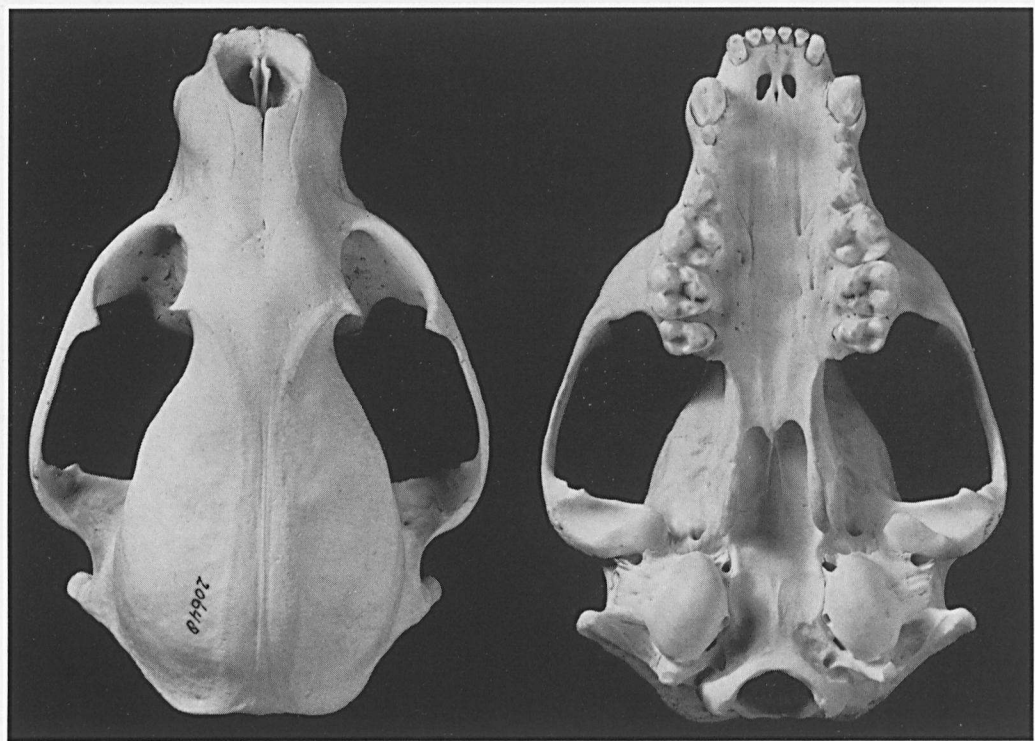


Potos flavus flavus (Schreber), ♀, no. 17773; zyg. br., 52.4 mm.



Galictis vittata vittata (Schreber), ♂, no. 17745; zyg. br., 55.1 mm.

PLATE 83



Procyon cancrivorus cancrivorus (G. Cuvier), no. 20648; zyg. br., 87.5 mm.



Nasua nasua vittata Tschudi, ♂, no. 18267; zyg. br., 67.3 mm.

PLATE 84

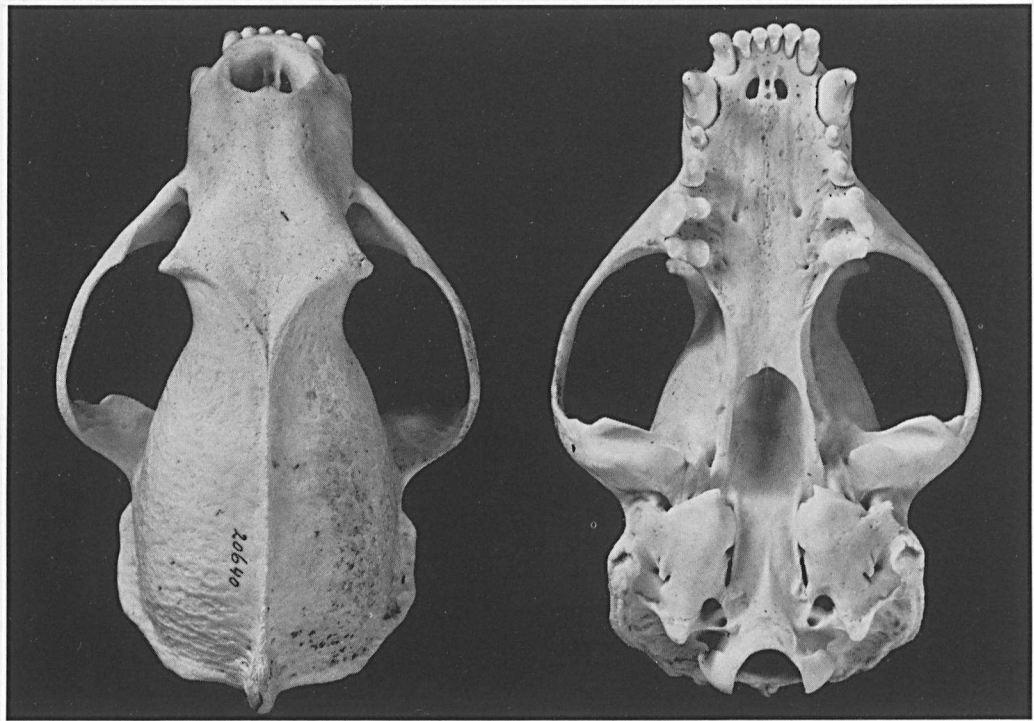


Lutra enudris F. Cuvier, ♂, no. 18008; zyg. br., 71.0 mm.



Pteronura brasiliensis brasiliensis (Gmelin), ♀, no. 20724; zyg. br., 92.0 mm.

PLATE 85

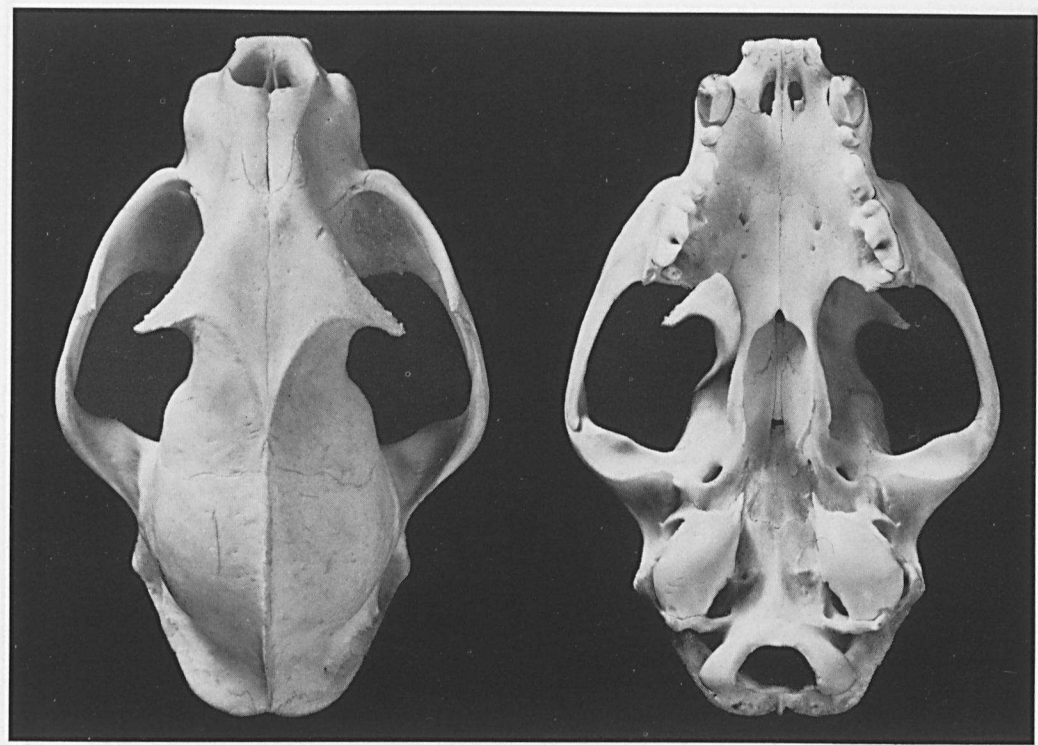


Eira barbara barbara (Linnaeus), no. 20640; zyg. br., 76.8 mm.



Herpestes auro punctatus (Hodgson), ♂, no. 16057; zyg. br., 31.0 mm.

PLATE 86

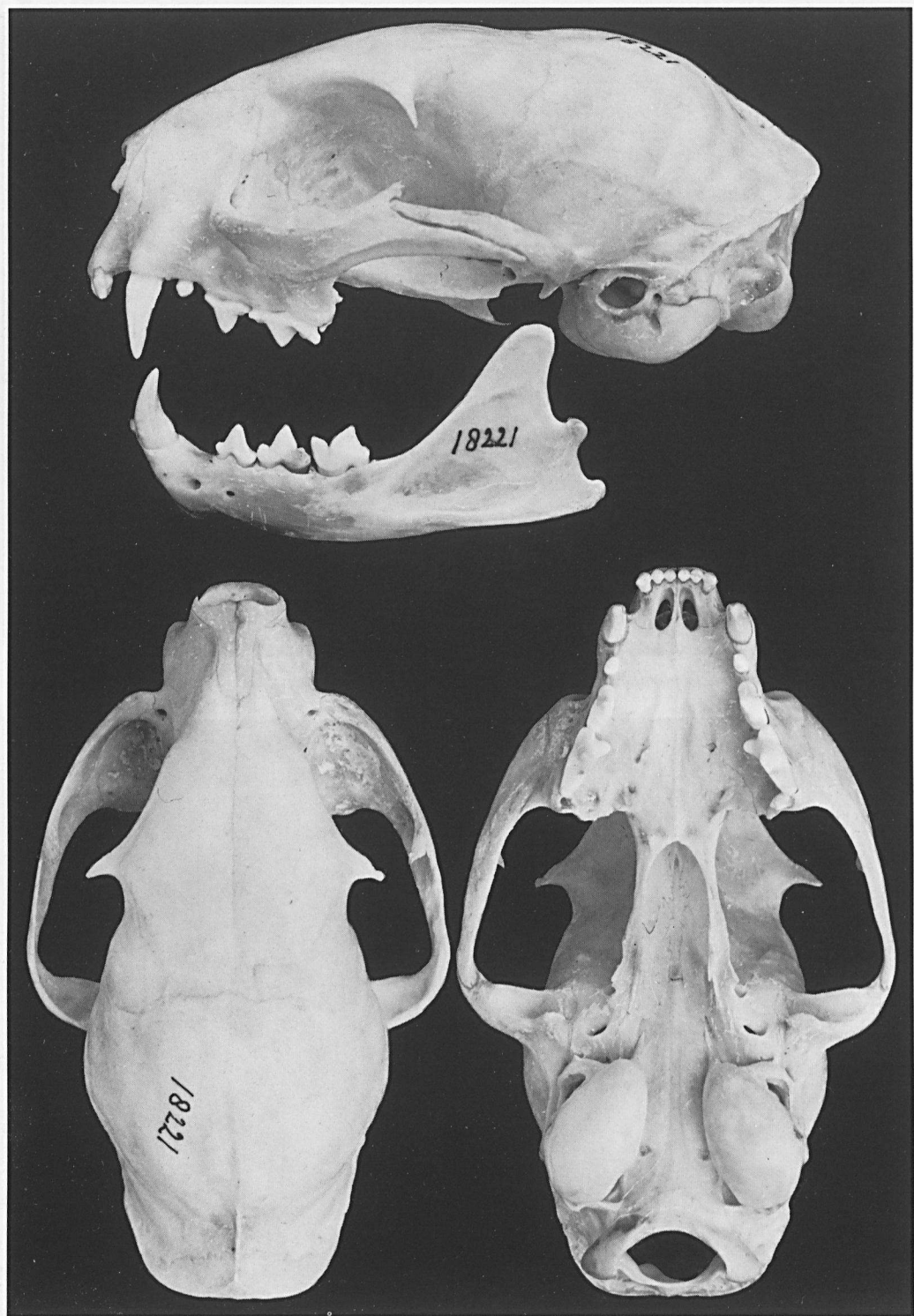


Leopardus pardalis melanurus (Ball), ♂, no. 18010; zyg. br., 87.7 mm.



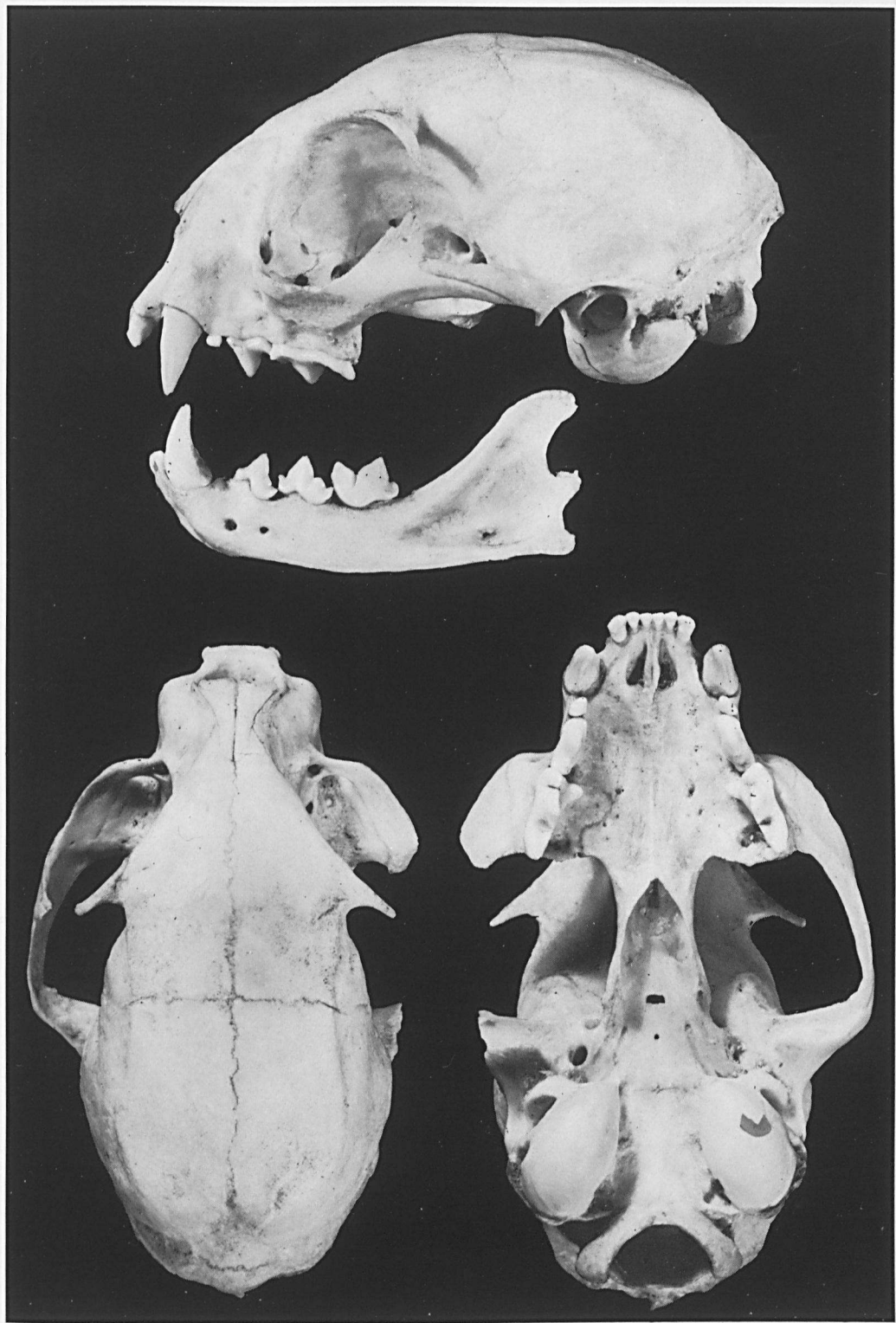
Puma concolor discolor (Schreber), no. 17825; zyg. br., 136.0 mm.

PLATE 87



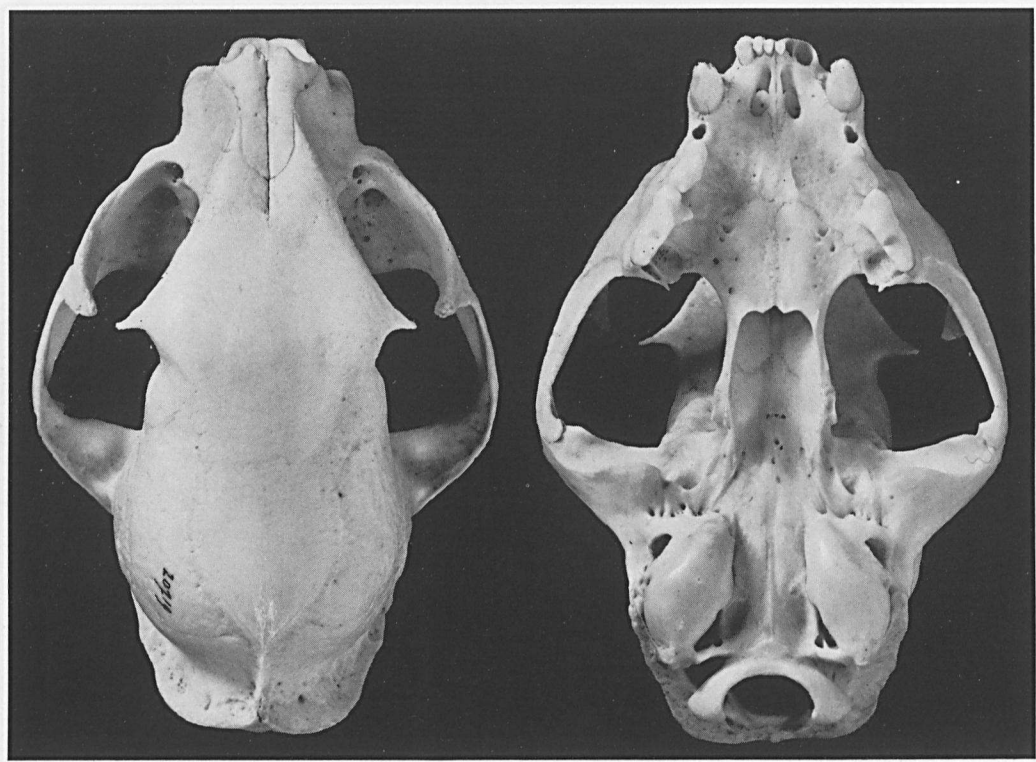
Leopardus tigrinus tigrinus (Schreber), ♂, no. 18221; zyg. br., 56.7 mm.

PLATE 88



Leopardus wiedii vigens (Thomas), no. 19670; condylob. length, 86.4 mm.

PLATE 89



Herpailurus yagouaroundi yagouaroundi (E. Geoffroy), no. 20719; zyg. br., 77.3 mm.



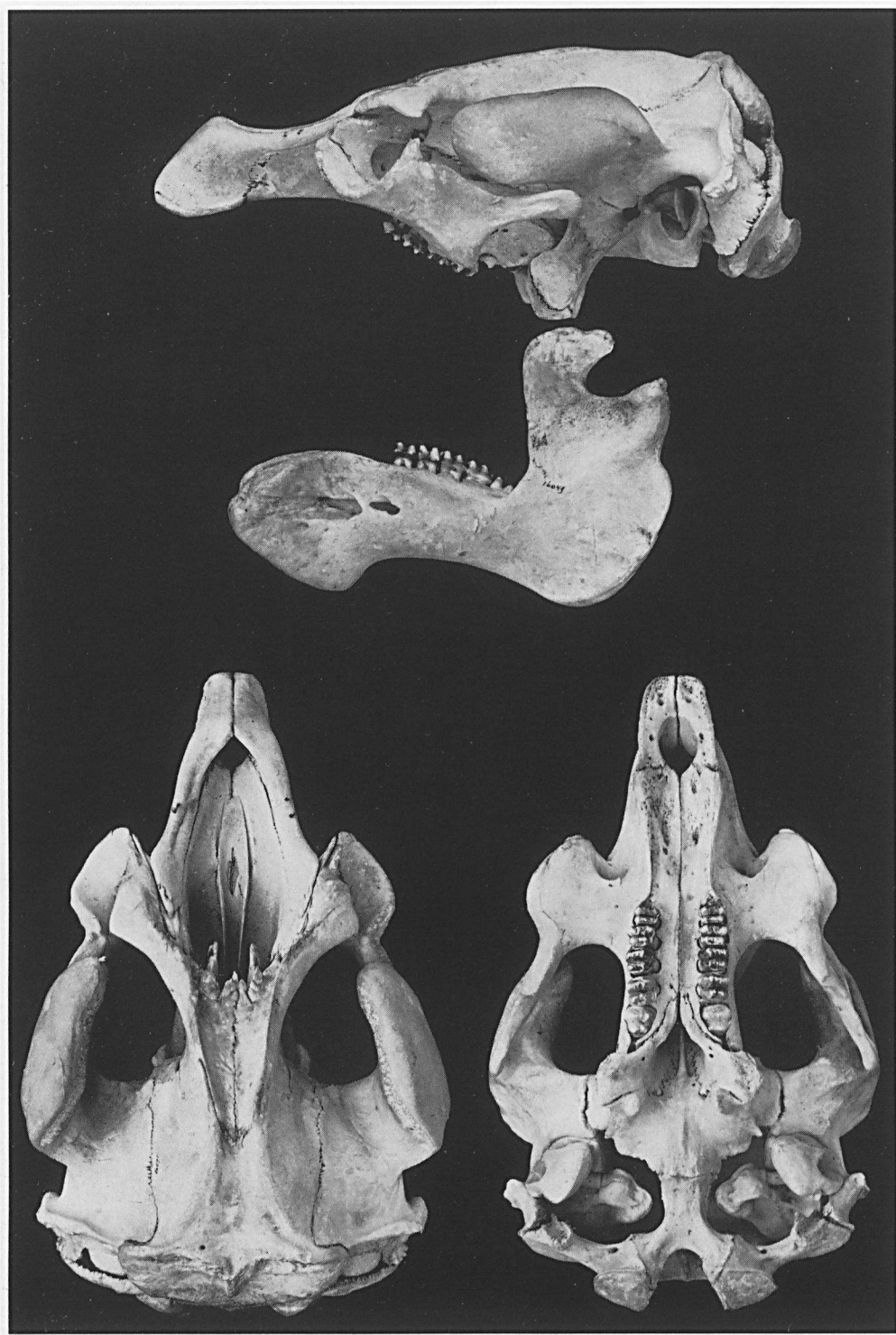
Panthera onca onca (Linnaeus), ♂, no. 20666; zyg. br., 163.5 mm.

PLATE 90

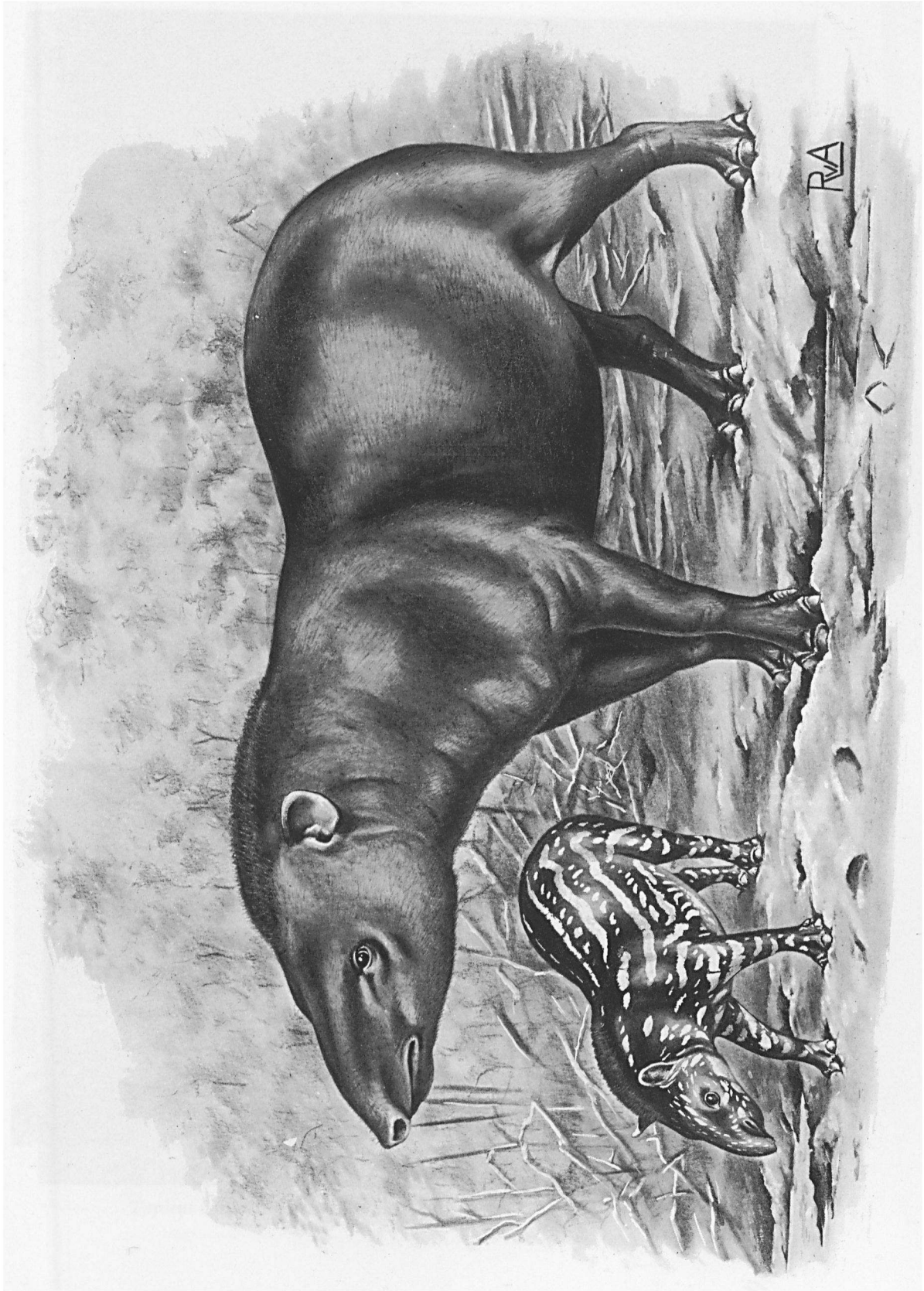


Trichechus manatus manatus Linnaeus

PLATE 91



Trichechus manatus manatus Linnaeus, no. 16049; zyg. br., 184 mm.



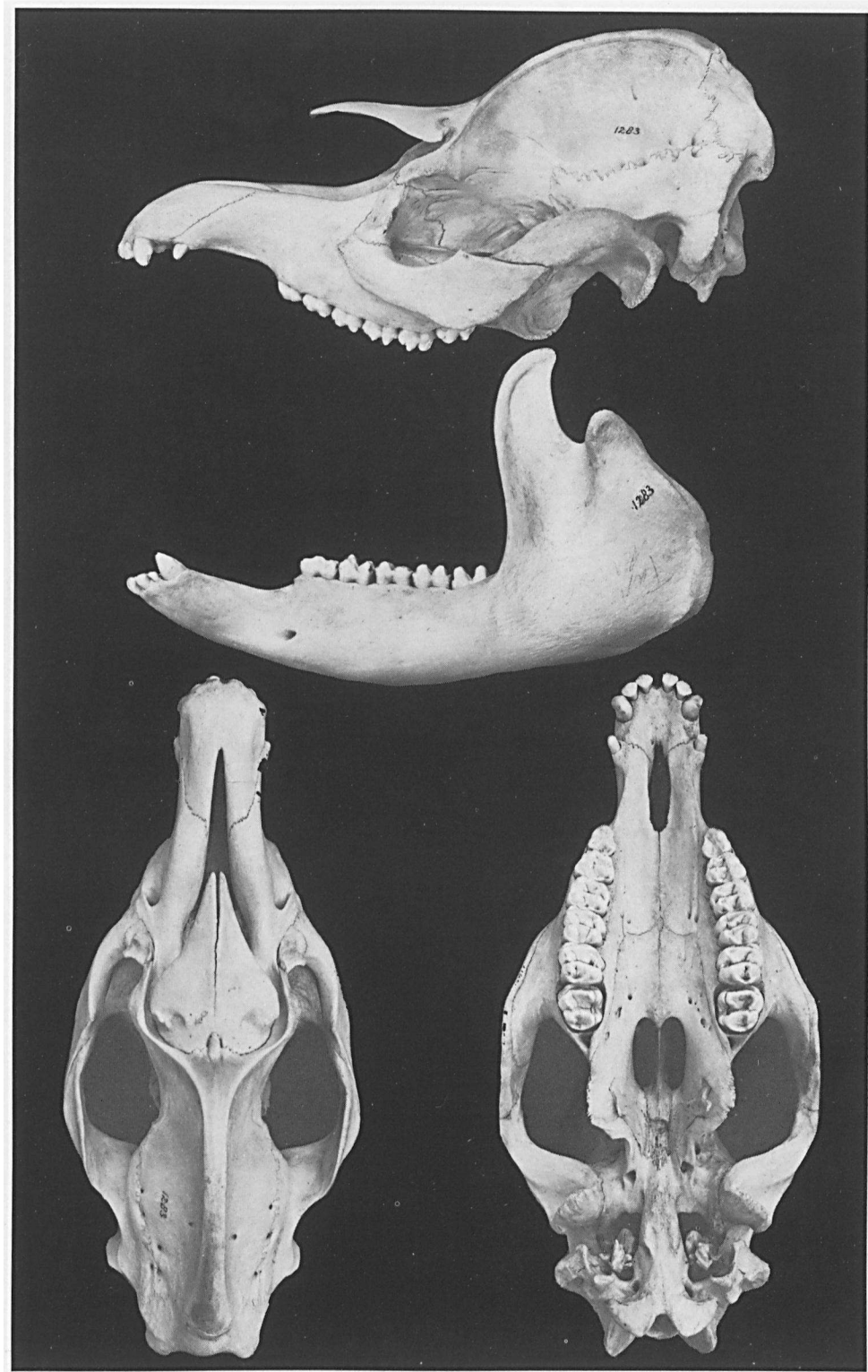
Tapirus terrestris terrestris (Linnaeus) with young

PLATE 93



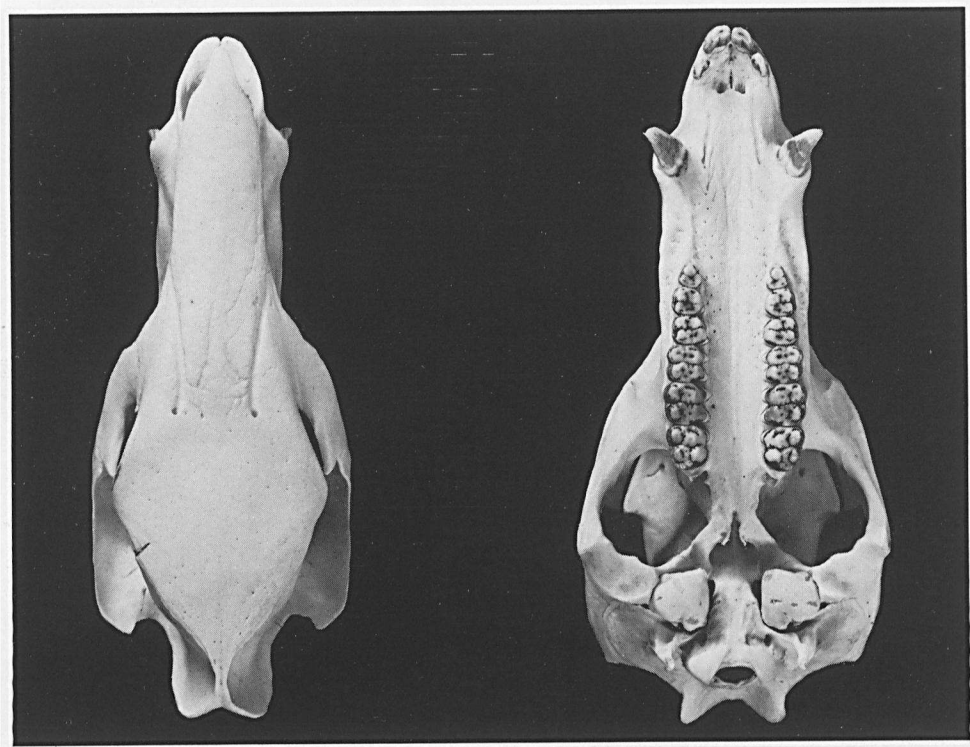
Tapirus terrestris terrestris (Linnaeus), young animal, Benzdorp, Lawa River, Marowijne Basin, April 1960.

PLATE 94

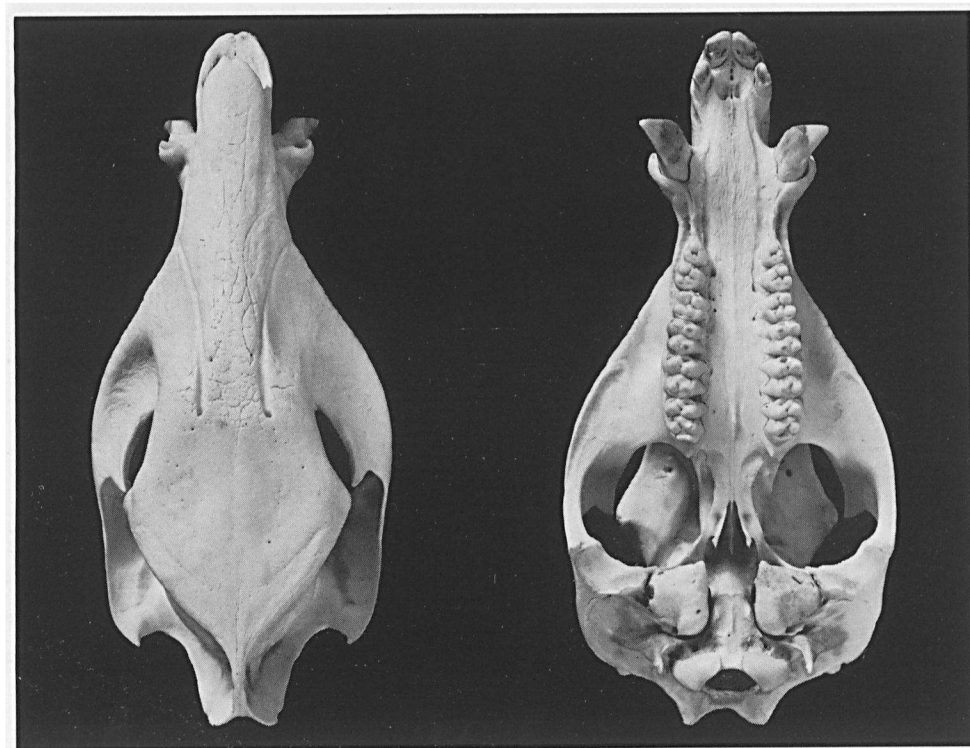


Tapirus terrestris terrestris (Linnaeus), ♂, no. 1283; zyg. br., 174 mm.

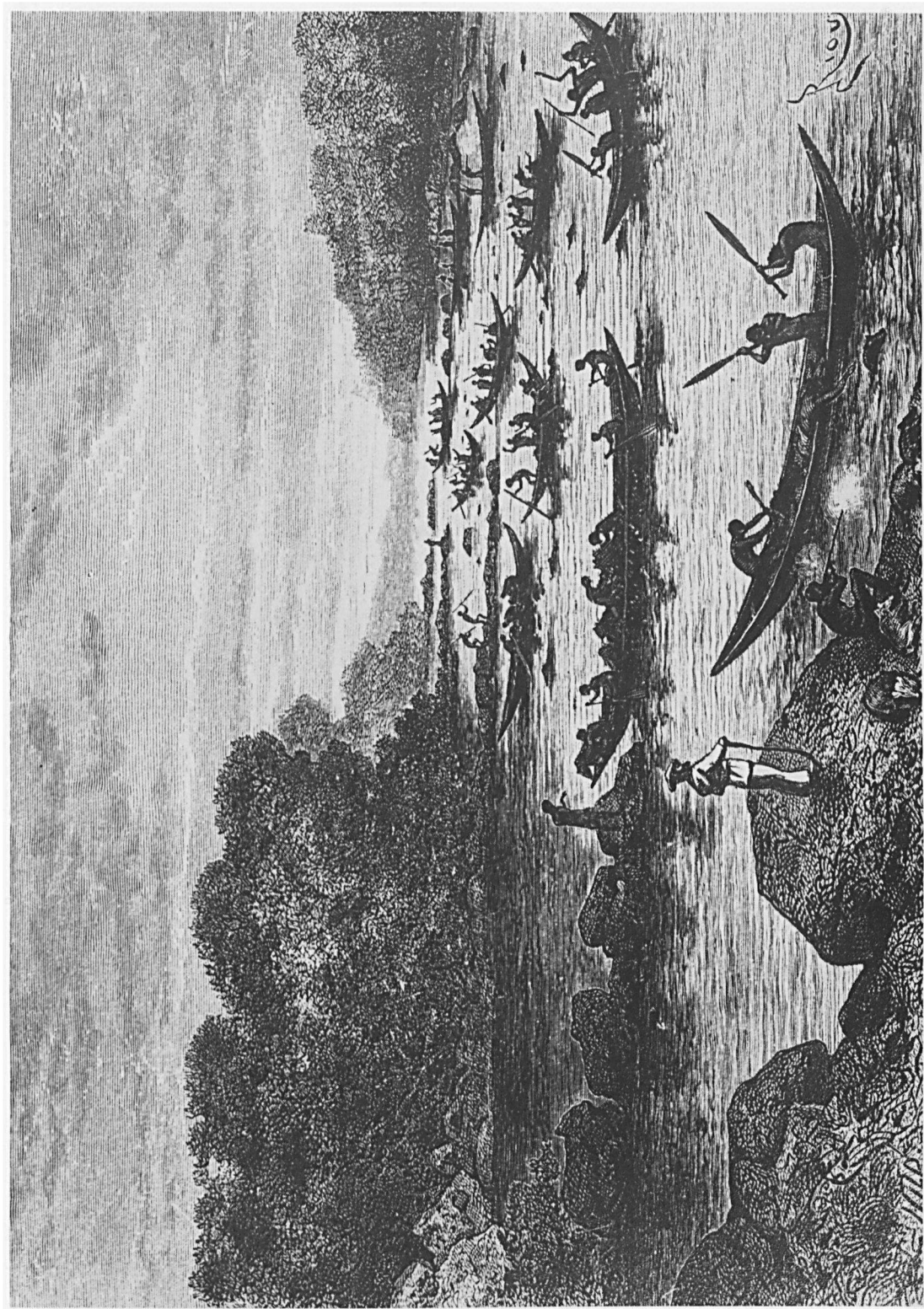
PLATE 95



Dicotyles pecari (Link), ♀, no. 18232; zyg. br., 118.5 mm.

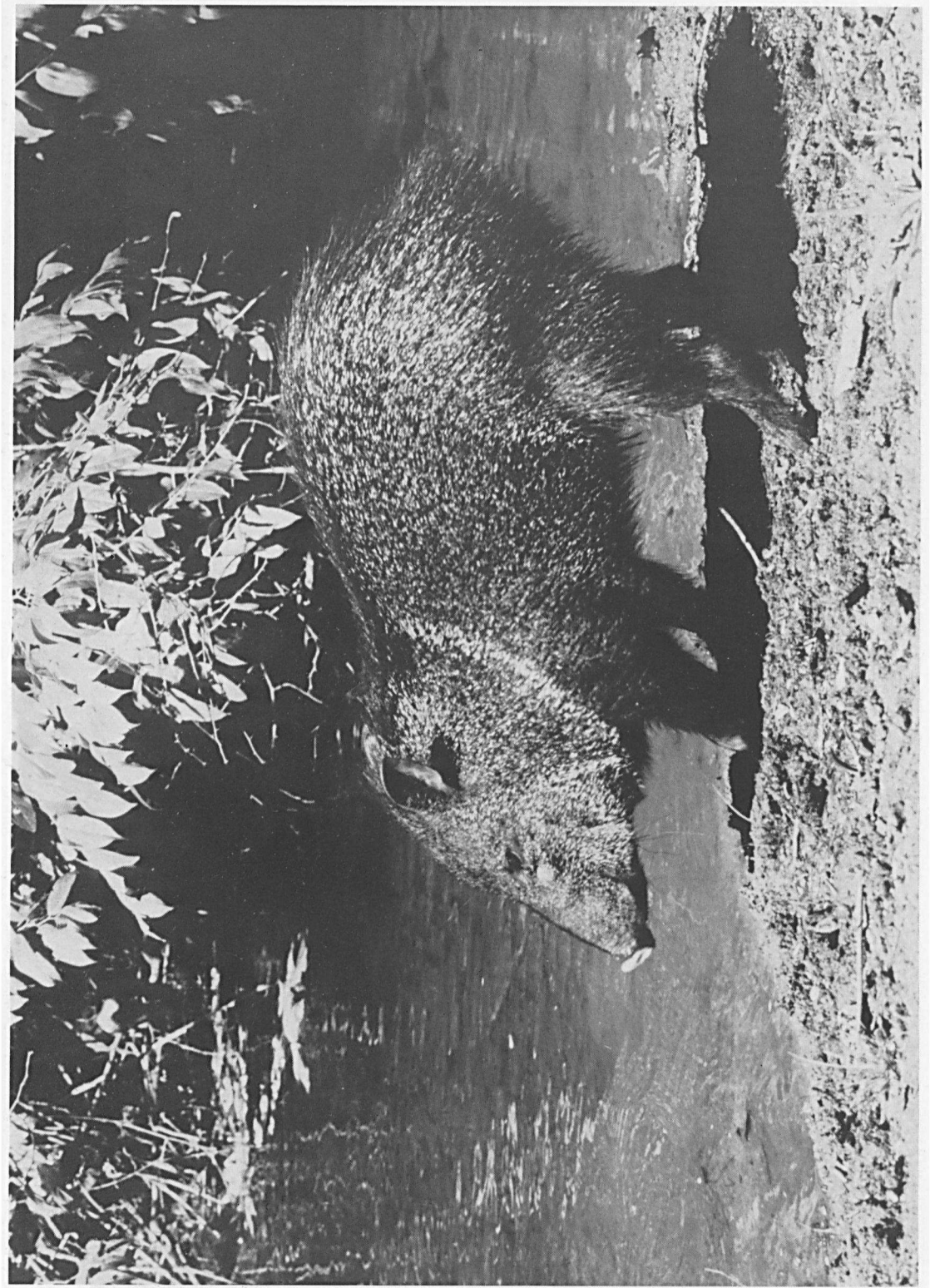


Tayassu tajacu pativa (Kerr), no. 20984; zyg. br., 107.5 mm.



A band of *Dicotyles pecari* (Link) swimming across the Marowijne River and being attacked by Bush-Negroes (see p. 352). After Kappler (1887: 80).

PLATE 97



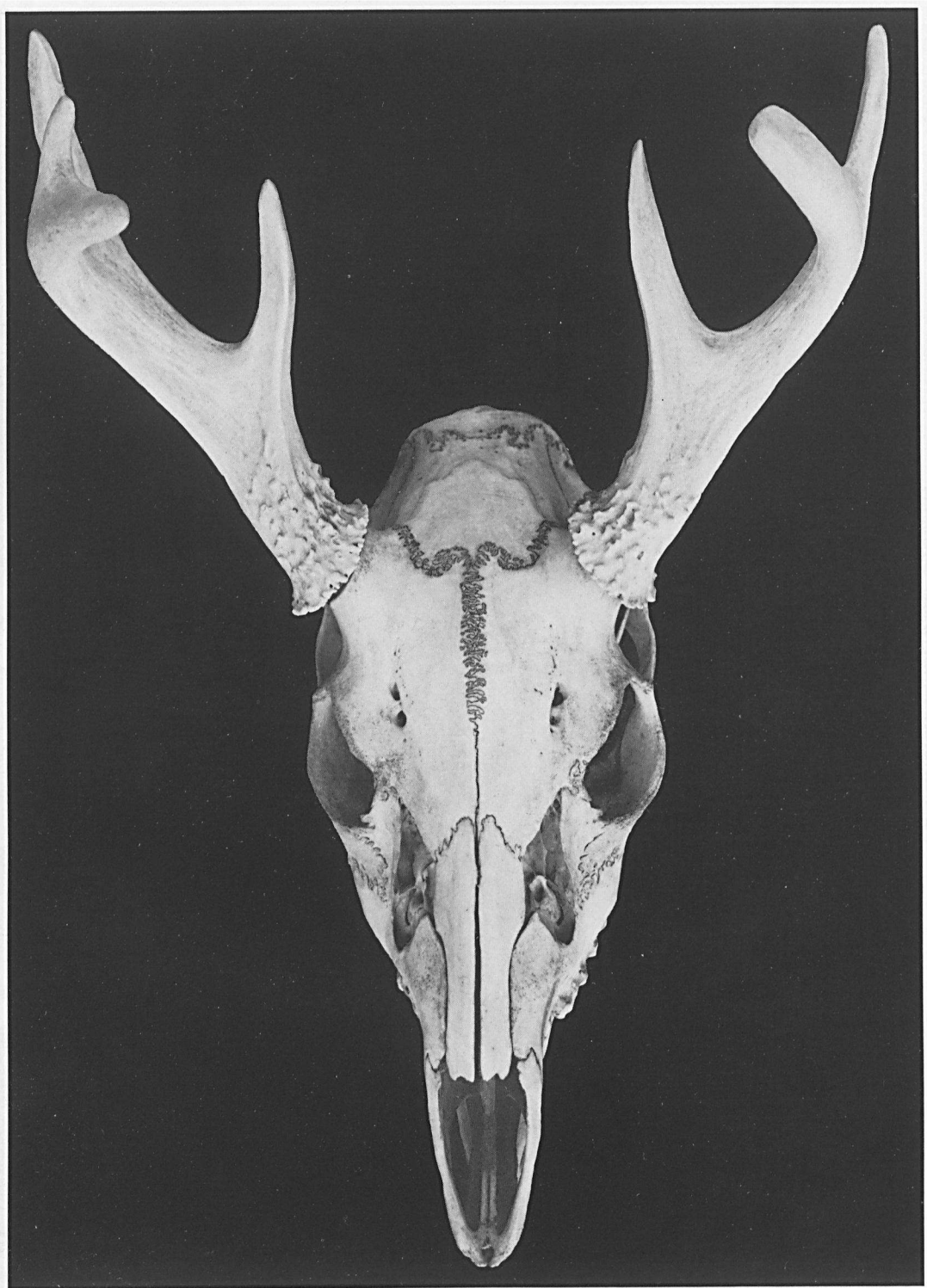
Tayassu tajacu patira (Kerr), Suriname

PLATE 98



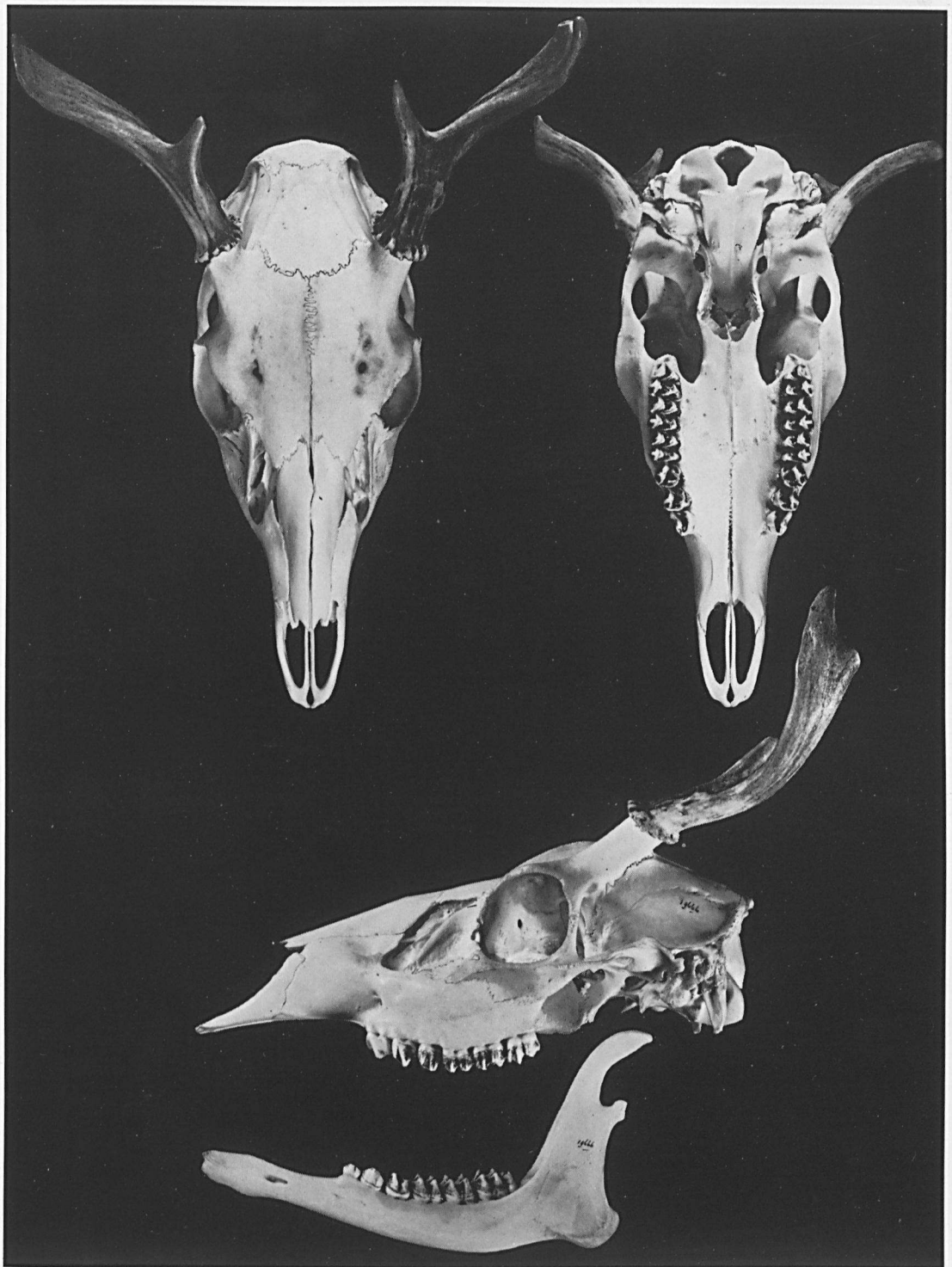
Odocoileus virginianus cariacou (Boddaert), male. The animal runs free around at the Fort Nieuw Amsterdam.

PLATE 99



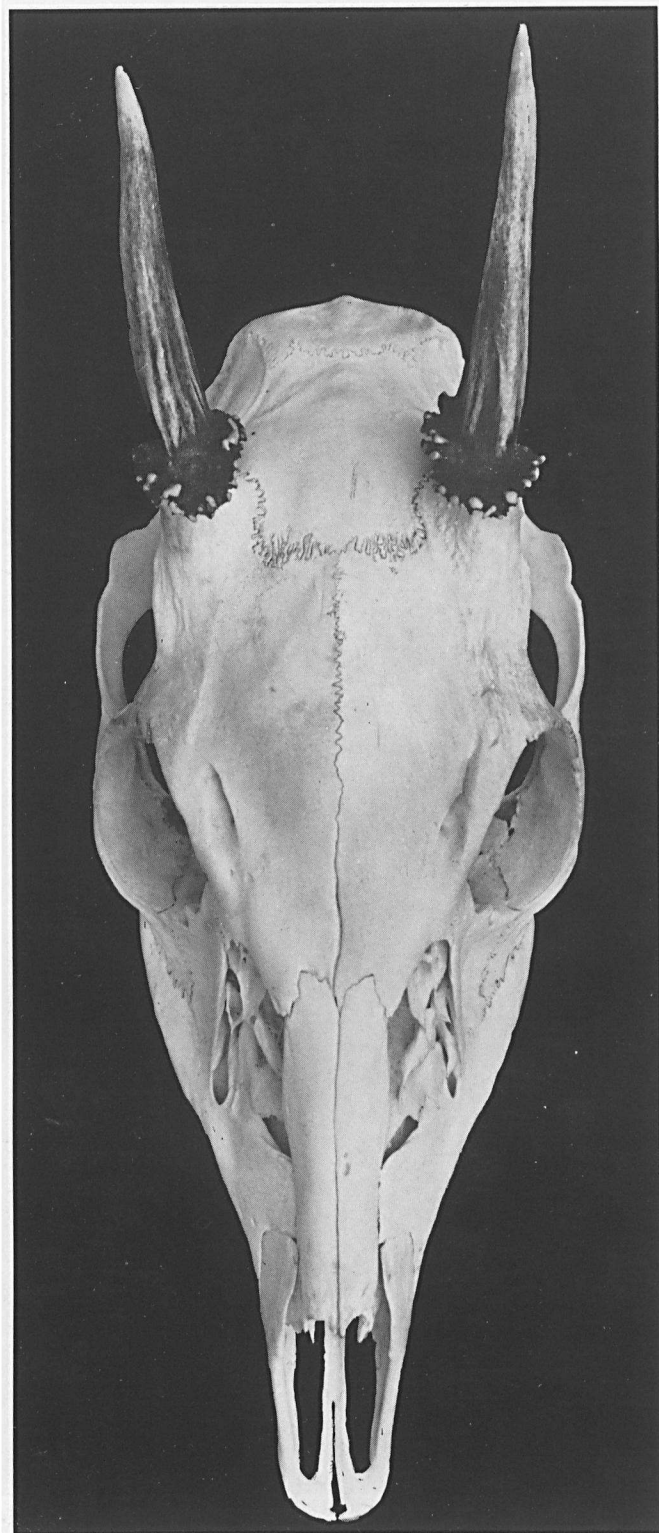
Odocoileus virginianus cariacou (Boddaert), ♂, no. 19644; zyg. br., 101.8 mm.

PLATE 100



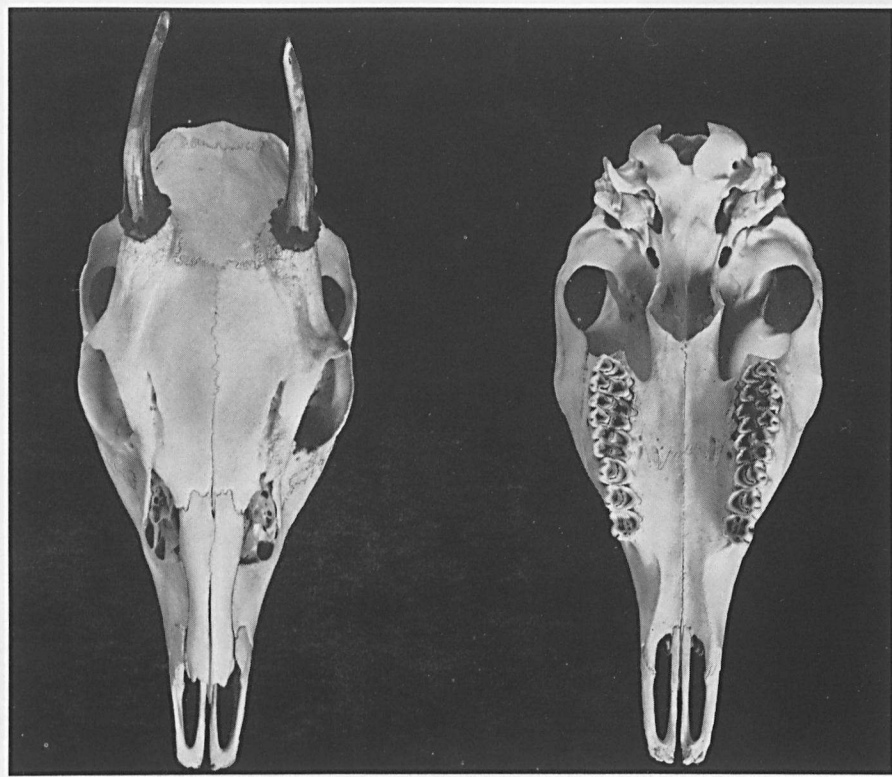
Odocoileus virginianus cariacou (Boddaert), ♂, no. 19666; zyg. br., 94.4 mm.

PLATE IOI

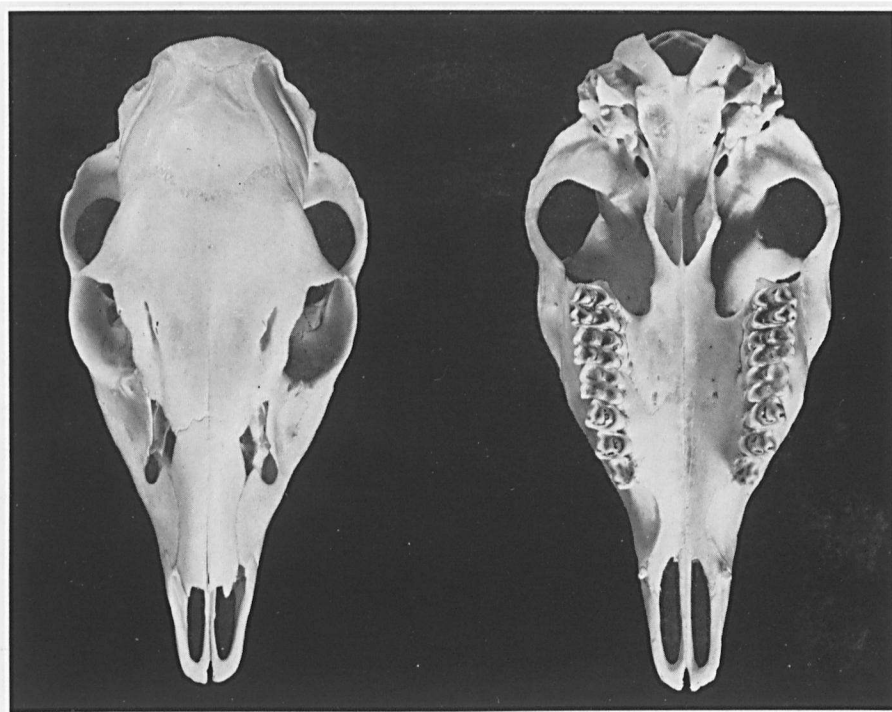


Mazama americana americana (Erxleben), ♂, no. 18018; zyg
br., 92.0 mm.

PLATE 102



Mazama americana americana (Erxleben), ♂, no. 21962; zyg. br., 95.4 mm.

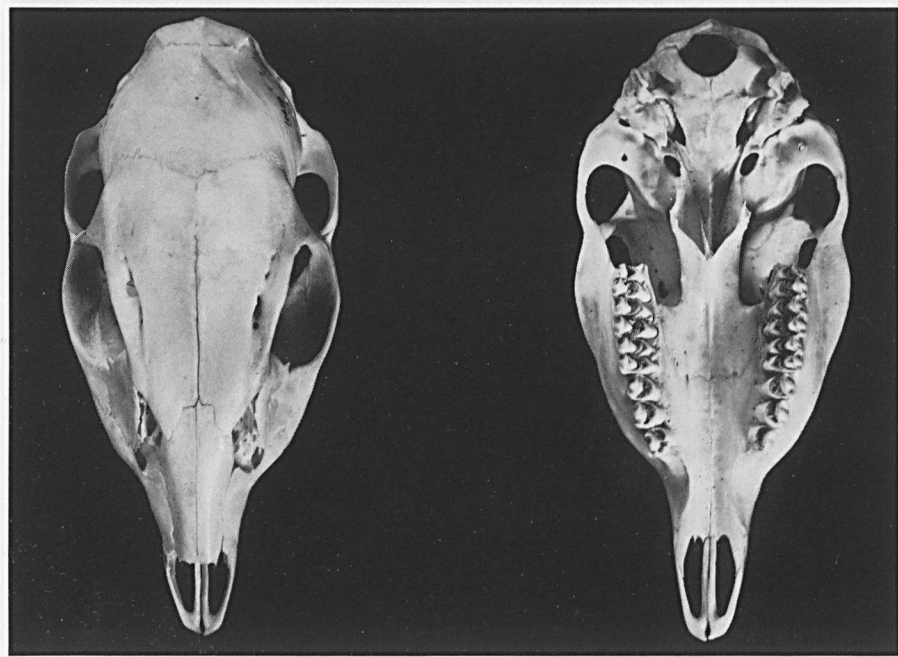


Mazama americana americana (Erxleben), ♀, no. 21963; zyg. br., 103.0 mm.

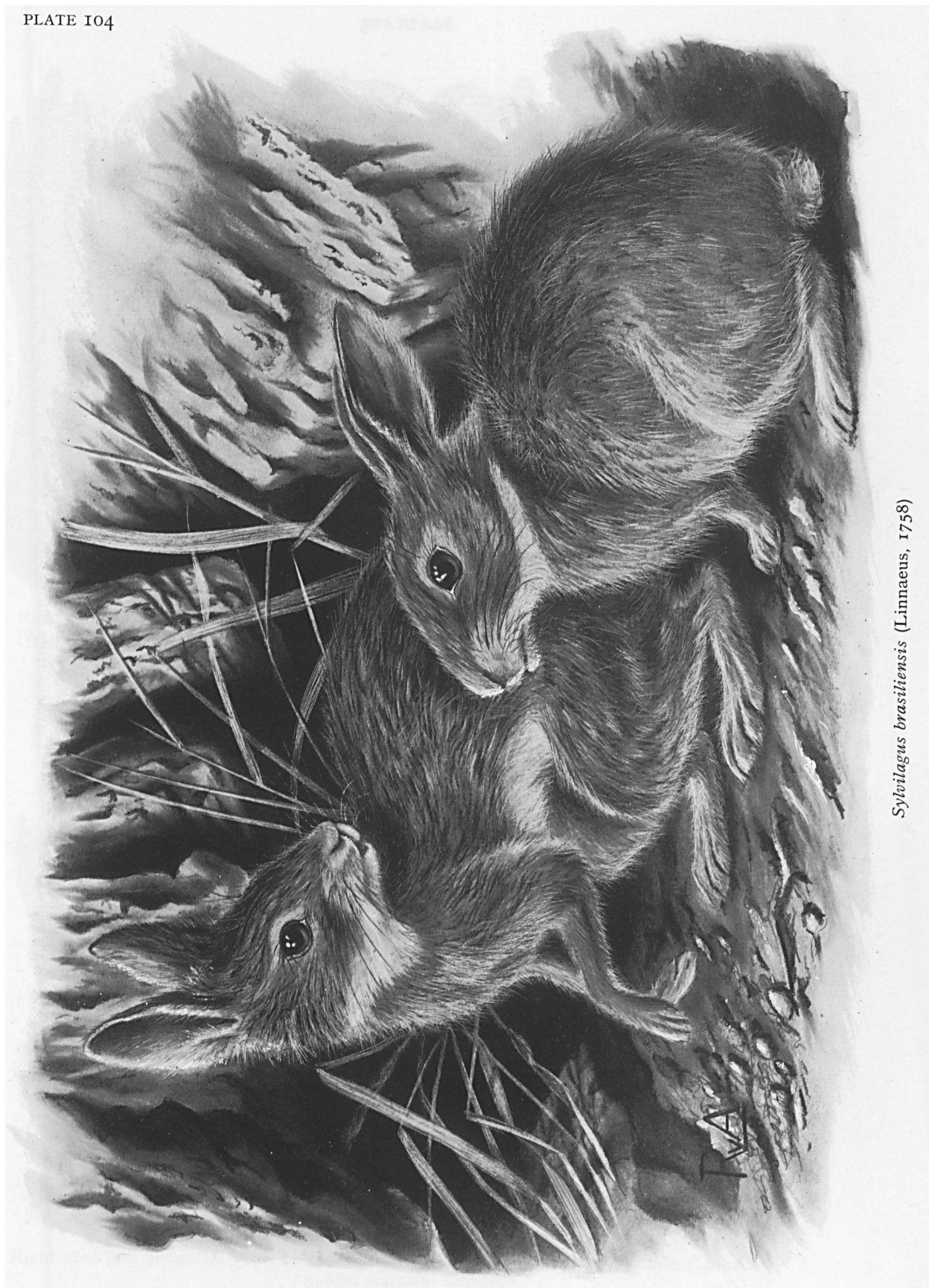
PLATE 103



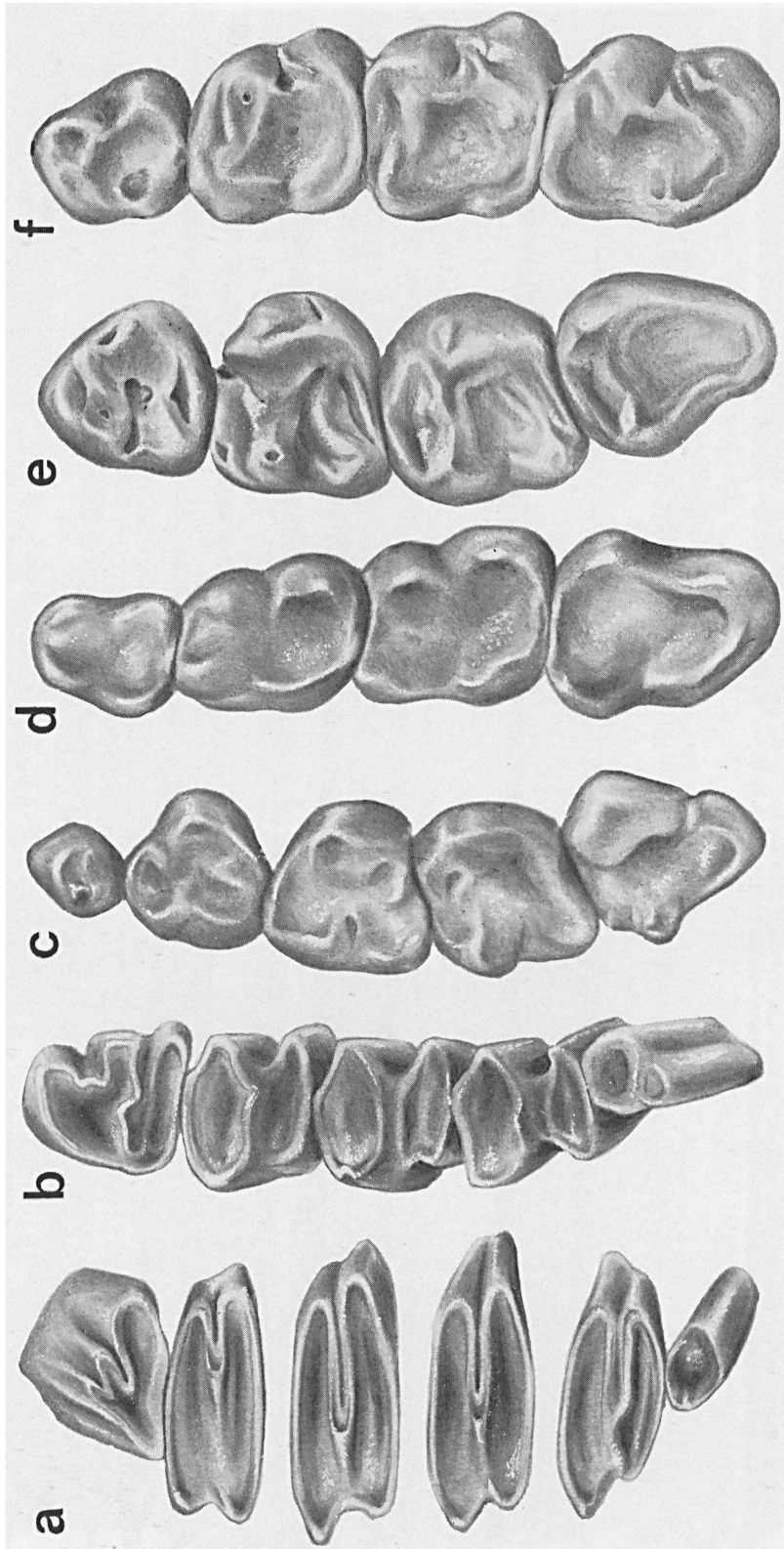
Mazama gouazoubira nemorivaga (F. Cuvier), ♂, no. 21711; zyg. br., 77.0 mm.



Mazama gouazoubira nemorivaga (F. Cuvier), ♀, no. 19658; zyg. br., 72.5 mm.

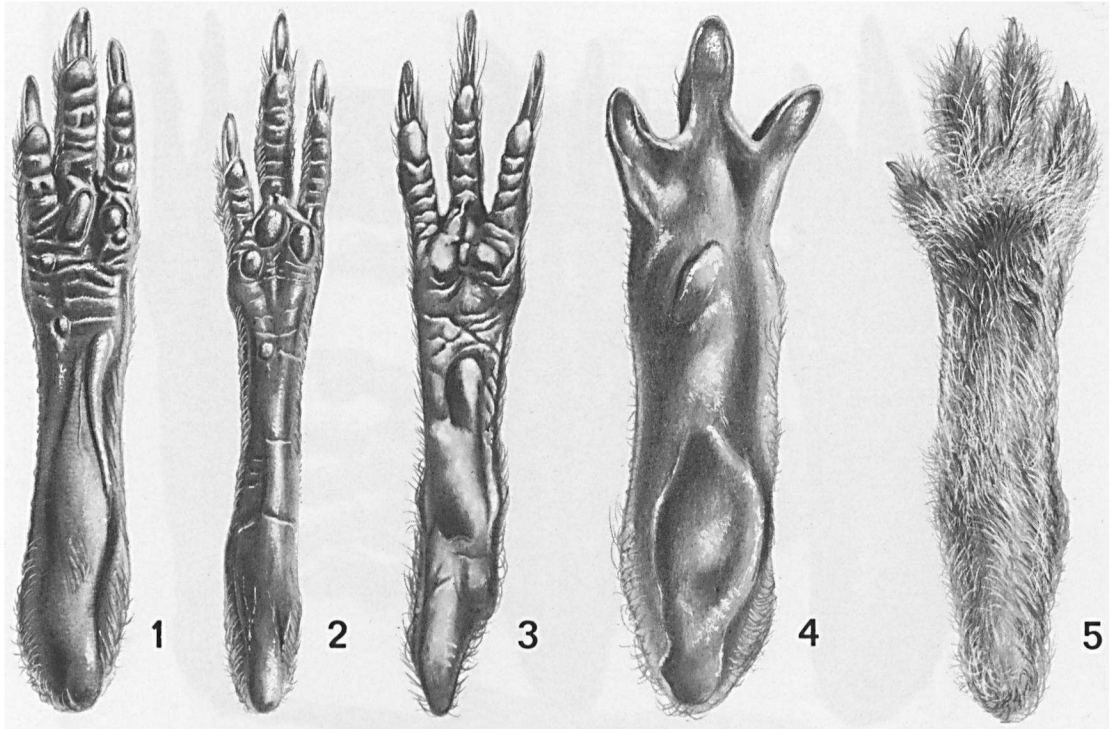


Sybilagus brasiliensis (Linnaeus, 1758)

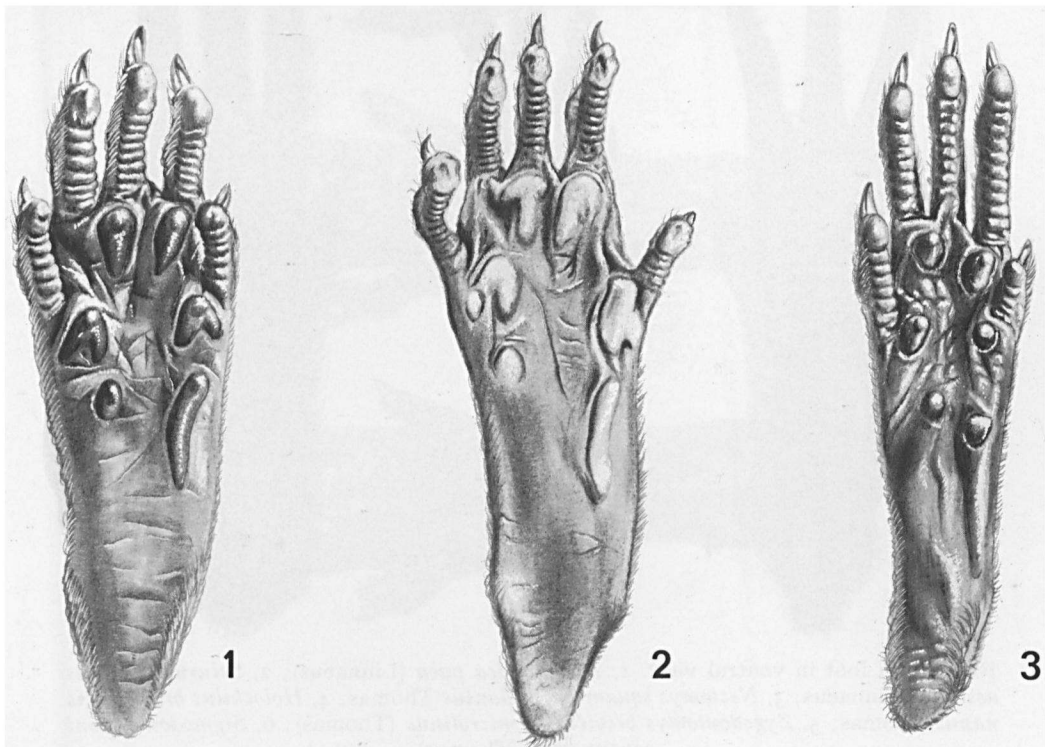


Tooth-rows of Leporidae and Scuriidae; left: right upper tooth-rows; right: right lower tooth-rows. - a, b, *Sylvilagus floridanus nigronuchalis* (Hartert) from Curaçao; c, d, *Sciurillus pusillus* (E. Geoffroy) from Suriname; e, f, *Sciurus aestuans aestuans* Linnaeus from Suriname.

PLATE 106

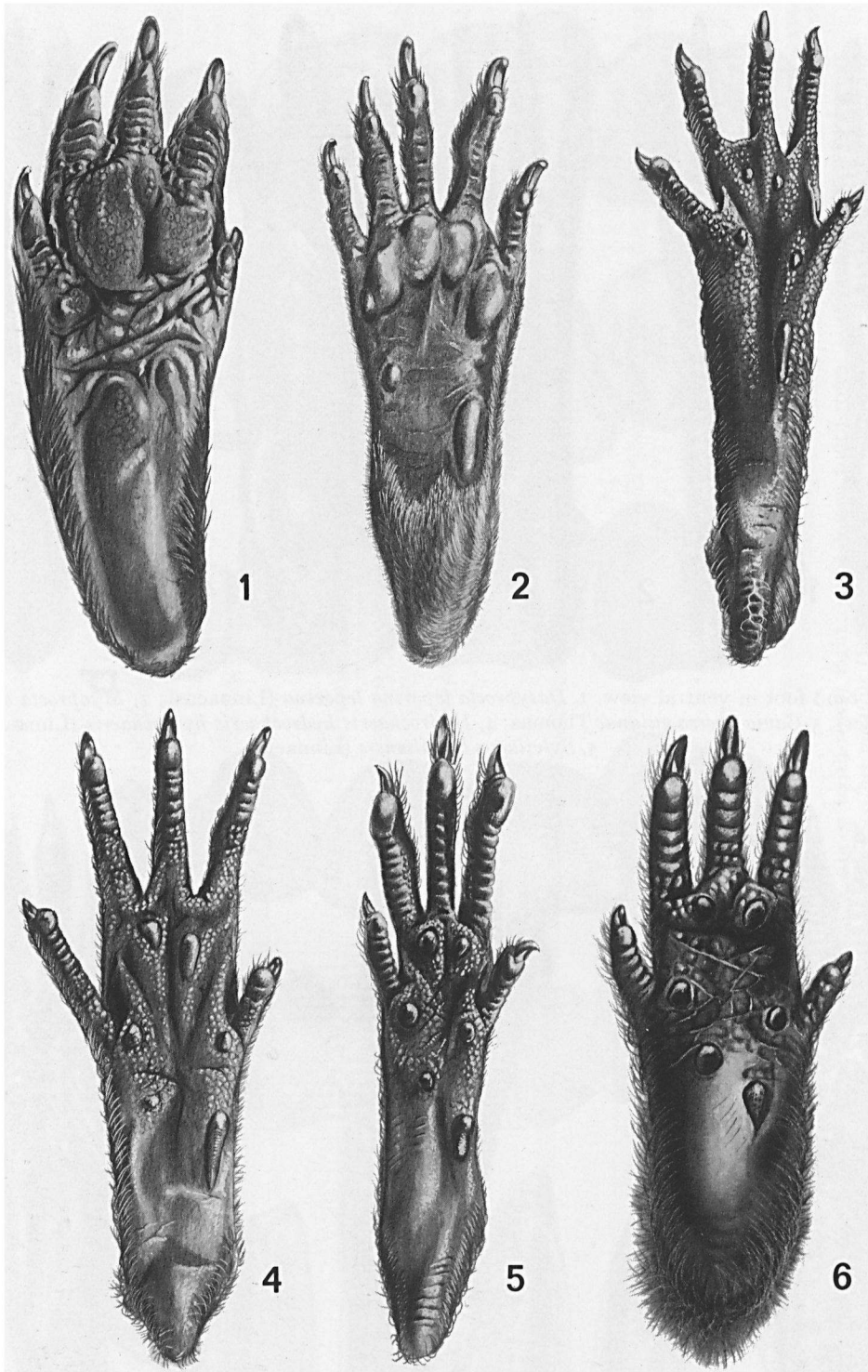


Right hind foot in ventral view. 1, *Dasyprocta leporina leporina* (Linnaeus); 2, *Myoprocta exilis* (Wagler); 3, *Cavia aperea guianae* Thomas; 4, *Hydrochaeris hydrochaeris hydrochaeris* (Linnaeus); 5, *Sylvilagus brasiliensis* (Linnaeus).



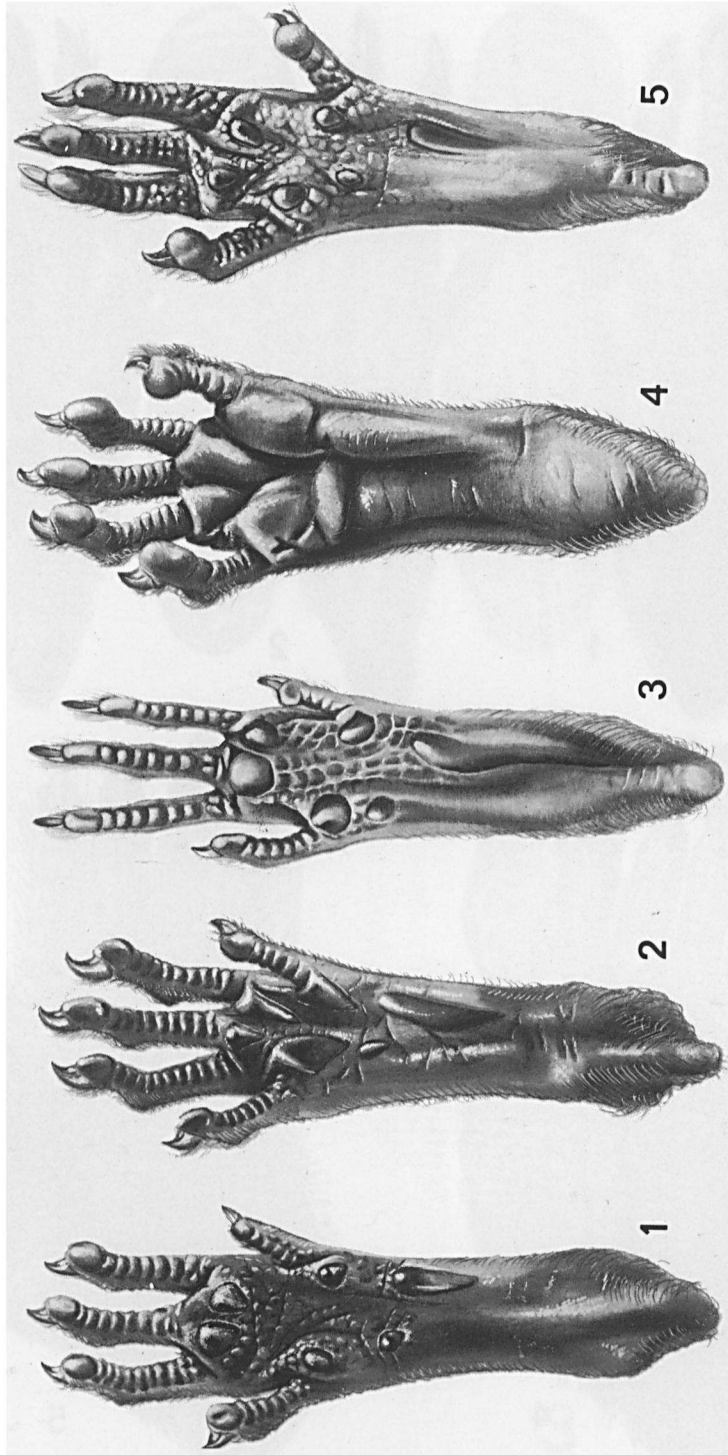
Right hind foot in ventral view. 1, *Rattus norvegicus* (Berkenhout); 2, *Rattus rattus* (Linnaeus); 3, *Mus musculus* Linnaeus.

PLATE 107



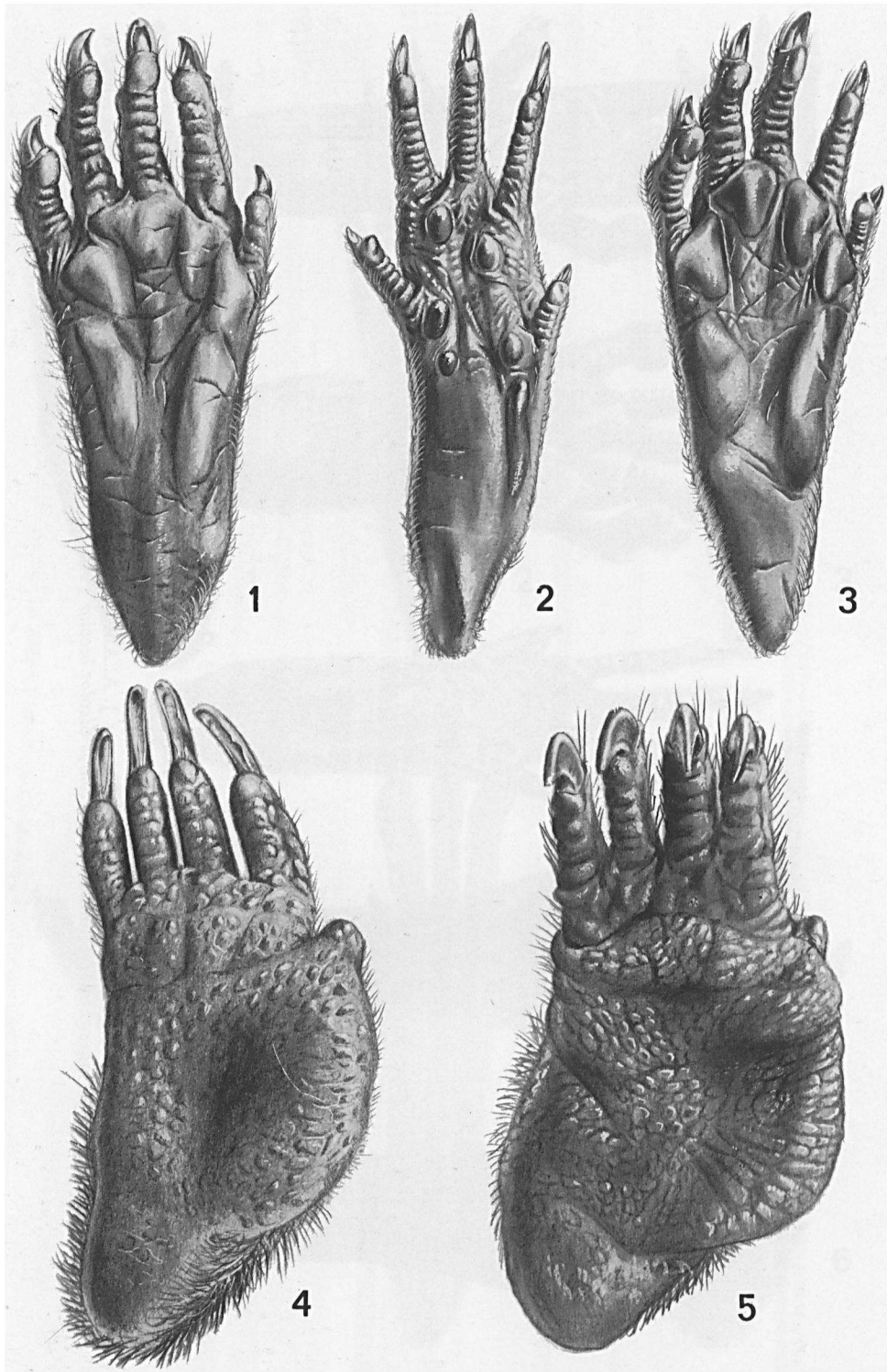
Right hind foot in ventral view. 1, *Agouti paca paca* (Linnaeus); 2, *Sciurus aestuans aestuans* Linnaeus; 3, *Nectomys squamipes melanius* Thomas; 4, *Holochilus brasiliensis nanus* Thomas; 5, *Zygodontomys brevicauda microtinus* (Thomas); 6, *Sigmodon alstoni savannarum* (Thomas).

PLATE 108



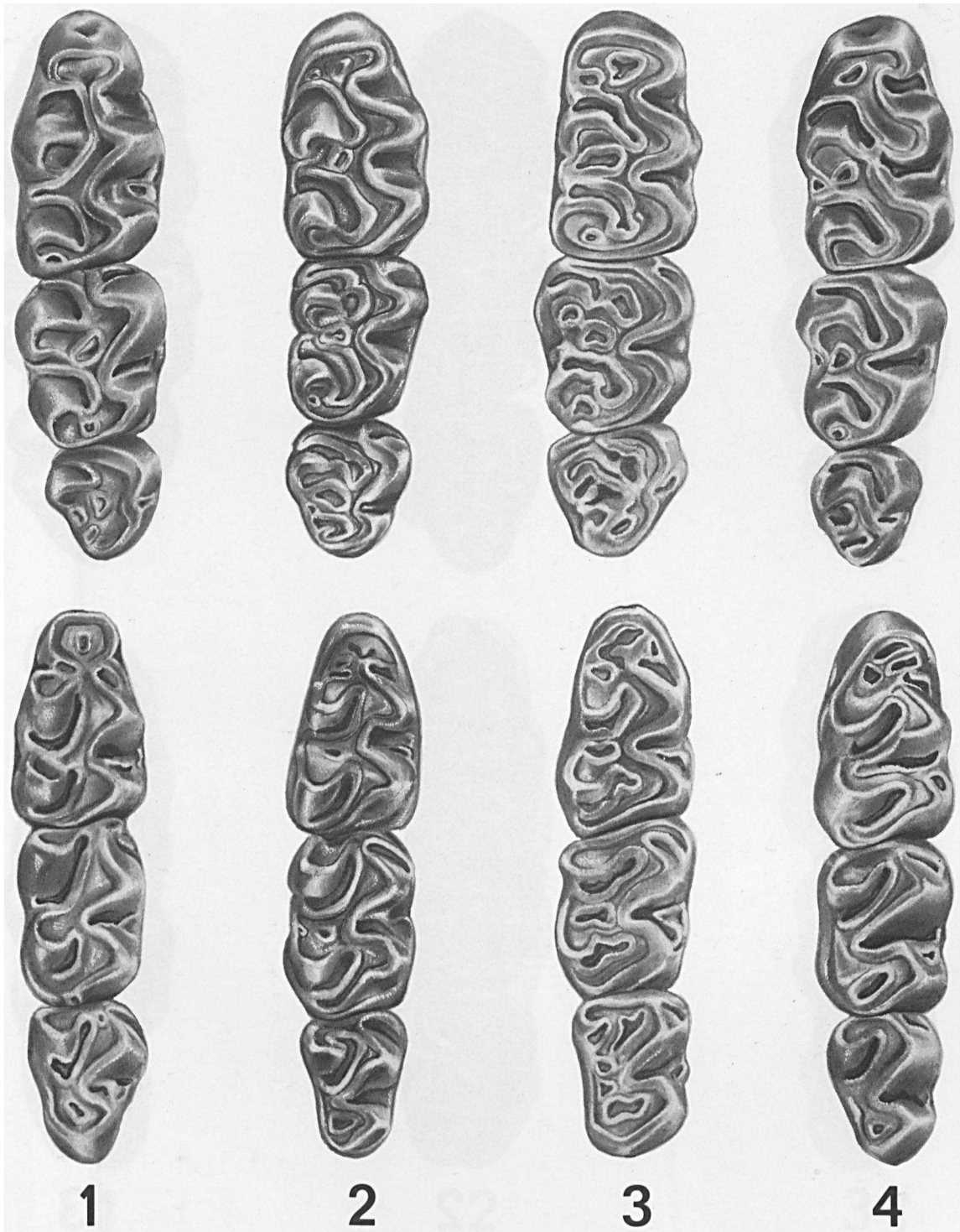
Right hind foot in ventral view. 1, *Oryzomys capito velutinus* J. A. Allen & Chapman; 2, *Oryzomys concolor speciosus* J. A. Allen & Chapman; 3, *Oryzomys macconnelli* Thomas; 4, *Oryzomys bicolor bicolor* (Tomes); 5, *Oryzomys delicatus* J. A. Allen & Chapman.

PLATE IO9



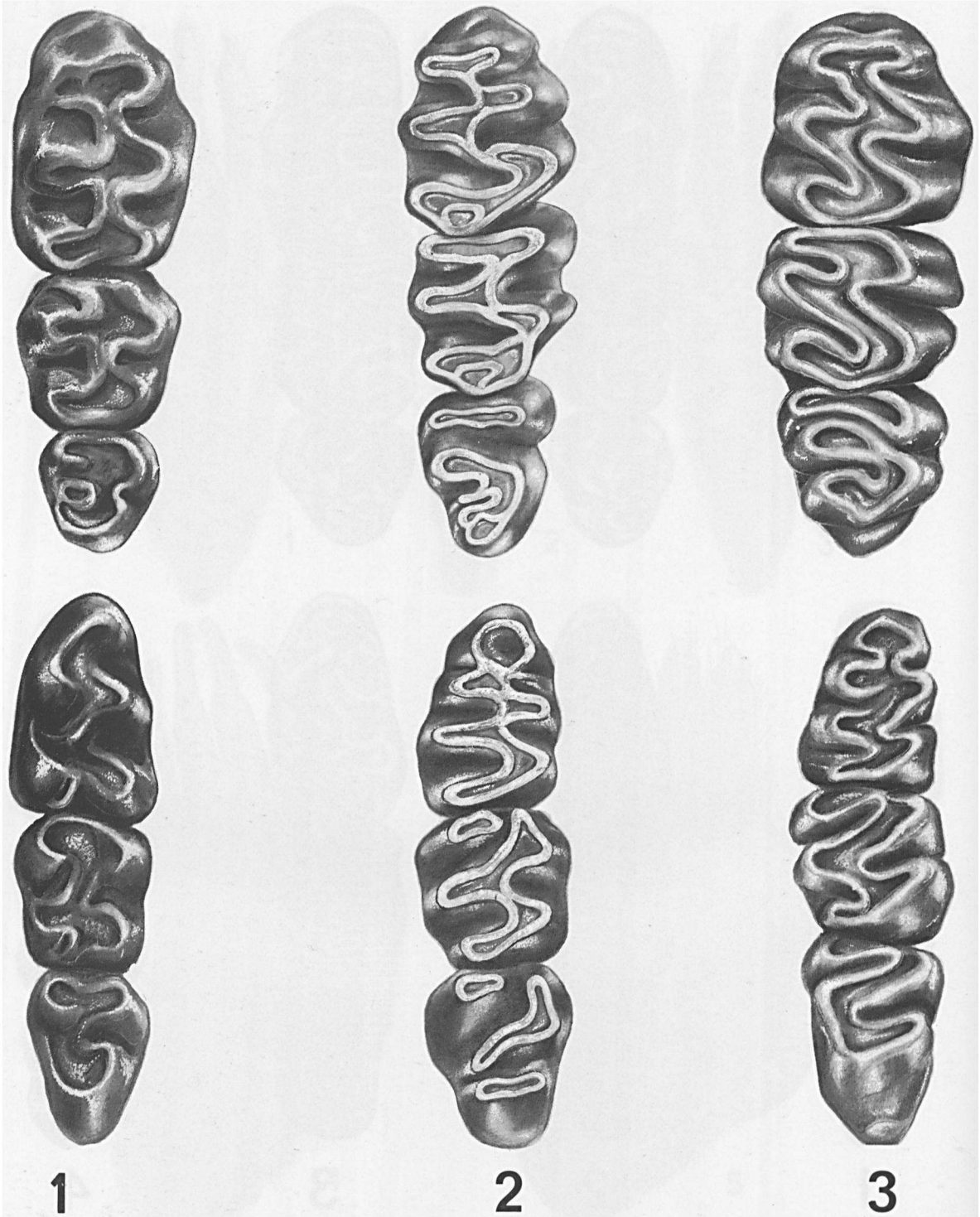
Right hind foot in ventral view. 1, *Echimys chrysurus chrysurus* (Zimmermann); 2, *Proechimys guyannensis guyannensis* (E. Geoffroy); 3, *Makalata armata armata* (L. Geoffroy); 4, *Coendou prehensilis prehensilis* (Linnaeus); 5, *Sphiggurus insidiosus* (Lichtenstein).

PLATE IIO



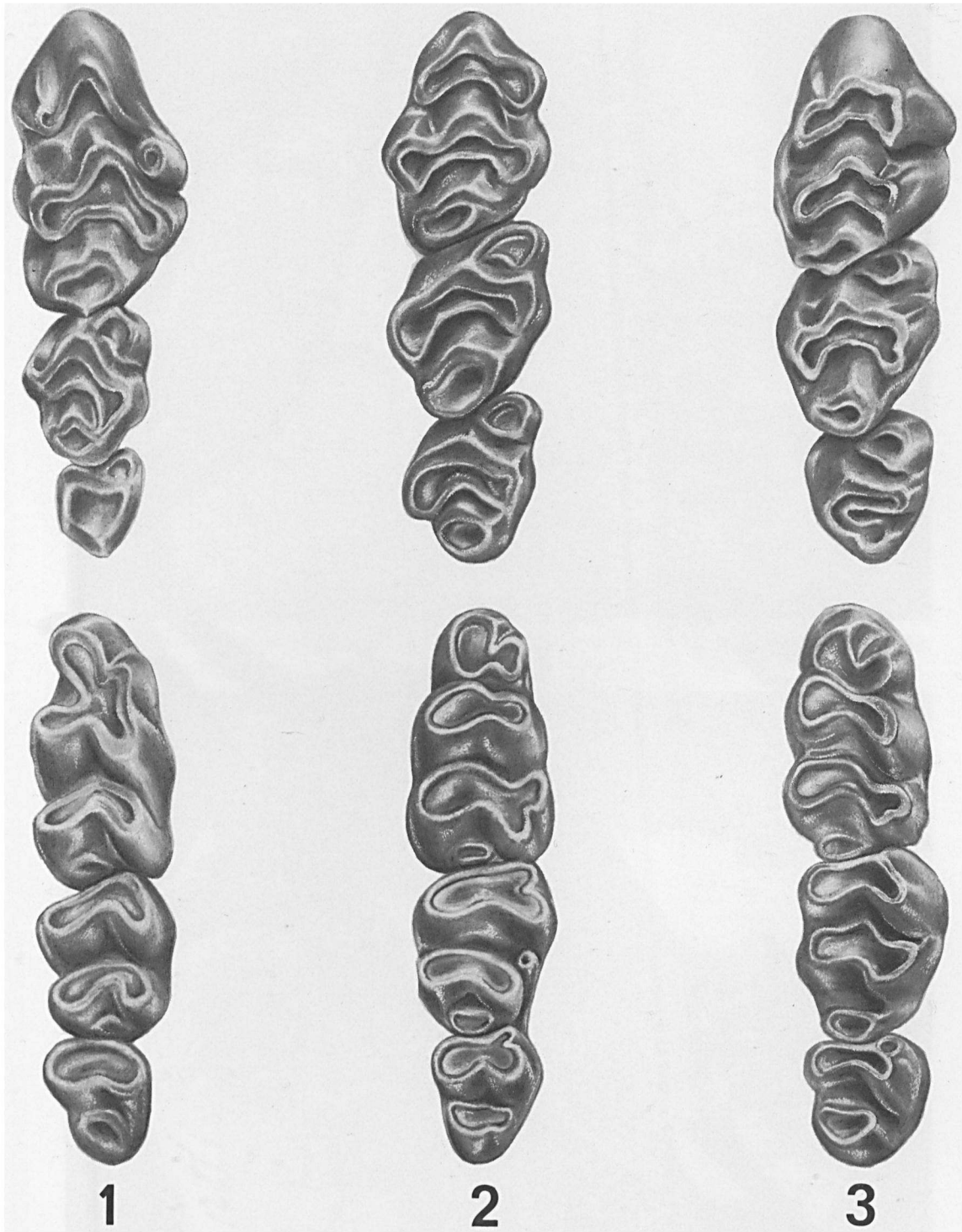
Tooth-rows of four species of the genus *Oryzomys*. Upper: right upper tooth-rows; lower: right lower tooth-rows. 1, *Oryzomys delicatus* J. A. Allen & Chapman; 2, *Oryzomys concolor speciosus* J. A. Allen & Chapman; 3, *Oryzomys bicolor bicolor* (Tomes); 4, *Oryzomys capito velutinus* J. A. Allen & Chapman.

PLATE III



Tooth-rows of Cricetinae. Upper: right upper tooth-rows; lower: right lower tooth-rows. 1, *Zygodontomys brevicauda microtinus* (Thomas); 2, *Holochilus brasiliensis nanus* Thomas; 3, *Sigmodon alstoni savannarum* (Thomas).

PLATE II2

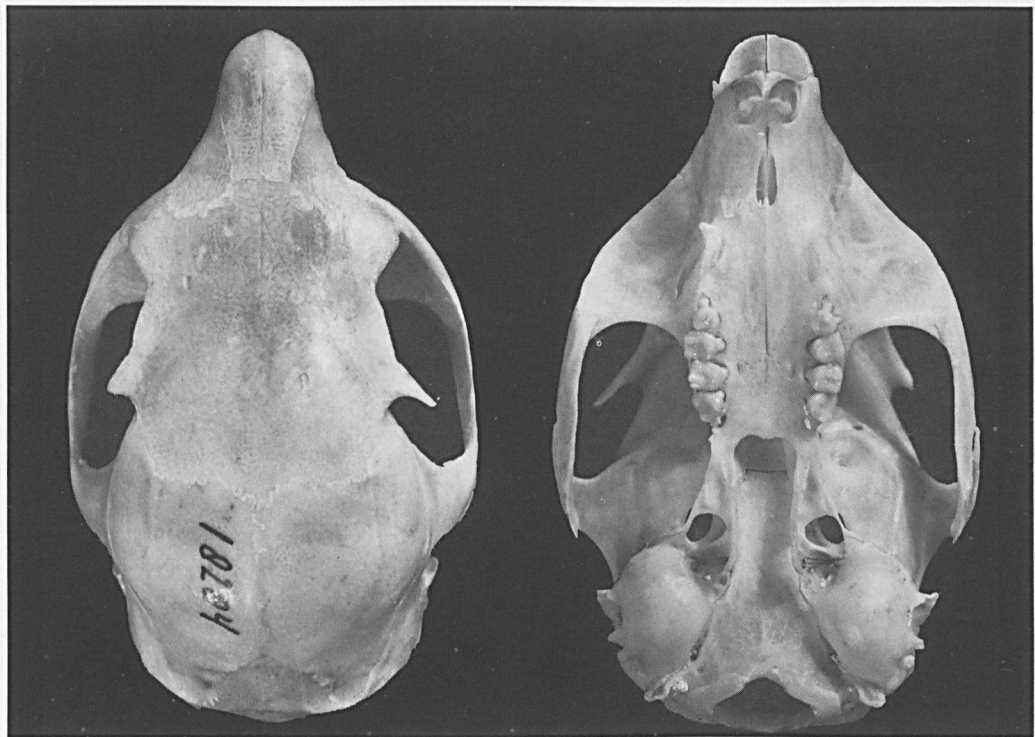


Tooth-rows of Muridae: Upper: right upper tooth-rows; lower: right lower tooth-rows. 1, *Mus musculus* Linnaeus; 2, *Rattus rattus* (Linnaeus); 3, *Rattus norvegicus* (Berkenhout).

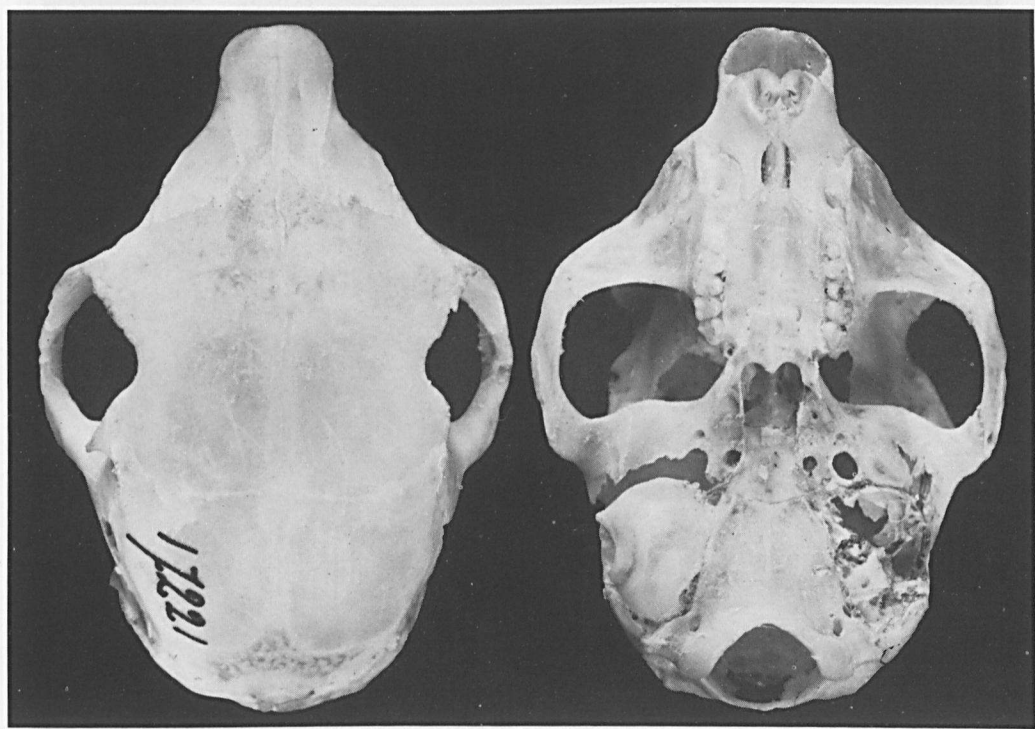


Sciurus aestuans aestuans Linnaeus

PLATE II4

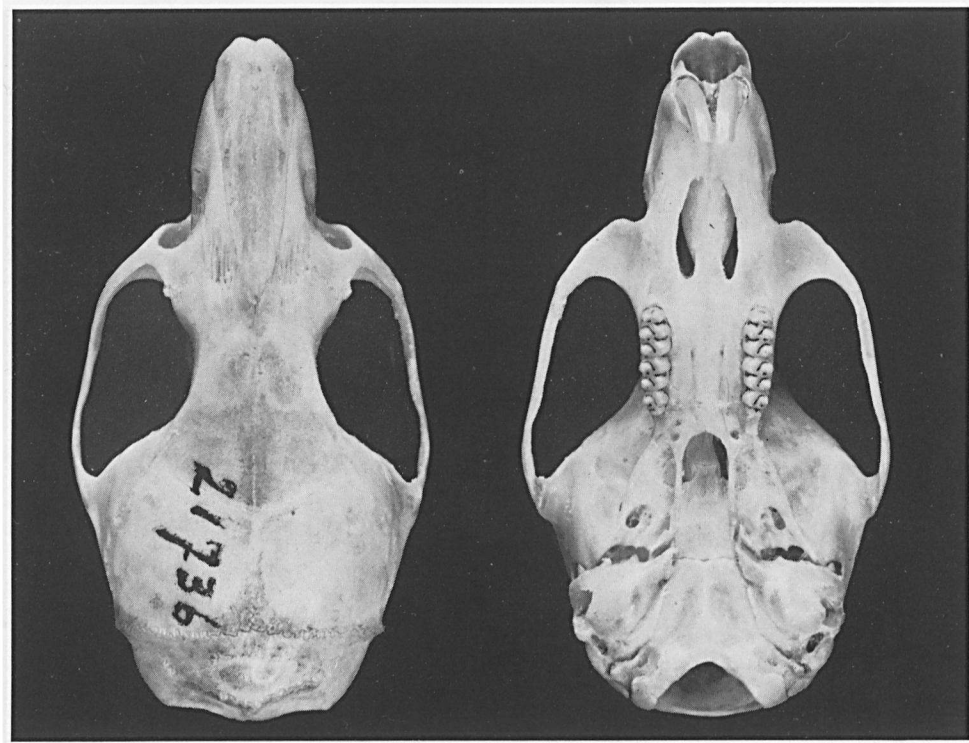


Sciurus aestuans aestuans Linnaeus. Left: ♀, no. 18284; zyg. br., 26.4 mm. Right: ♂, no. 23889; zyg. br., 27.0 mm.

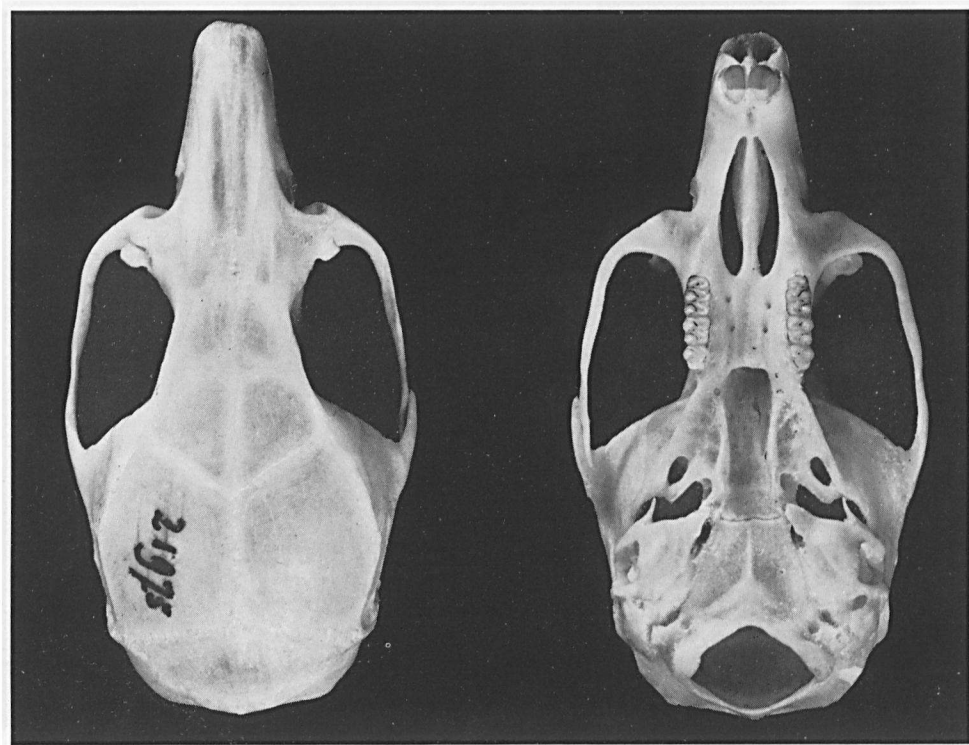


Sciurillus pusillus pusillus (E. Geoffroy), ♀, no. 17221; zyg. br., 19.6 mm.

PLATE II5

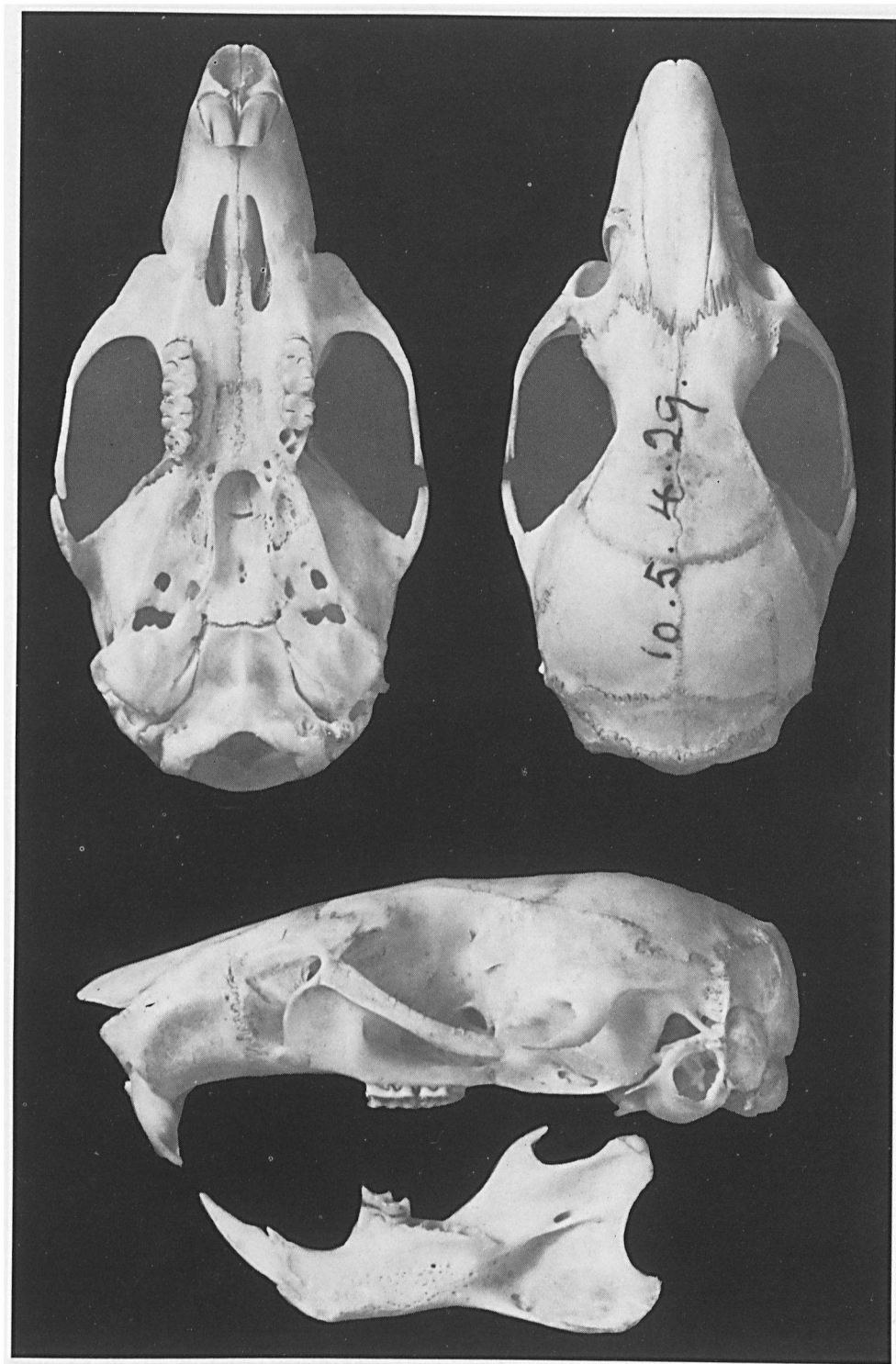


Oryzomys capito velutinus J. A. Allen & Chapman, ♂, no. 21736; zyg. br., 14.8 mm.



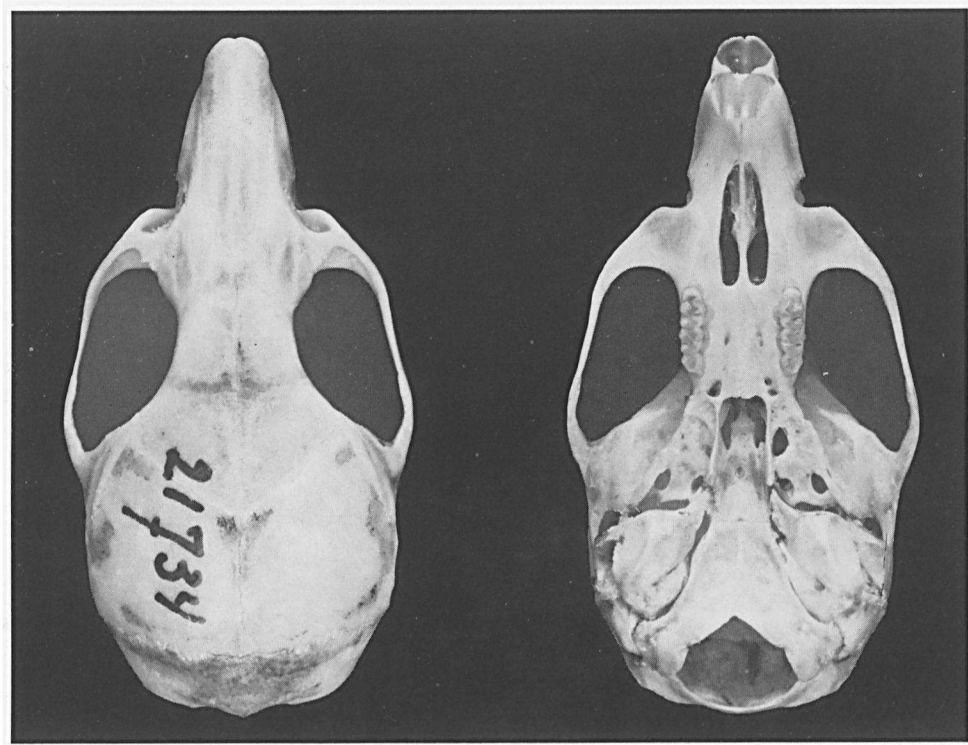
Rhipidomys mastacalis nitela Thomas, ♀, no. 21975; zyg. br., 15.6 mm.

PLATE II6

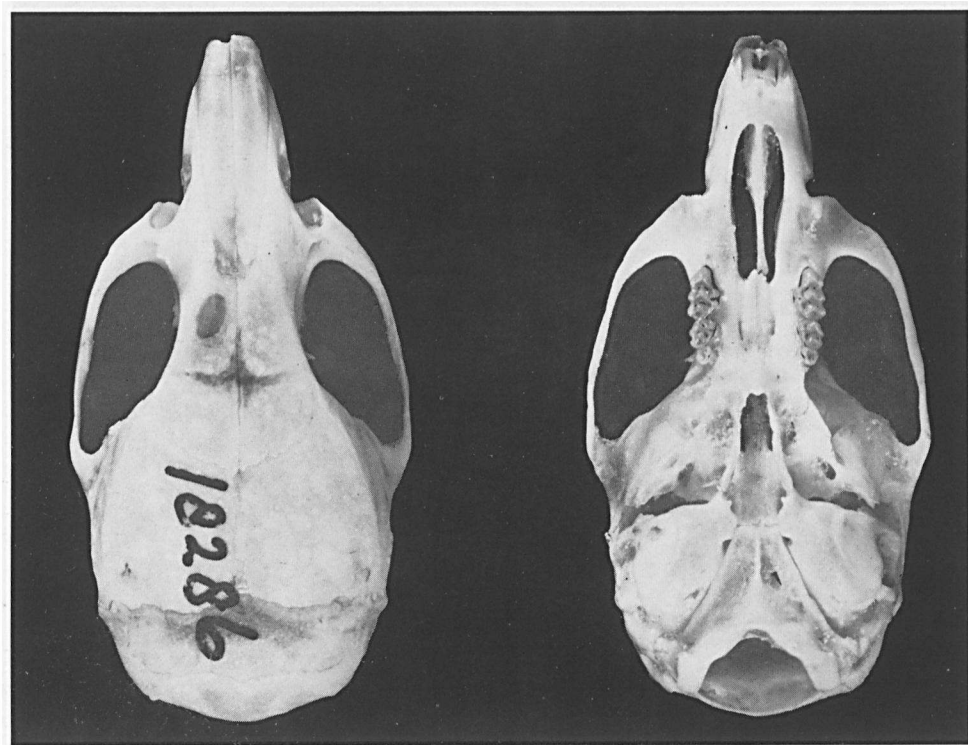


Oryzomys macconnelli Thomas, ♂, River Supinaam, British Guiana, BMNH no. 10.5.4.29;
zyg. br., 16.3 mm.

PLATE II7

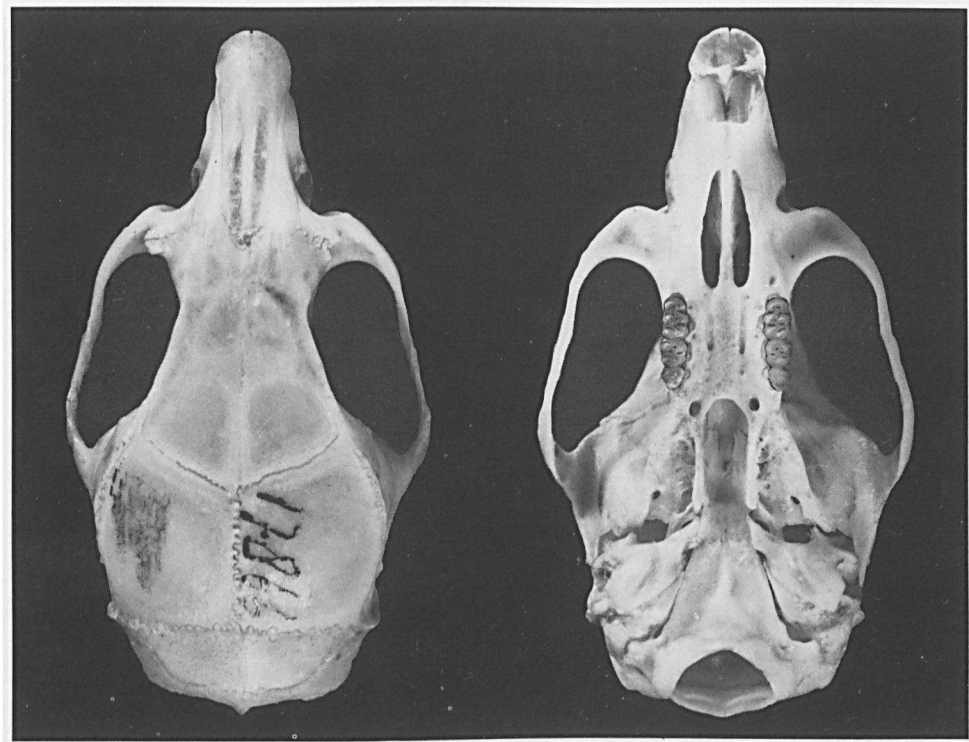


Oryzomys delicatus J. A. Allen & Chapman, ♀, no. 21734; zyg. br., 11.8 mm.

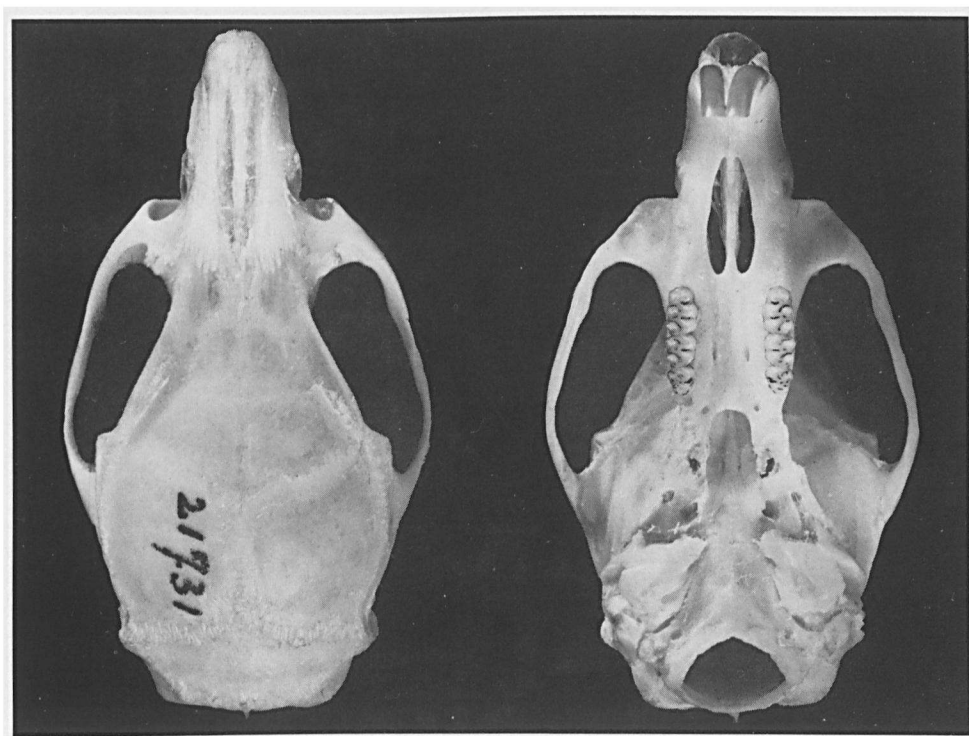


Mus musculus Linnaeus, ♀, no. 18286; zyg. br., 10.8 mm.

PLATE II8

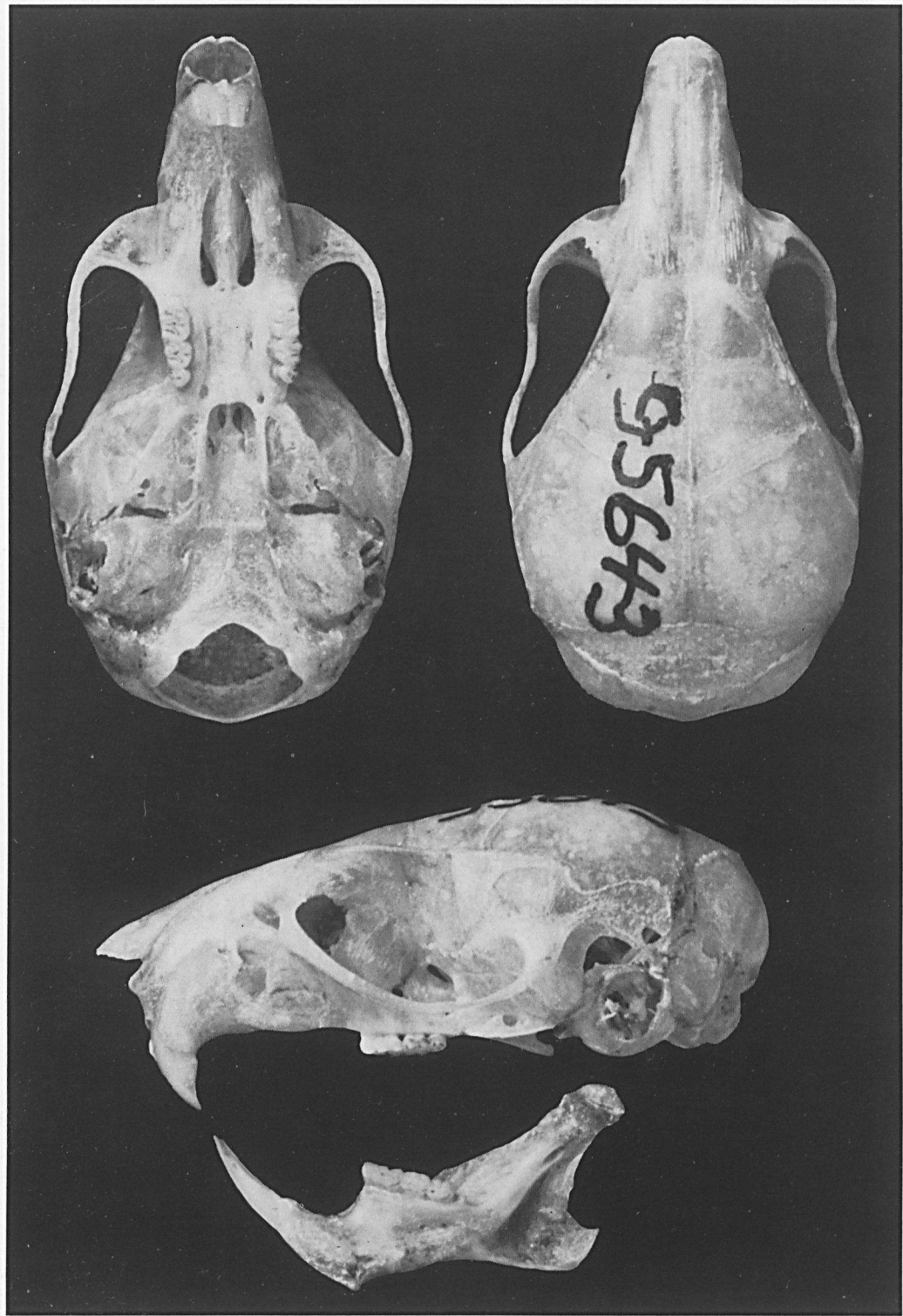


Oryzomys bicolor bicolor (Tomes), ♂, no. 17866; zyg. br., 15.2 mm.



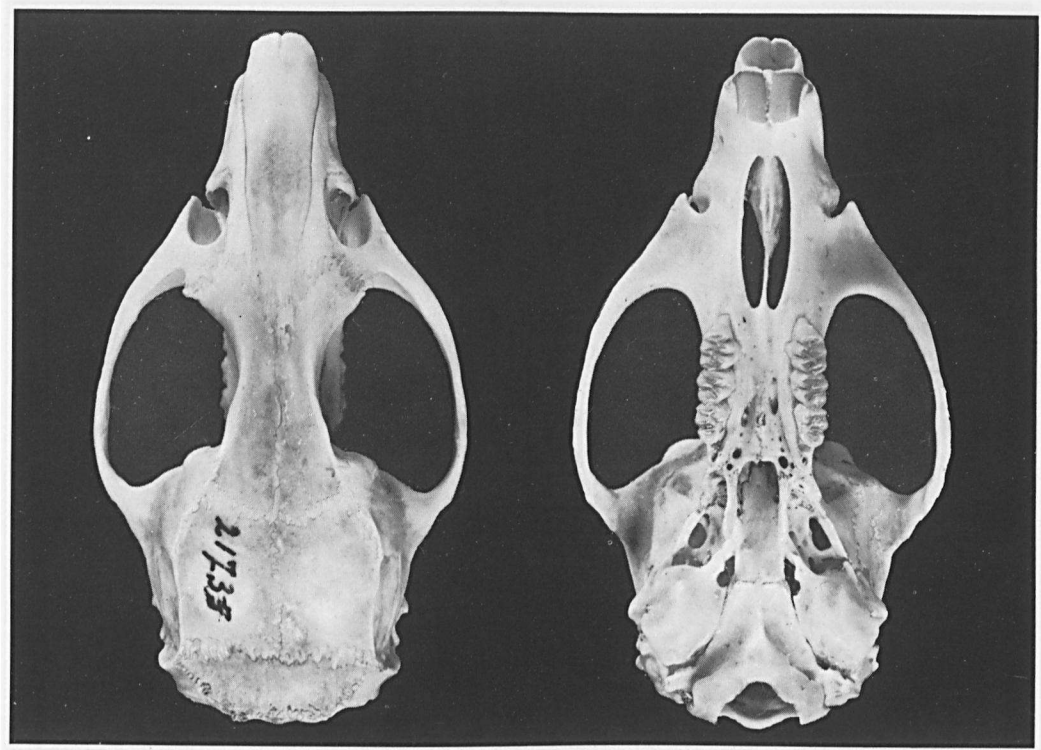
Oryzomys concolor speciosus J. A. Allen & Chapman, ♀, no. 21731; zyg. br., 19.0 mm.

PLATE II9

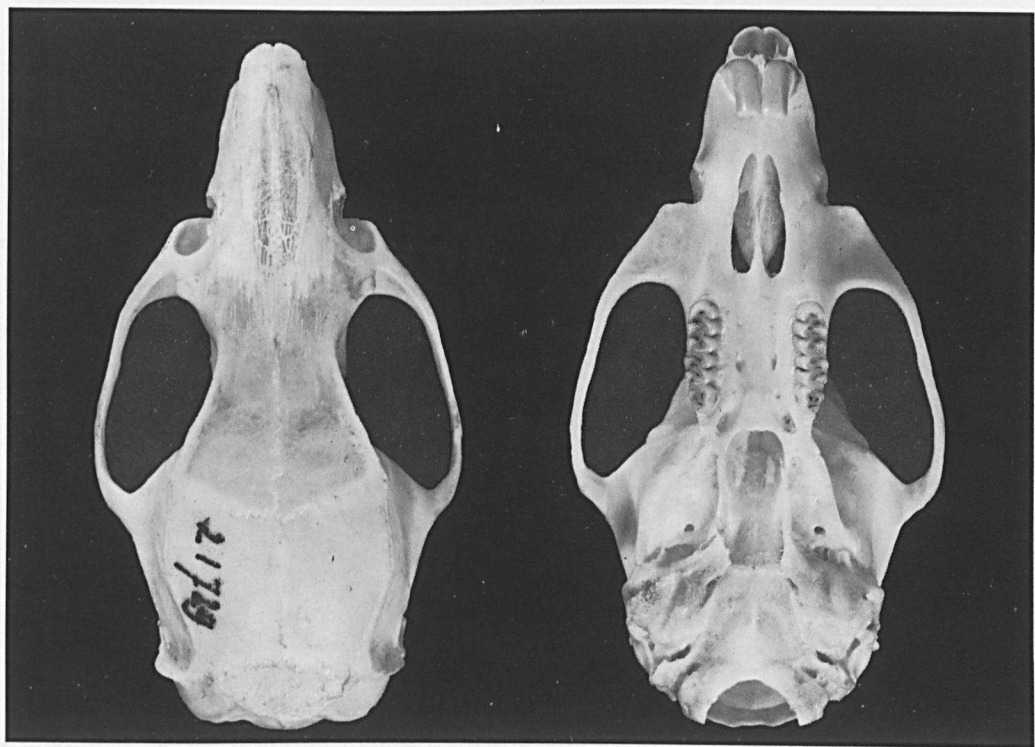


Neacomys guianae Thomas, ♀, CNHM no. 95643; zyg. br., 10.3 mm.

PLATE I20

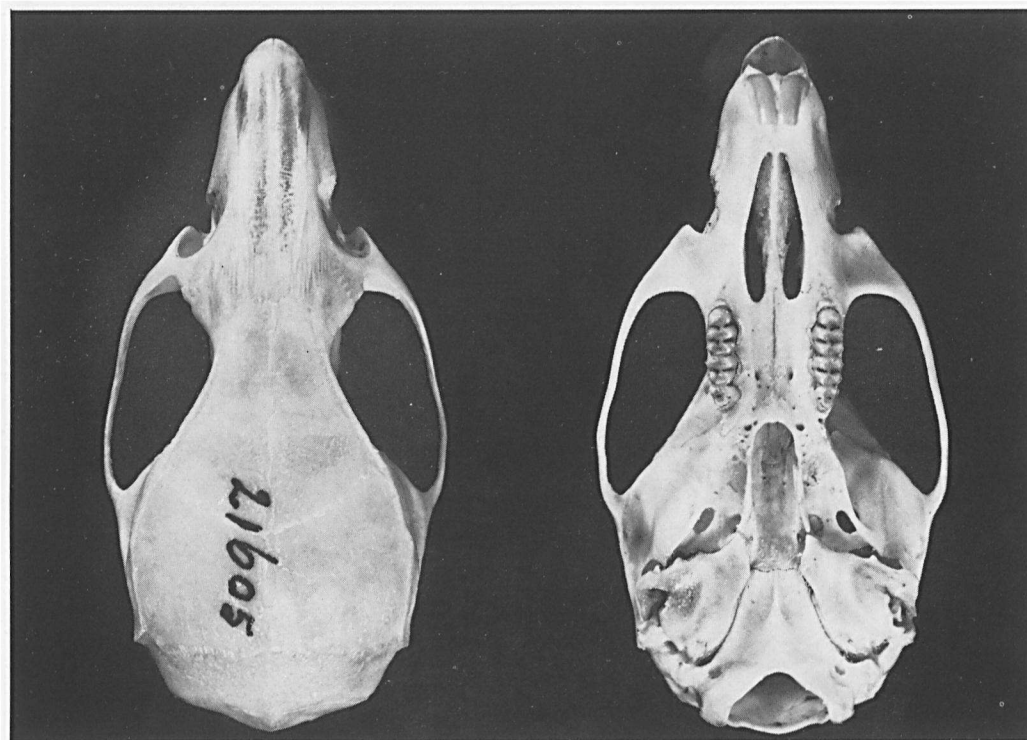


Holochilus brasiliensis nanus Thomas, ♂, no. 21735; zyg. br., 23.1 mm.



Nectomys squamipes melanius Thomas, ♀, no. 21729; zyg. br., 22.2 mm.

PLATE I2I

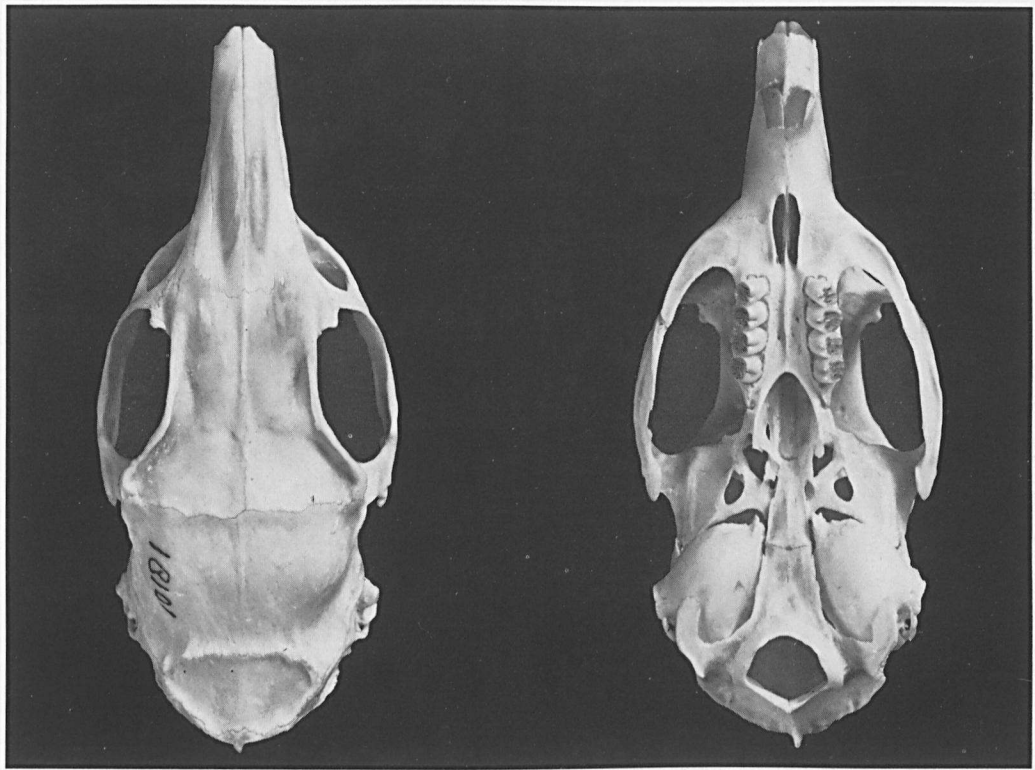


Zygodontomys brevicauda microtinus (Thomas), ♀, no. 21605; zyg. br., 14.8 mm.



Sigmodon alstoni savannarum (Thomas), ♂, no. 18295; zyg. br., 21.0 mm.

PLATE 122

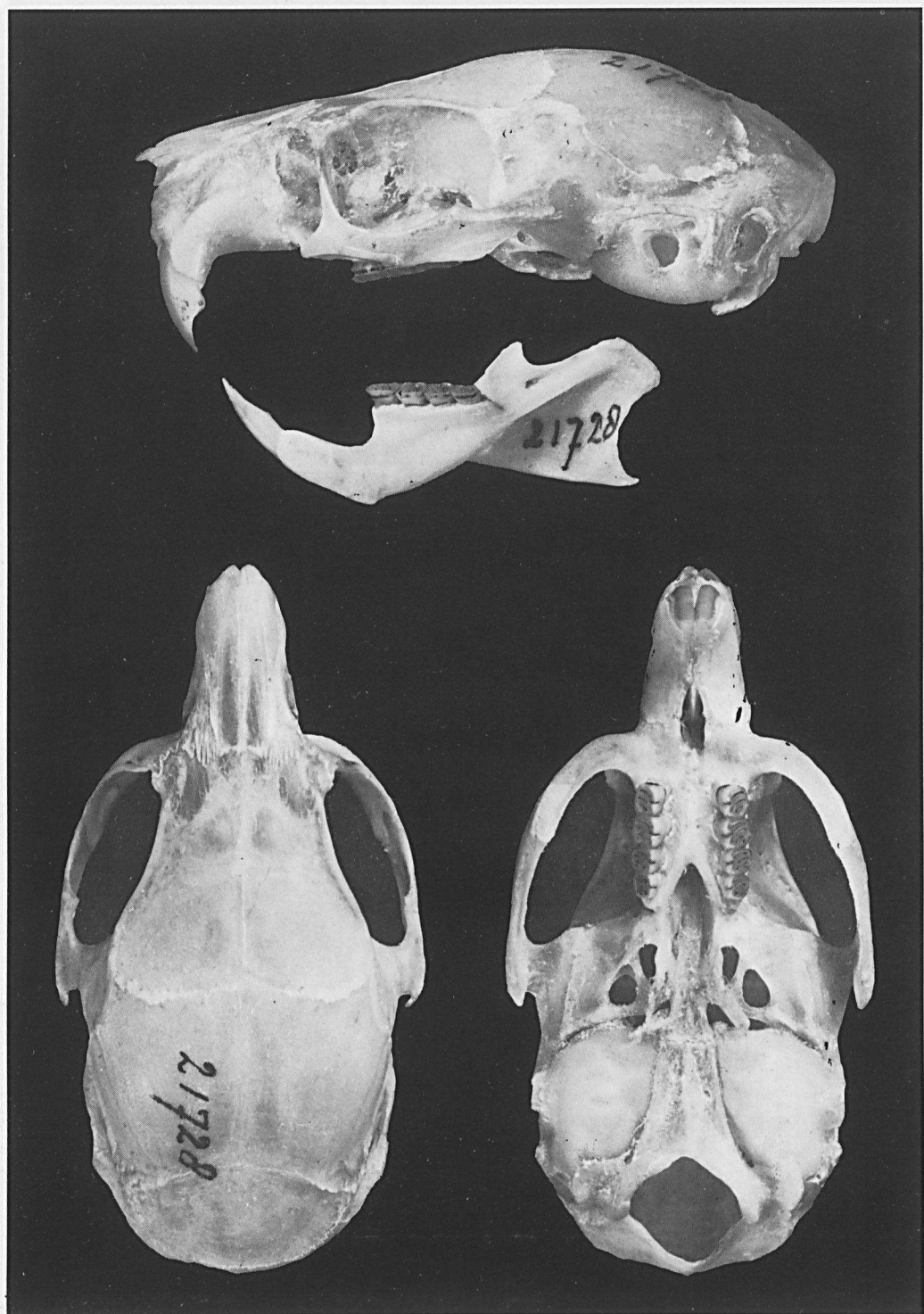


Proechimys guyannensis guyannensis (E. Geoffroy), ♂, no. 18101; zyg. br., 28.0 mm.



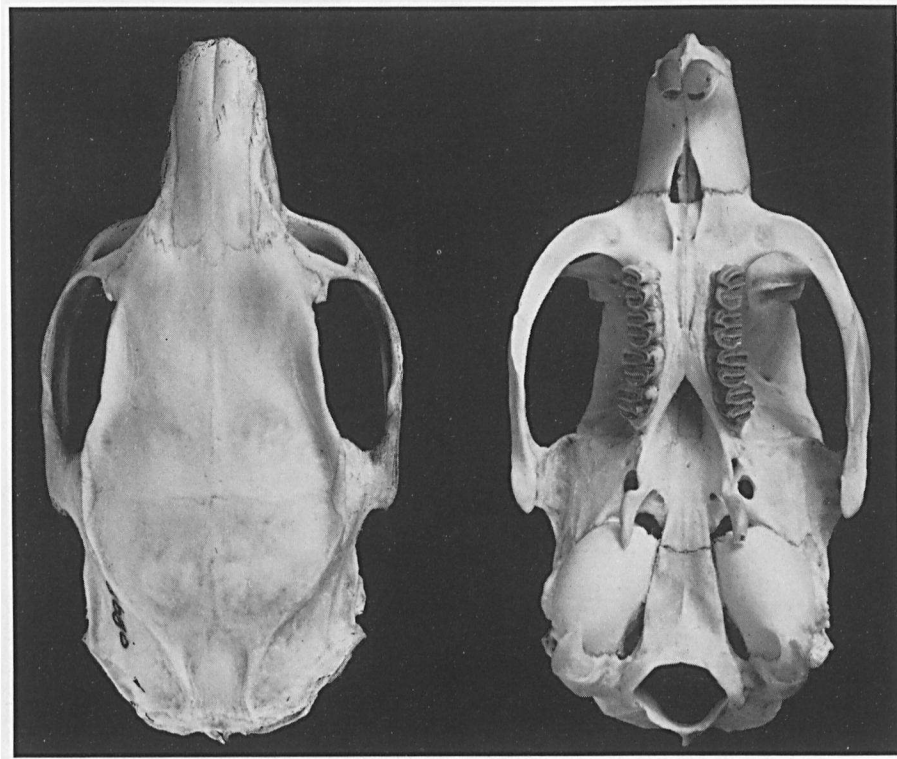
Proechimys warreni Thomas, ♀, no 18087; zyg. br., 22.1 mm.

PLATE I23

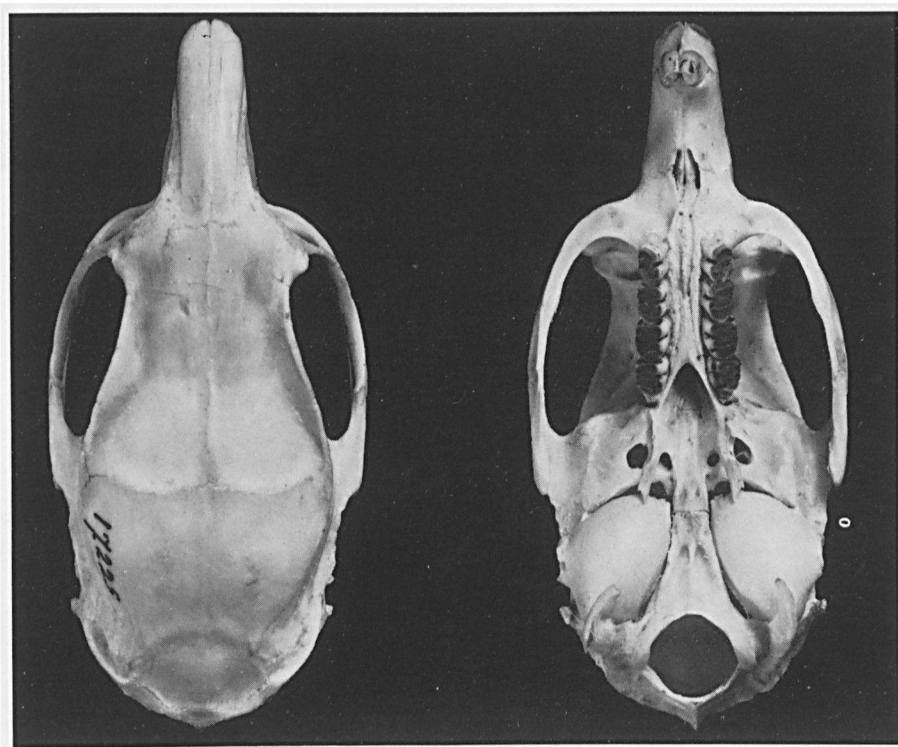


Mesomys stimula Thomas, ♀, no. 21728; zyg. br., 21.1 mm.

PLATE I24



Echimys chrysurus chrysurus (Zimmermann), ♀, no. 8690; zyg. br., 31.0 mm.



Makalata armata armata (I. Geoffroy), ♂, no. 17225; zyg. br., 23.4 mm.

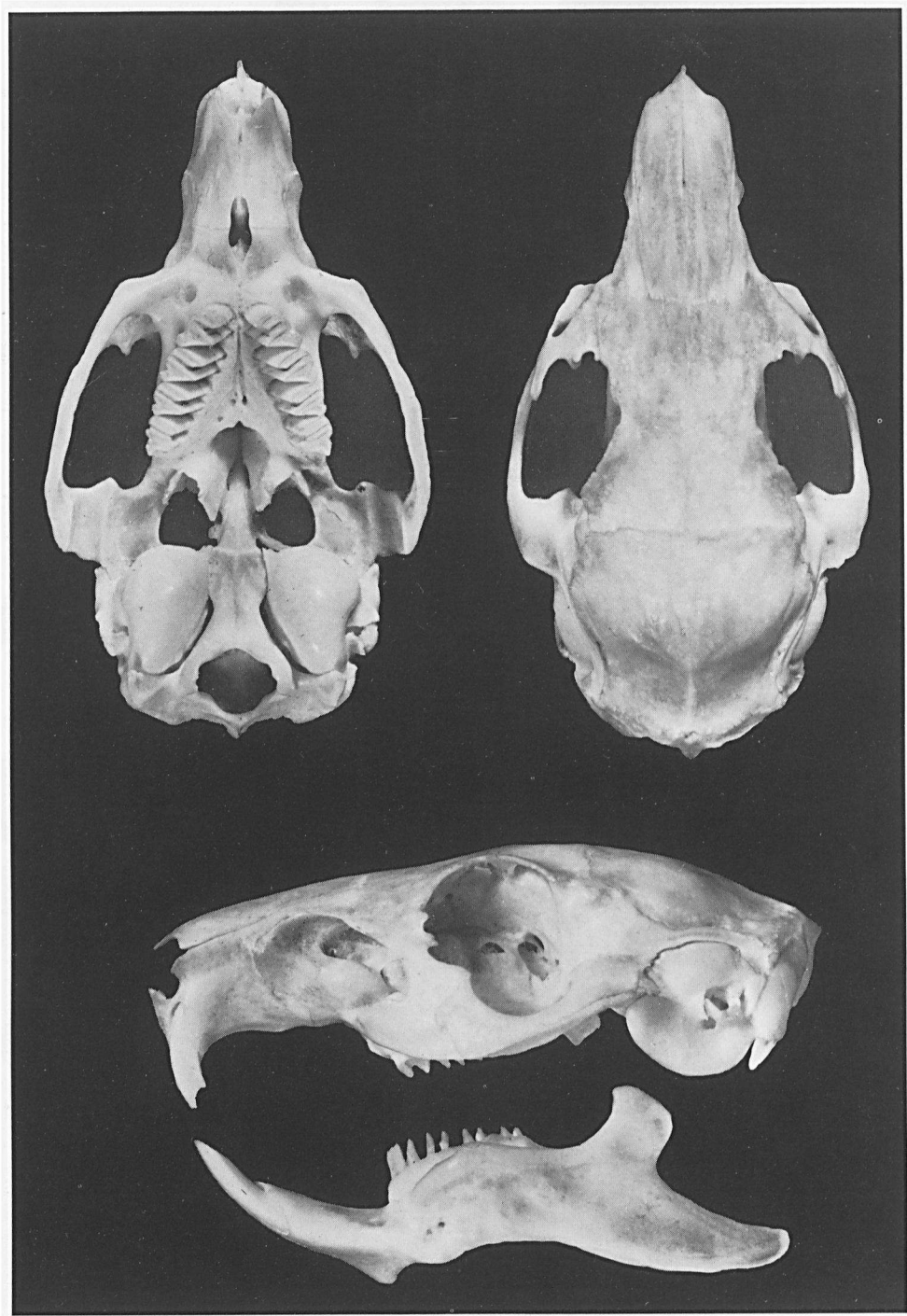


Echimys chrysurus chrysurus (Zimmermann)



Cavia aperca guianae Thomas

PLATE 127

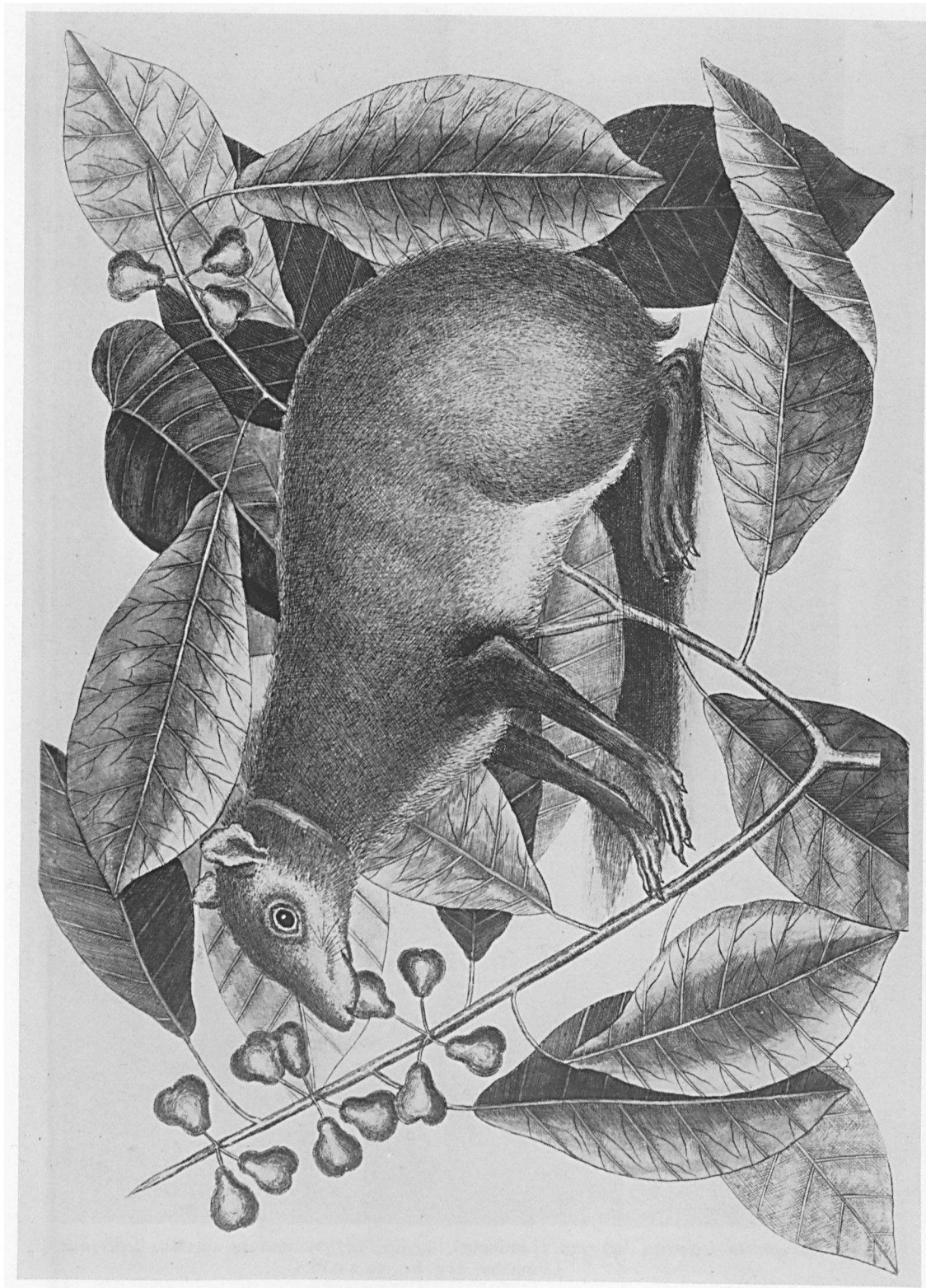


Cavia aperea guianae Thomas, ♀, no. 21618; zyg. br., 34.9 mm.



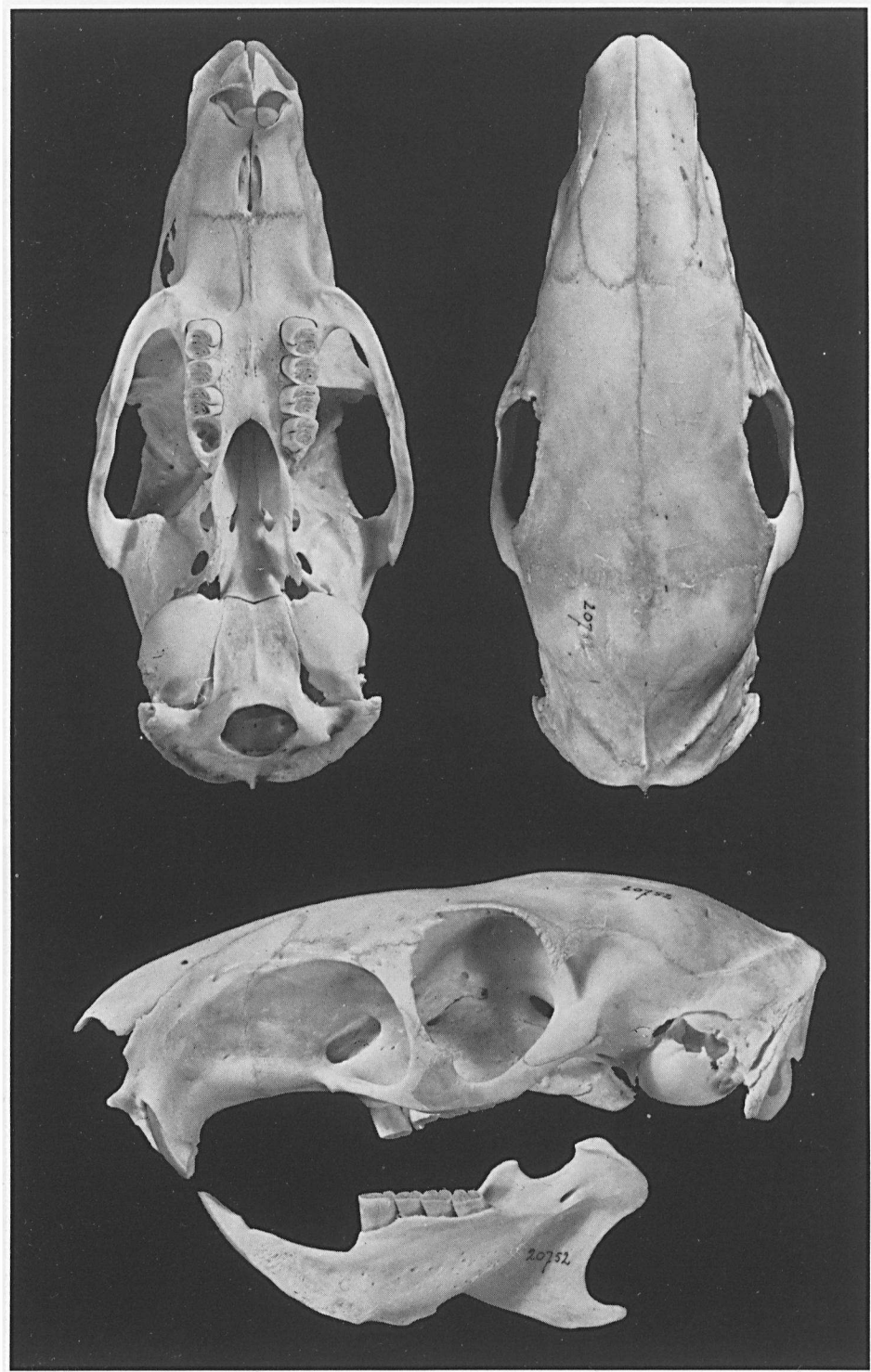
Hydrochaeris hydrochaeris hydrochaeris (Linnaeus)





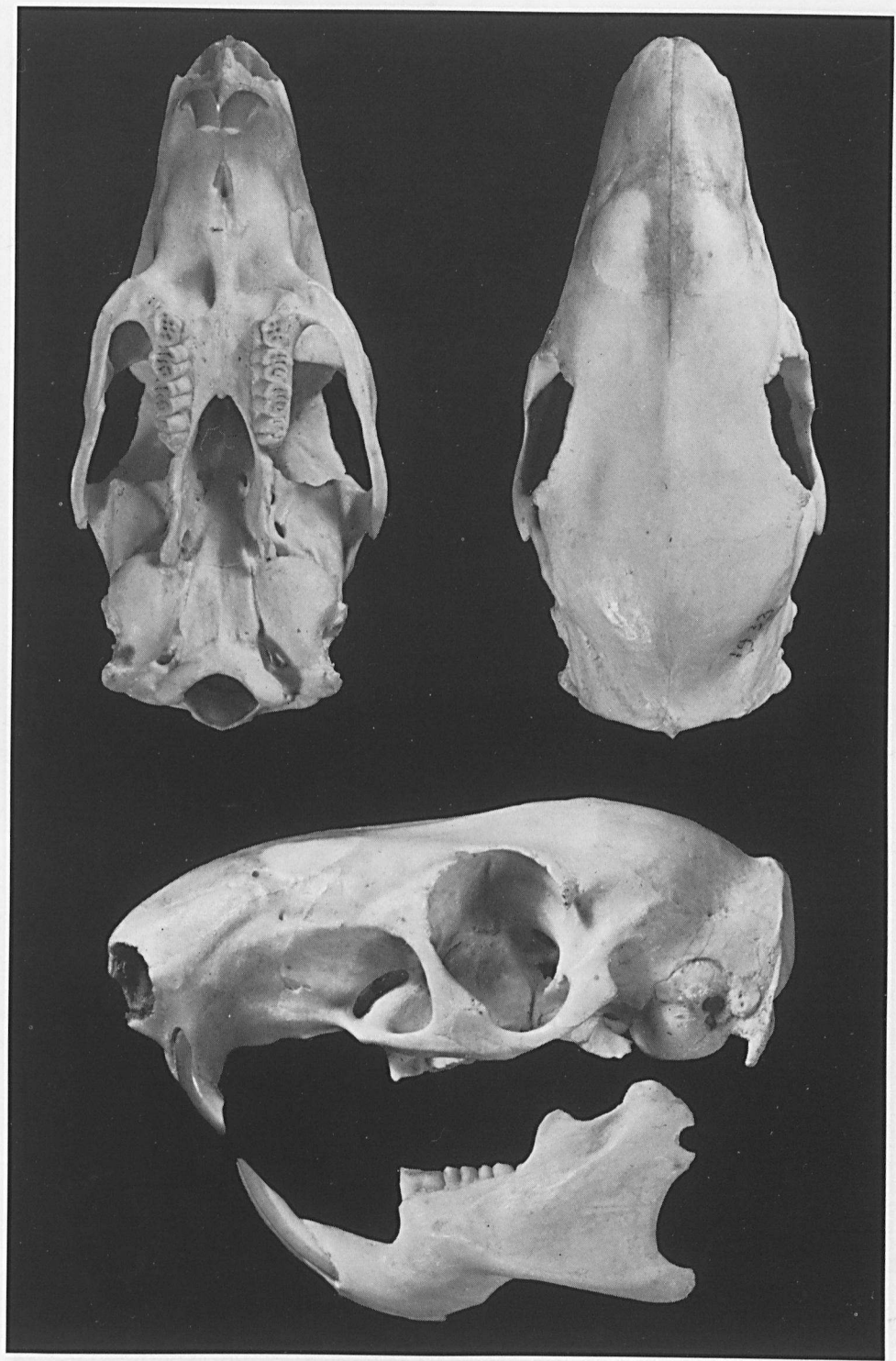
Dasyprocta leporina leporina (Linnaeus). After Catesby (1754, pl. 18, as "*Lepus javensis*").

PLATE I3I



Dasyprocta leporina leporina (Linnaeus), ♀, no. 20752, neotype of *Mus leporinus* Linnaeus; zyg. br., 52.2 mm.

PLATE 132

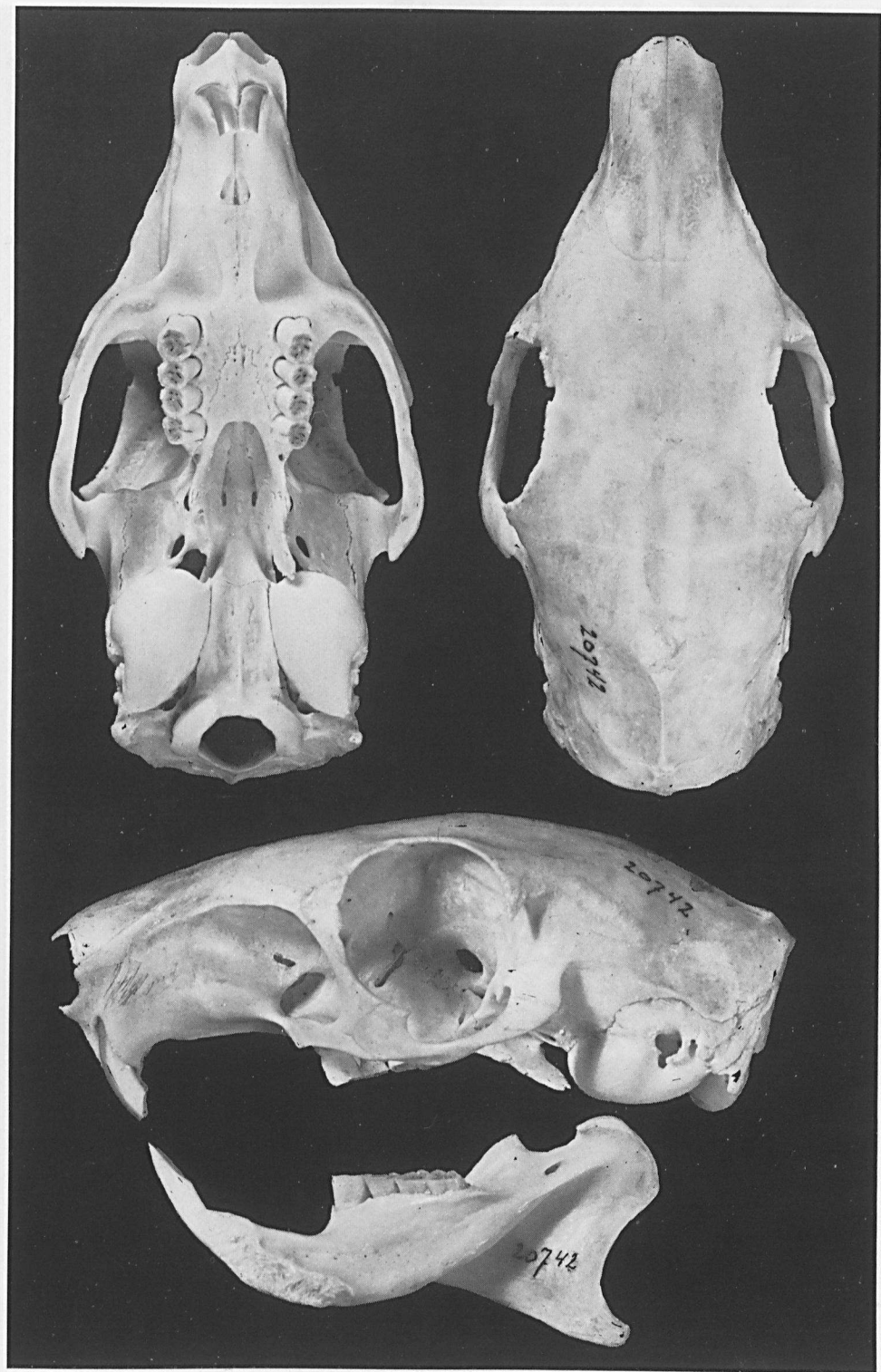


Dasyprocta cristata (E. Geoffroy), ♂, no. 1933; zyg. br., 45.8 mm.



Myoprocta exilis (Wagler)

PLATE I34

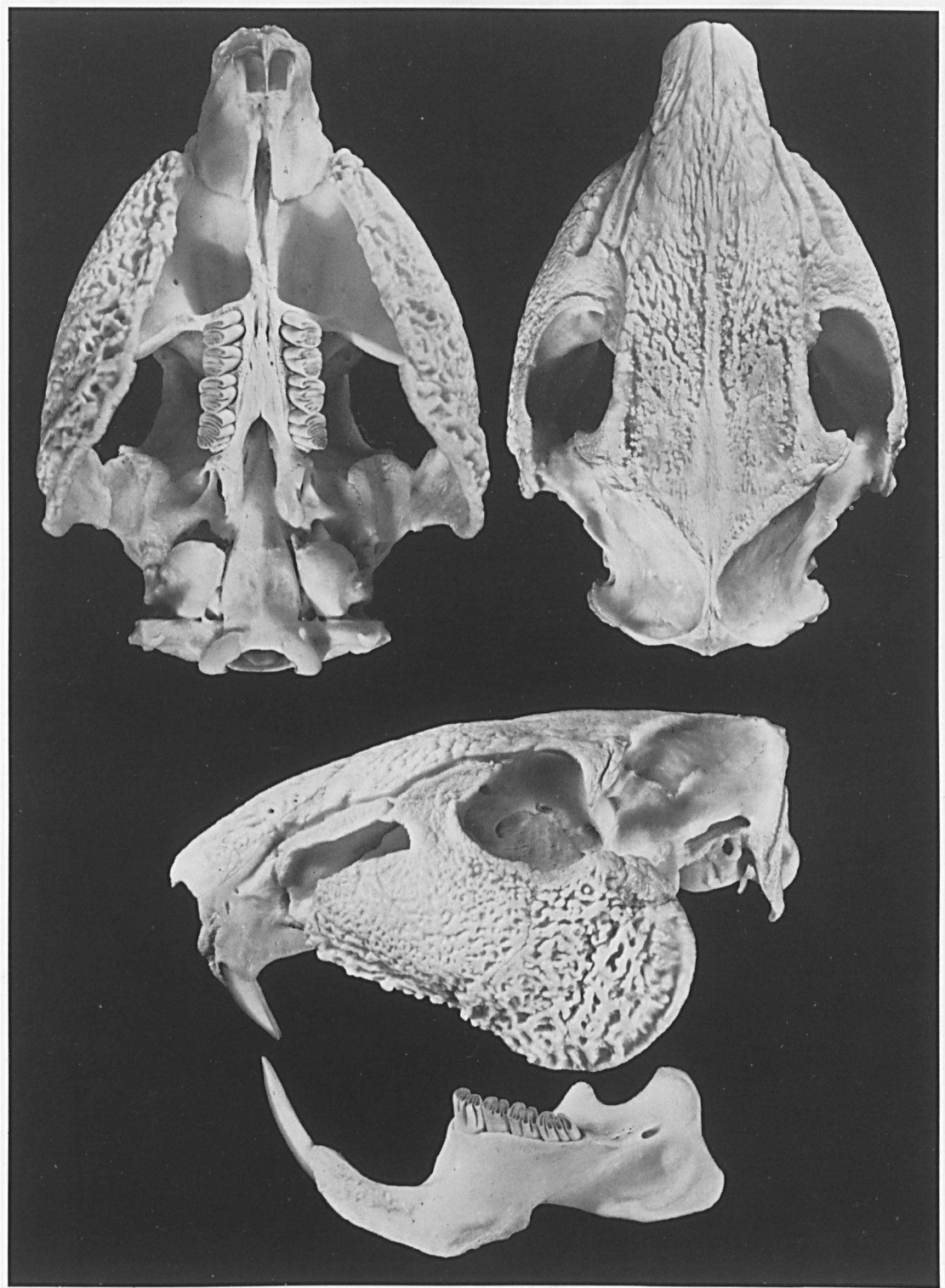


Myoprocta exilis (Wagler), ♀, no. 20742; zyg. br., 39.8 mm.



Agouti paca paca (Linnaeus)

PLATE 136



Agouti paca paca (Linnaeus), ♂, no. 18233; zyg. br., 96.4 mm.

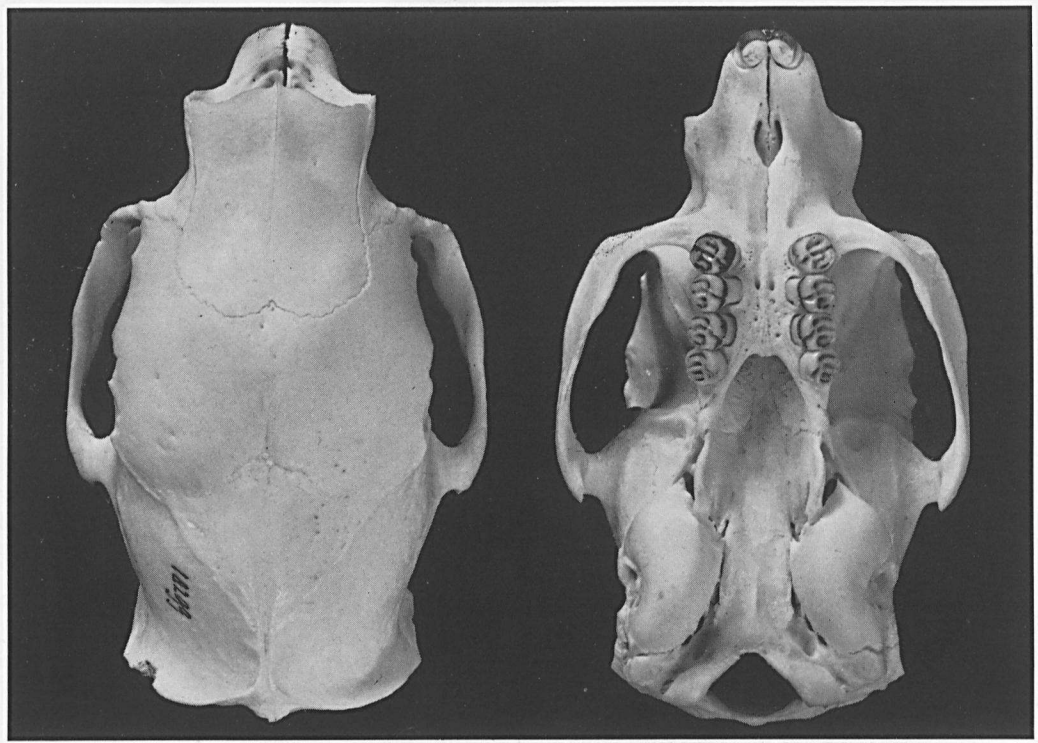


Coendou prehensilis prehensilis (Linnaeus)

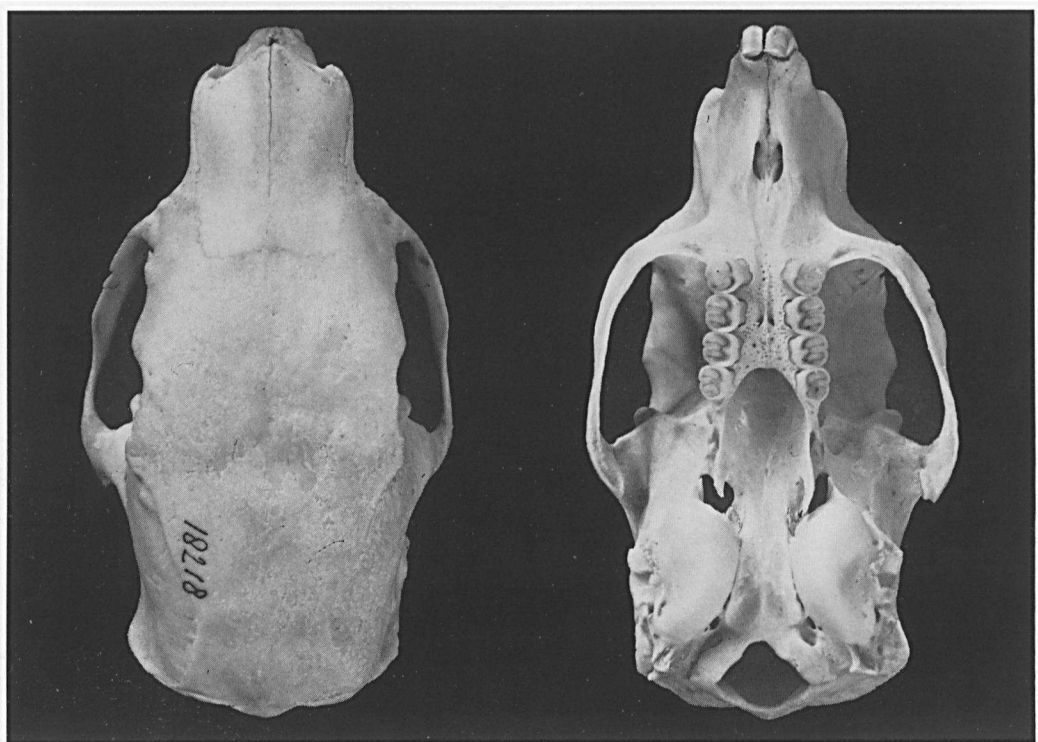


Sphiggurus insidiosus (Lichtenstein)

PLATE 139

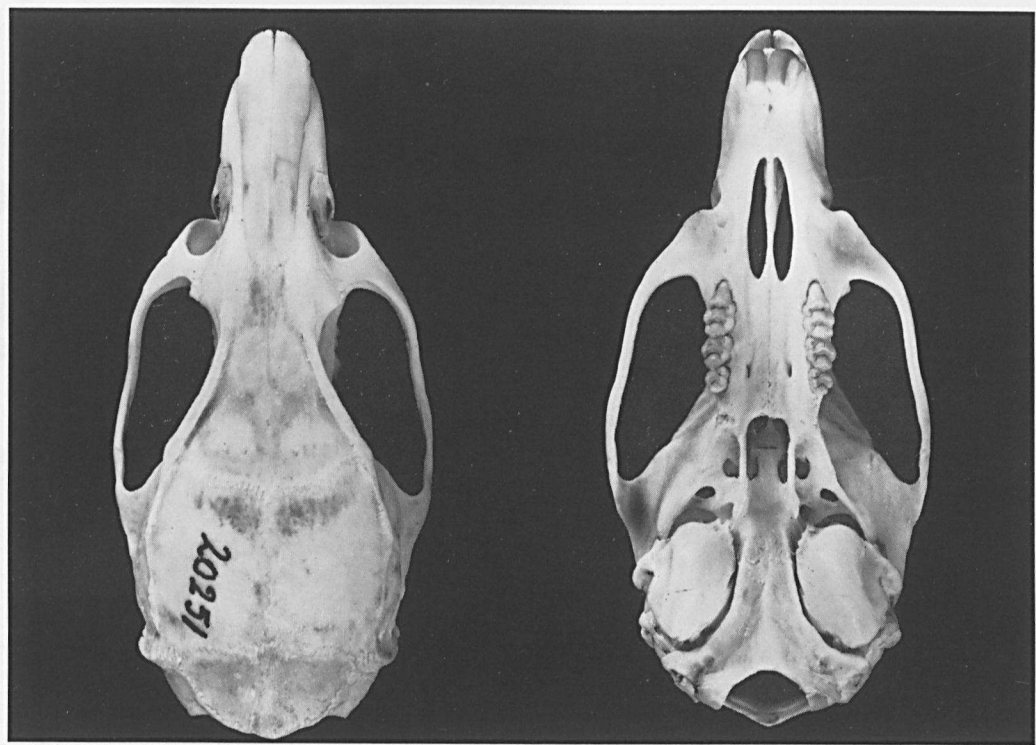


Coendou prehensilis prehensilis (Linnaeus), no. 18299; zyg. br., 57.4 mm.

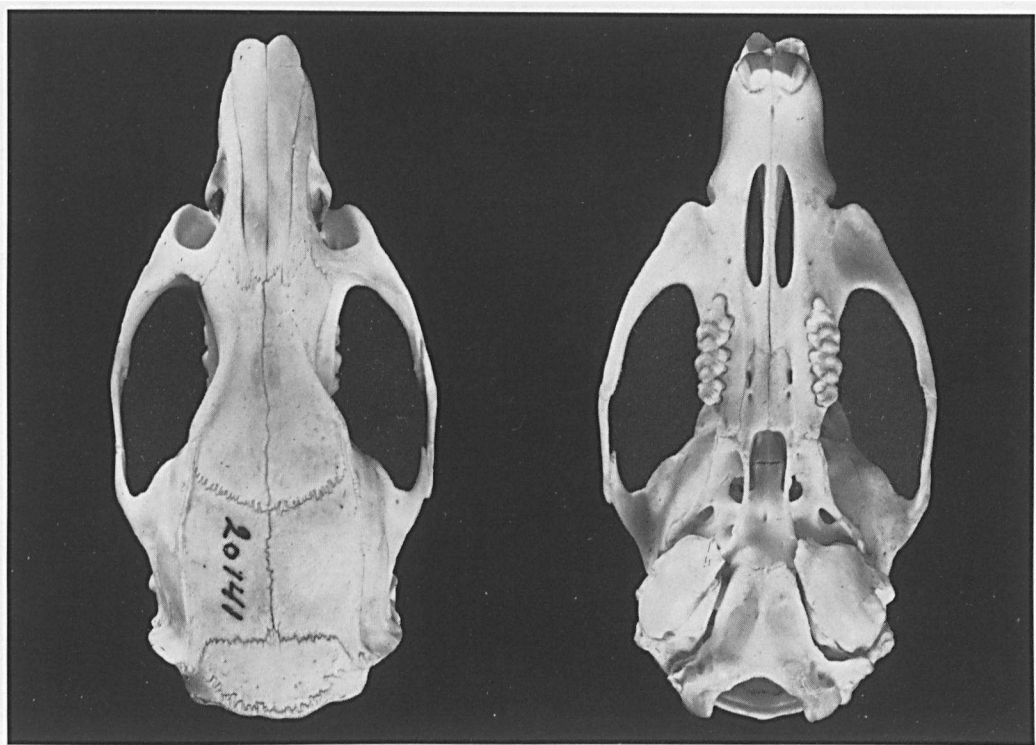


Sphiggurus insidiosus (Lichtenstein), ♂, no. 18218; zyg. br., 46.0 mm.

PLATE 140

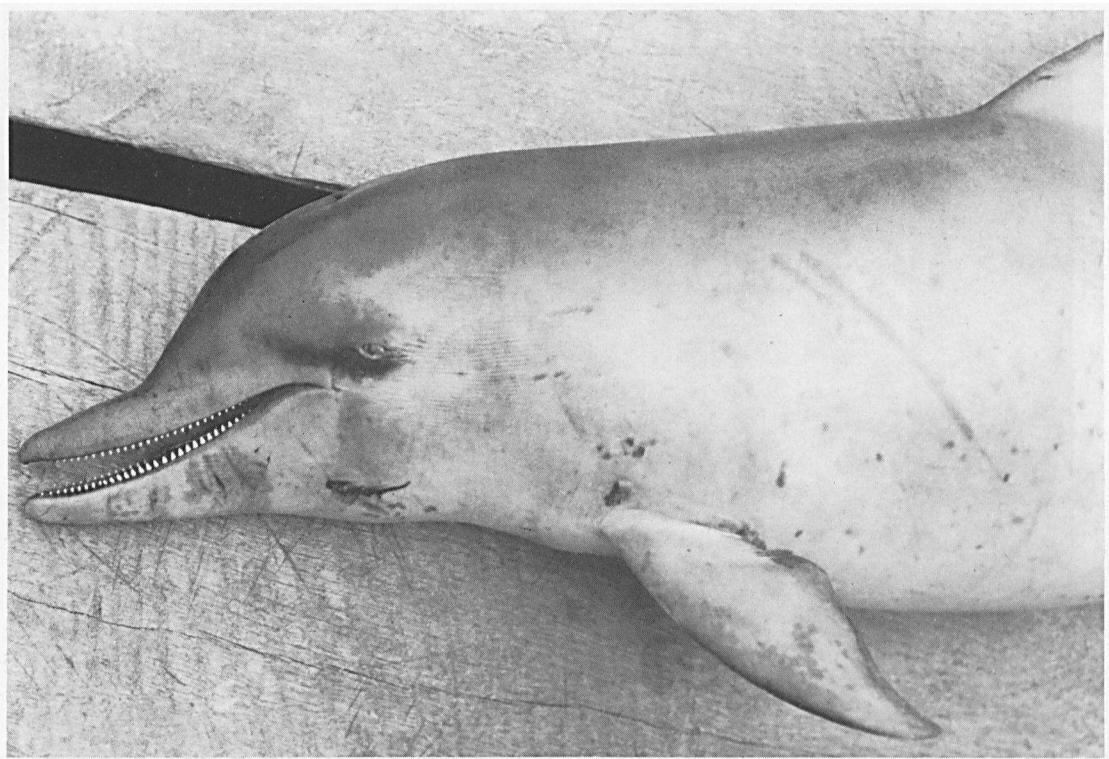
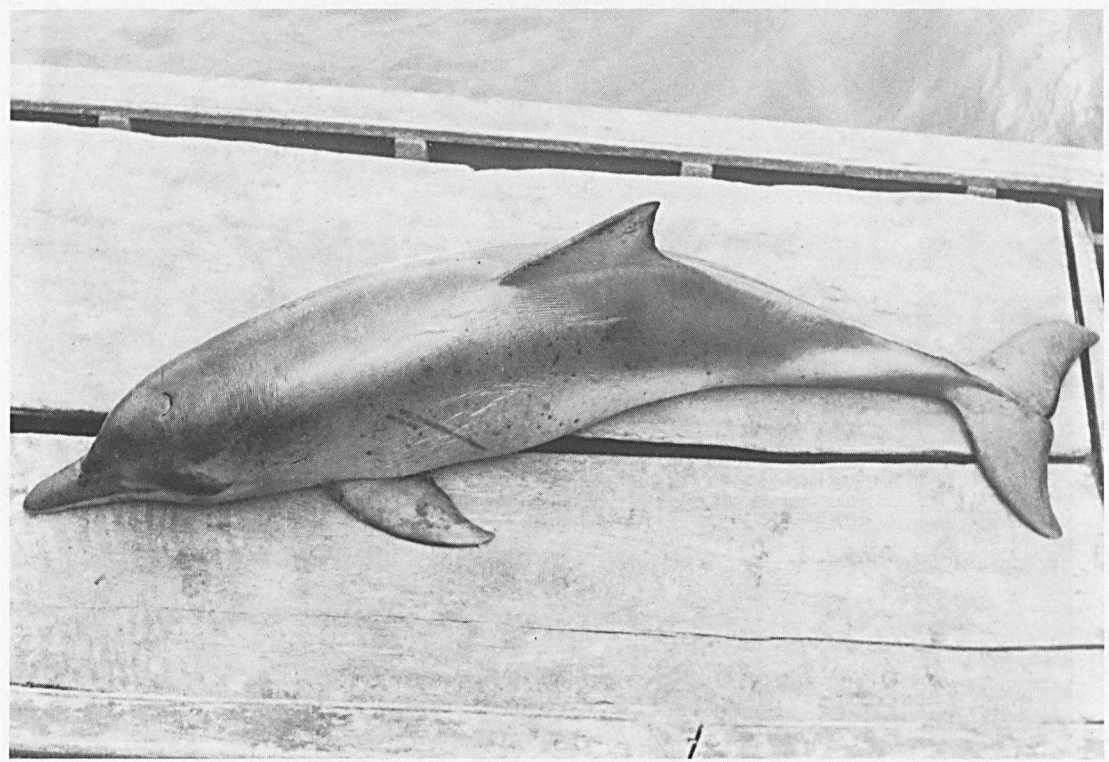


Rattus rattus rattus (Linnaeus), ♂, no. 20251; zyg. br., 19.7 mm.

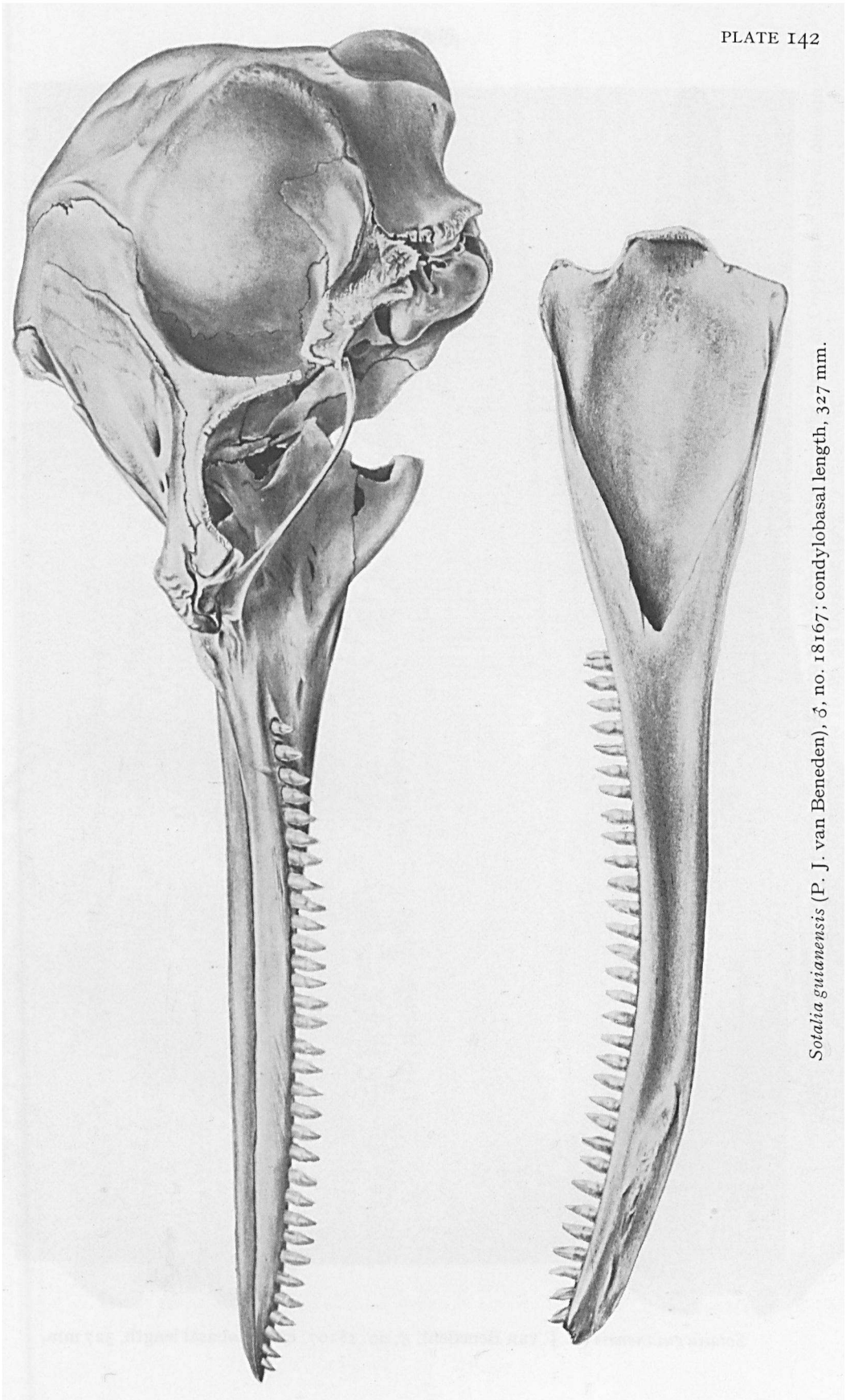


Rattus norvegicus (Berkenhout), ♂, no. 20141; zyg. br., 23.9 mm.

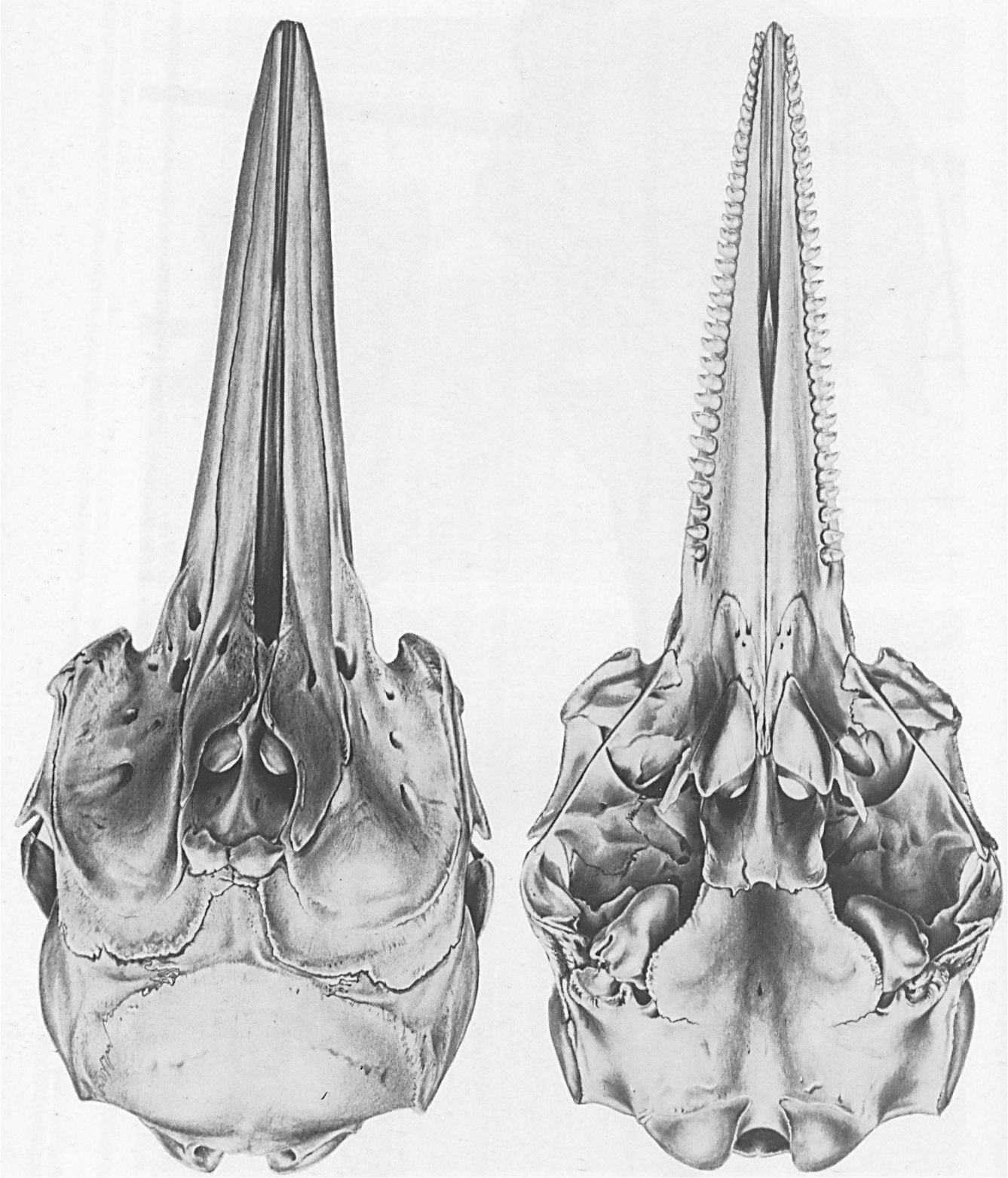
PLATE I4I



Sotalia guianensis (P. J. van Beneden), ♂, no. 18168; total length, 123.5 cm.

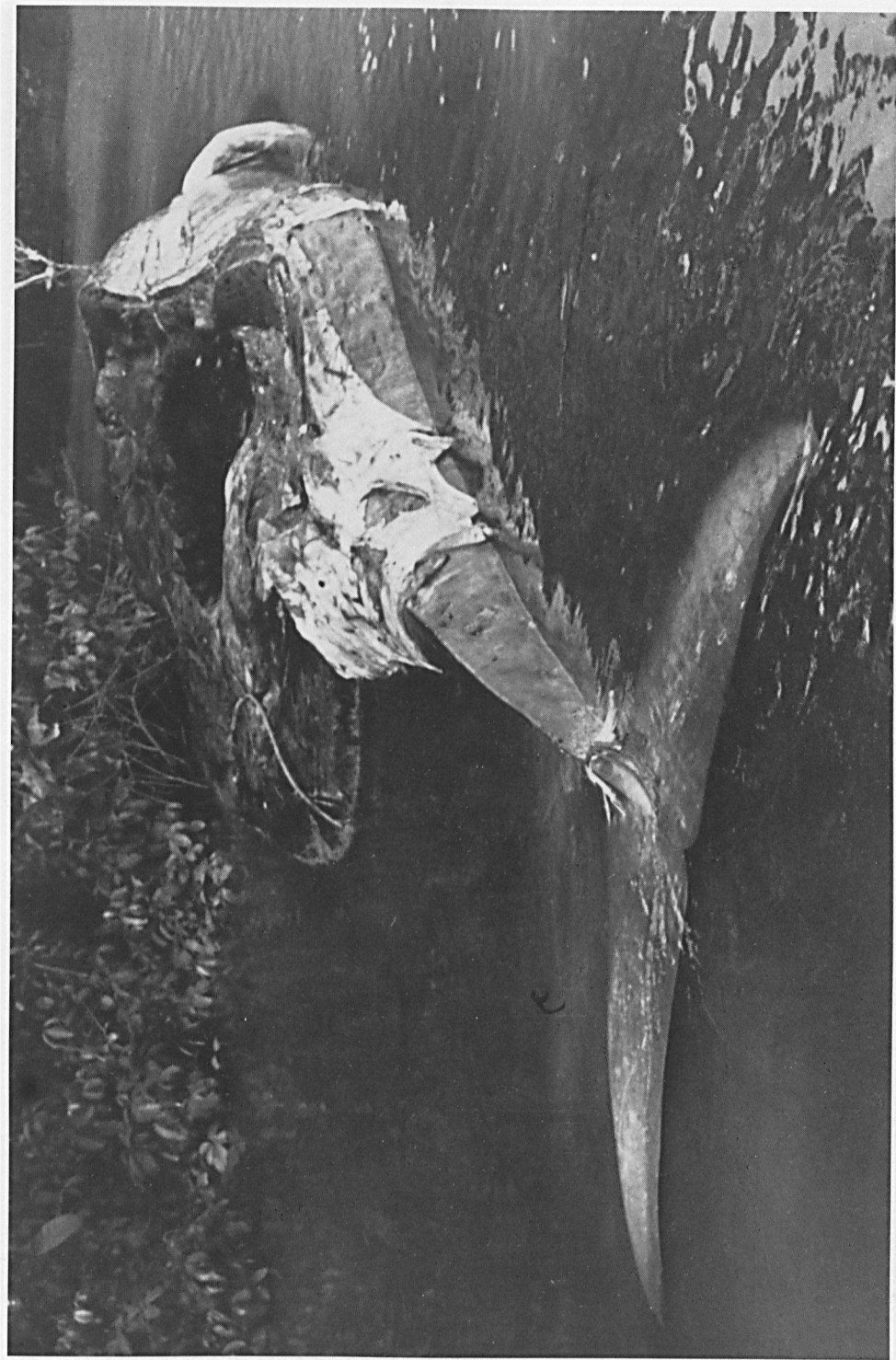


Sotalia guianensis (P. J. van Beneden), ♂, no. 18167; condylobasal length, 327 mm.



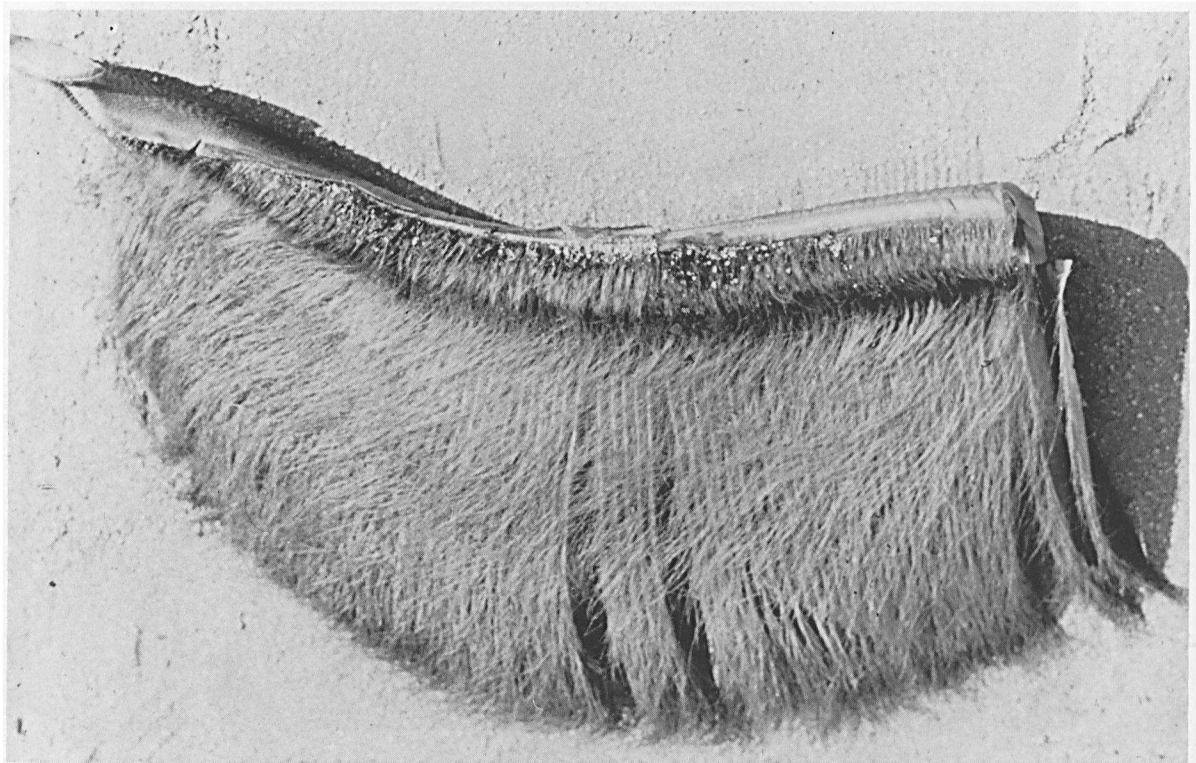
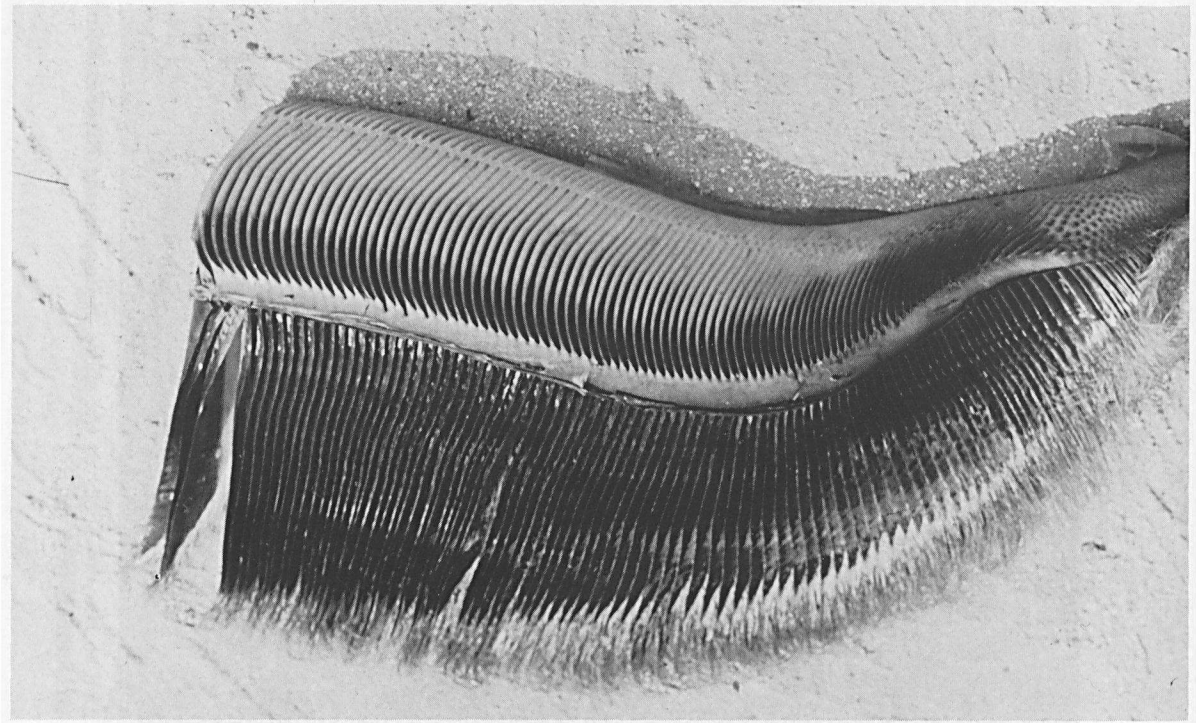
Sotalia guianensis (P. J. van Beneden), ♂, no. 18167; condylobasal length, 327 mm.

PLATE I44



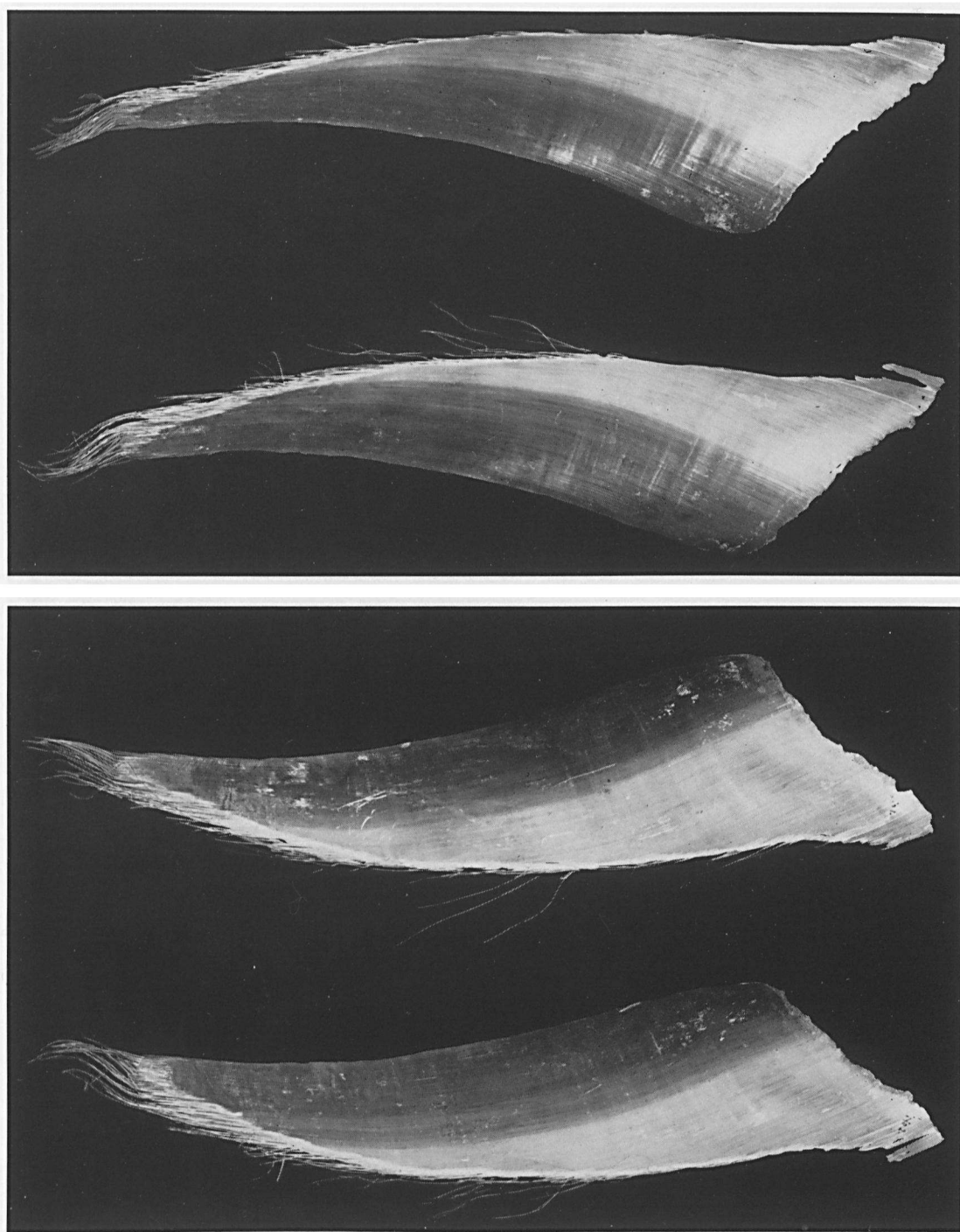
Balaenoptera acutorostrata Lacépède, female. Decomposed specimen tied to the shrubbery of the shore of Coppename River one km above Goede Hoop, 29 October 1963.

PLATE I45



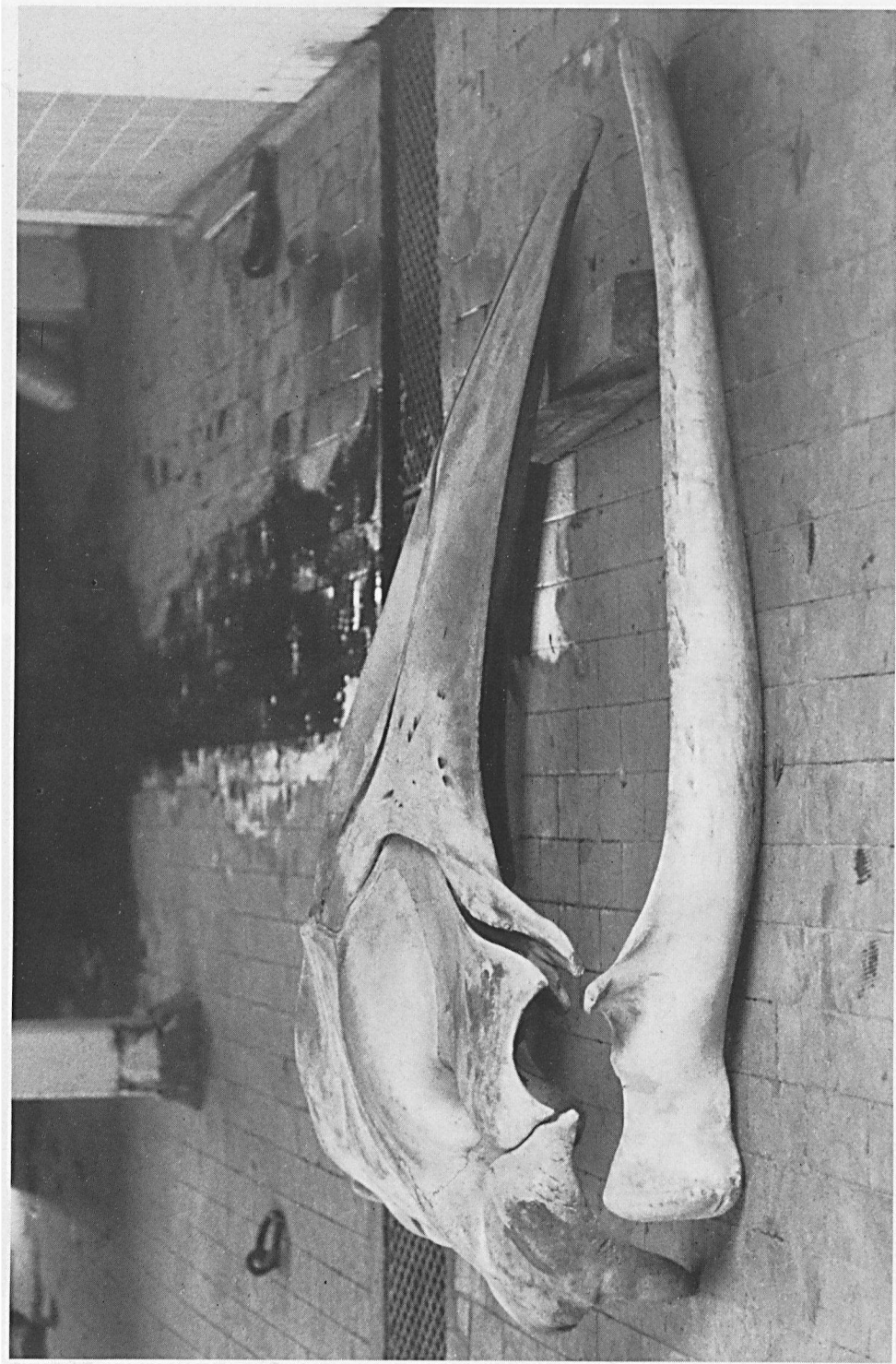
Balaenoptera acutorostrata Lacépède, female from Coppename River, near Goede Hoop, 23 October 1963.
Right side row of baleen plates in outer view (upper) and inner view (lower).

PLATE I46



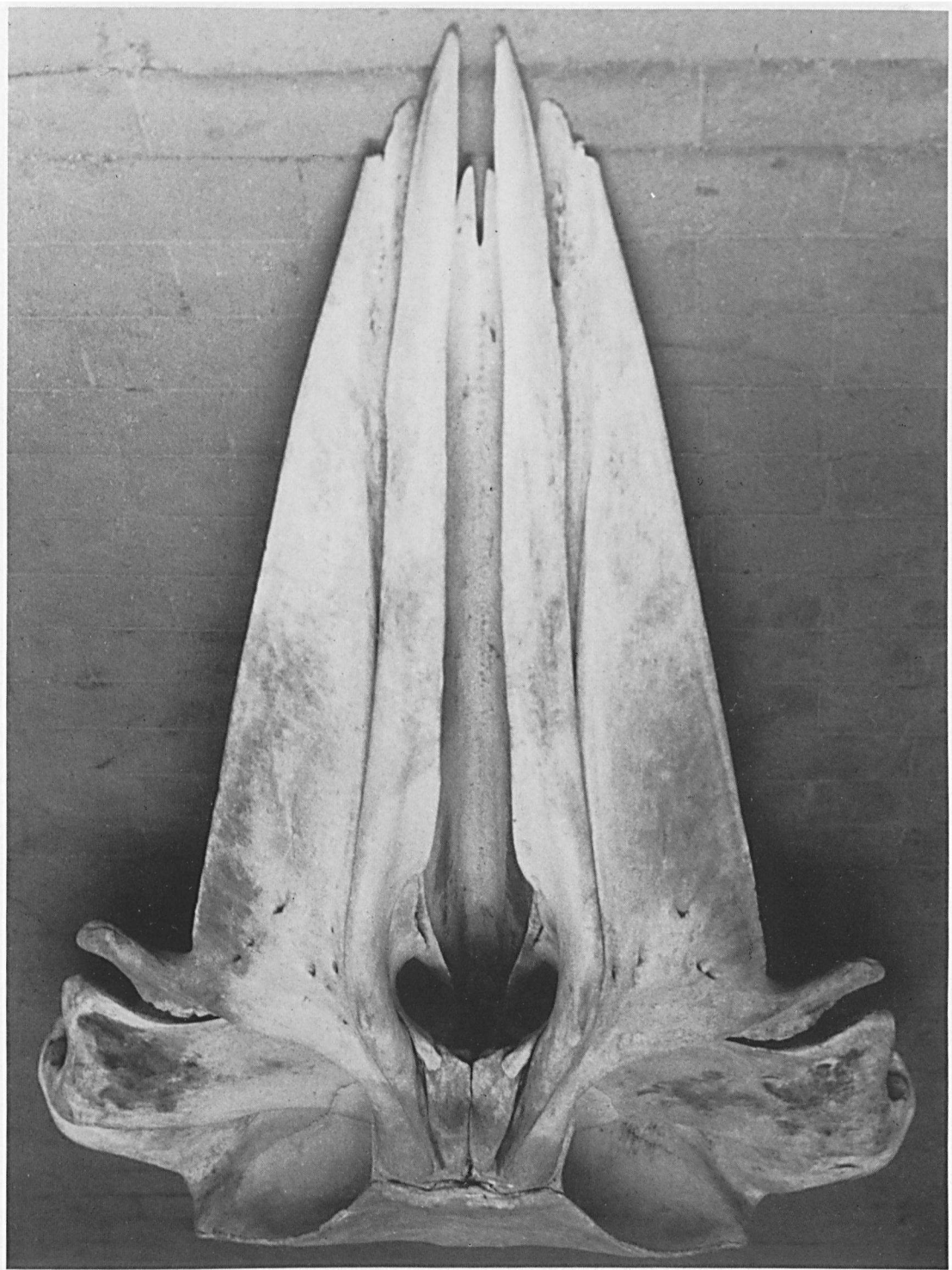
Balaenoptera acutorostrata Lacépède, female from Coppename River, near Goede Hoop, 23 October 1963. Two baleen plates in front view (upper) and posterior view (lower); total length of baleens about 30 cm.

PLATE I47

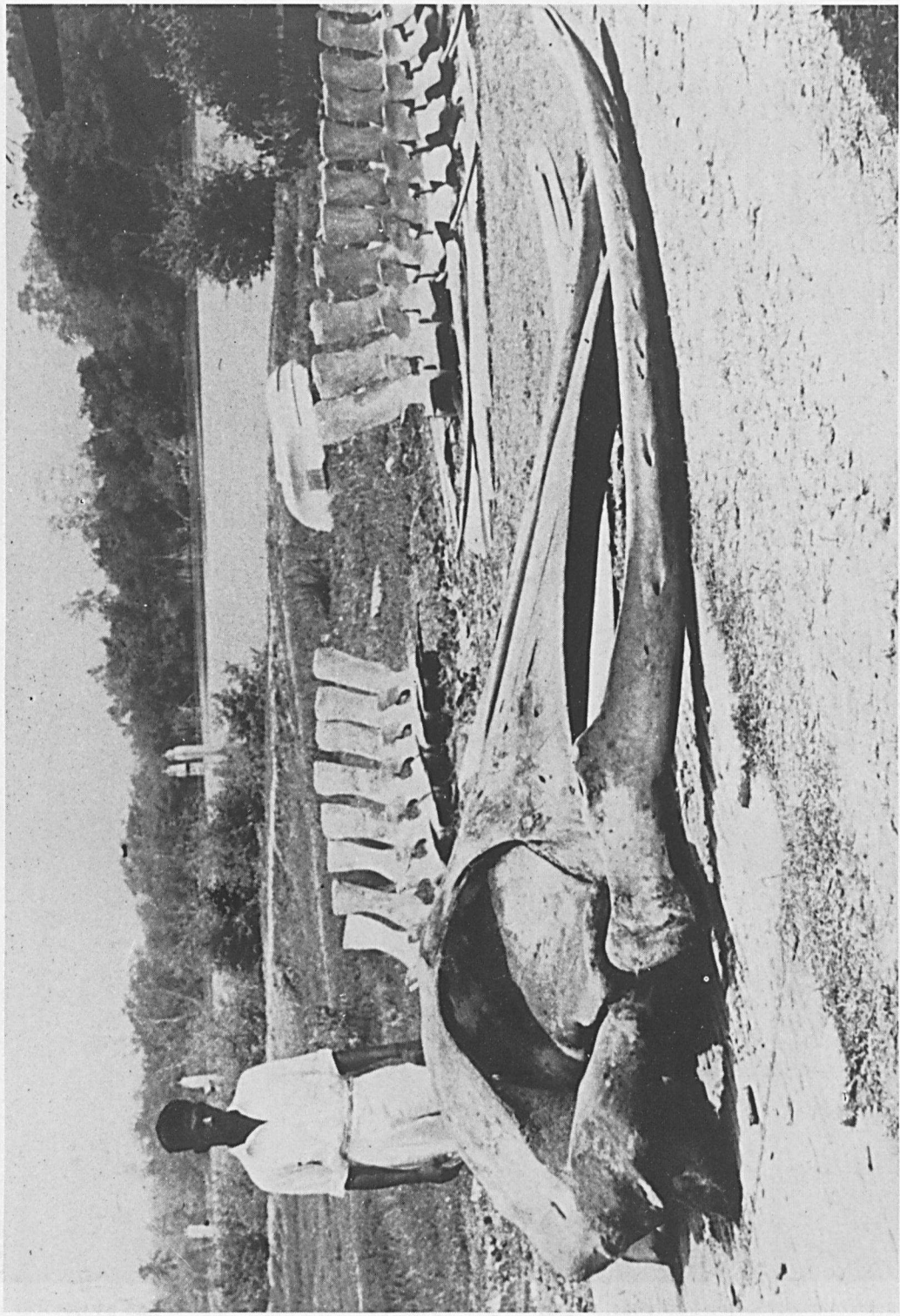


Balaenoptera acutorostrata Lacépède, female from Coppename River, near Goede Hoop, 23 October 1963. Skull in side view; photographed in the former slaughterhouse, Paramaribo, 3 May 1967.

PLATE I48



Balaenoptera acutorostrata Lacépède, female from Coppename River, near Goede Hoop, 23 October 1963.
Skull in dorsal view; photographed in the former slaughterhouse, Paramaribo, 3 May 1967.

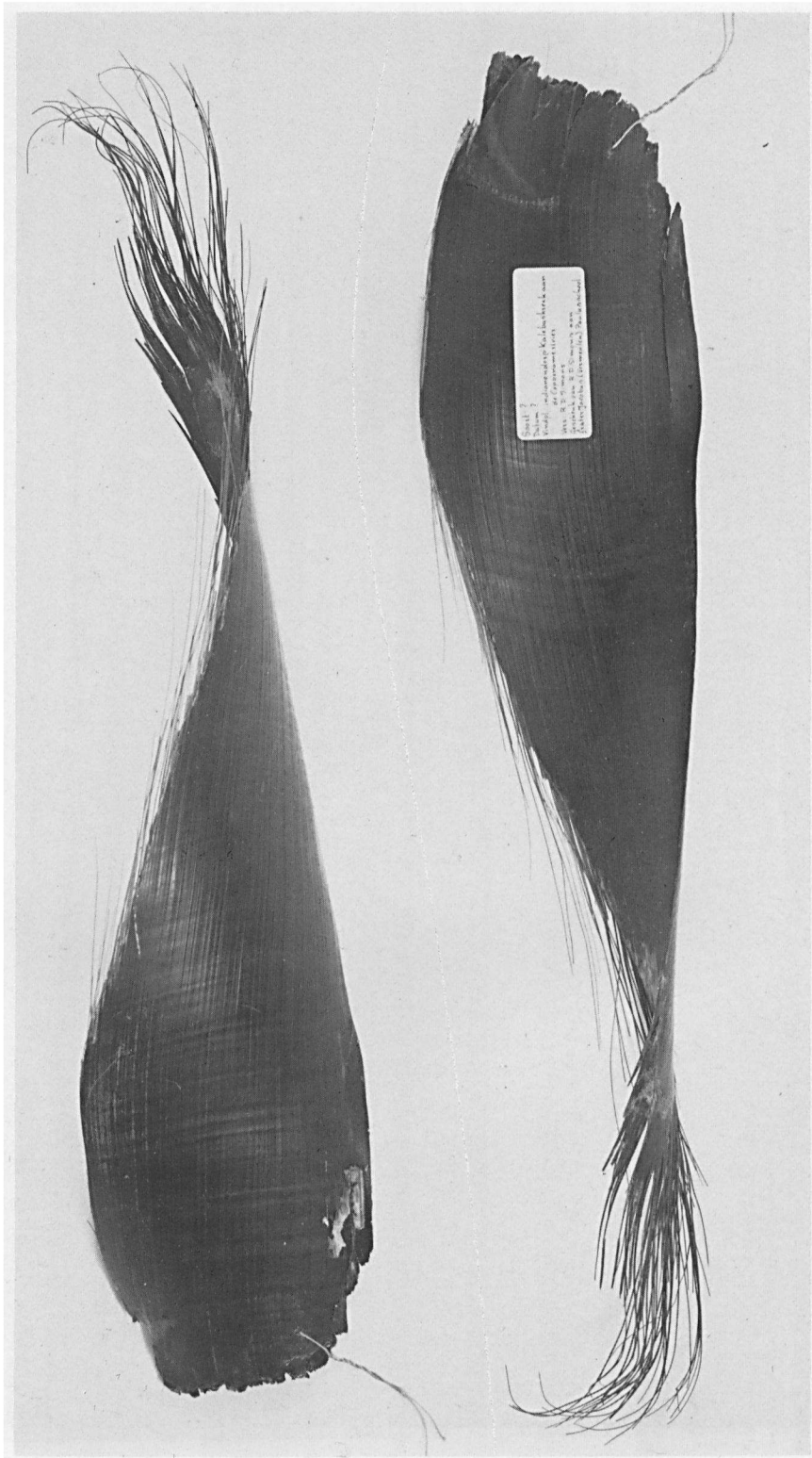


Balaenoptera borealis Lesson. Skull and vertebrae of the male specimen from Prodobong Creek, east of Nieuw Nickerie, washed ashore on 11 Februari 1964.



Balaenoptera physalus (Linnaeus). Tail of the specimen stranded in August 1923 near Braamspunt, mouth of Suriname River, exhibited in a garage in Paramaribo. A rule of 1 m is placed on the tail.

PLATE 151



Balaenoptera physalus (Linnaeus). Baleen preserved in St. Paulusschool in Paramaribo, obtained in 1923 from the Amerindian village of Kalebaskreek on the Coppename River (see also text, p. 526). Length of baleen about 75 to 80 cm.