

NOTES ON SOME RECENT AND FOSSIL CATS, CHIEFLY FROM THE MALAY ARCHIPELAGO

by

Dr. L. D. BRONGERSMA

with 11 plates and 38 textfigures

INTRODUCTION

The present paper contains notes on some recent cats in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden, as well as descriptions of the fossil Felidae in the "Collectie Dubois", Leiden, which its Director Prof. Dubois entrusted to me. The fossils were collected in Java¹⁾ by Prof. Eug. Dubois during his searches for remains of the precursor of man, and with the intention to gather data about the geological age and ecology of this precursor (cf. Dubois, 1888).

The age of the deposits from which the fossil cats were collected, has been much discussed. A review of the literature (up to 1931) on this subject has been given by Van Es (1931), who concludes that the Trinil-fauna must be referred to the lower plistocene age, while Van der Maarel (1932) believes the Trinil-fauna to belong to the middle-plistocene. In a recent paper Von Koenigswald (1934) arrives at the conclusion that the plistocene mammal-fauna of Java in reality consists of three distinct faunae of different age: 1. the old plistocene Djetis-fauna, 2. the Trinil-fauna in its restricted sense of middle-plistocene age, and 3. the young-plistocene Ngandong-fauna. The latter in his opinion is connected with the recent javanese fauna by the prehistoric Sampoeng-fauna, which was described by Dammerman (1932, 1934 a, 1934 b). To this I may add that Prof. Dubois after his extensive studies on this subject, arrives at the conclusion that the Trinil-fauna belongs paleontologically to the youngest

1) The collections with which this paper is concerned are exclusively from "Trinil-fauna" deposits in Von Koenigswald's conception of this fauna, excepted some specimens from Bangle, which locality, judging by Van Es' map, may belong to Von Koenigswald's "Djetis-fauna" deposits. As a matter of course the locality-records of the fossil specimens dealt with in this paper are for the collector's, Prof. Dubois', responsibility.

pliocene, geologically to the oldest pliocene, in the European sense of these terms.

In connection with the age of the Trinil-fauna it was to be expected, of course, that some of the species should prove to be identical with, or nearly related to those now living in the same zoogeographical region. Therefore it was necessary to make careful comparisons with the recent Felidae of the Malay Archipelago and the Asiatic Continent. For this purpose I made use of the collections of Felidae in the Rijksmuseum van Natuurlijke Historie, Leiden, the Zoologisch Museum, Amsterdam, the British Museum (Natural History), London, and the private collection of Prof. Eug. Dubois, Haarlem.

I may here express my thanks to the Trustees of the "Mr. H. van Vollenhoven-fonds", who enabled me to make comparative studies in the British Museum (Natural History).

To the following gentlemen I am indebted for the loan of specimens and much valuable information: Prof. Dr. O. de Beaux, Museo Civico di Storia Naturale, Genova; Prof. Dr. L. F. de Beaufort and Mr. A. C. V. van Bommel, Zoologisch Museum, Amsterdam; Prof. Dr. E. Bourdelle and Dr. P. Rode, Muséum National d'Histoire Naturelle, Paris; Dr. A. Burr, Musée zoologique de l'Université et de la Ville, Strasbourg; Prof. Dr. L. P. le Cosquino de Bussy, Koloniaal Instituut, Amsterdam; Prof. E. S. Goodrich, University Museum, Oxford; Dr. H. Haug, Musée d'Art et d'Art décoratif de la Ville, Strasbourg; Dr. M. A. C. Hinton, Dr. R. W. Hayman, Dr. A. T. Hopwood, Dr. G. E. Pilgrim, Dr. R. I. Pocock and Dr. E. Schwarz, British Museum (Natural History), London; Mr. W. K. Hirschfeld, Bloemendaal; Dr. G. Wilfried Jackson, Manchester Museum, Manchester; Dr. G. C. A. Junge, Rijksmuseum van Natuurlijke Historie, Leiden; Prof. Dr. G. Krediet, Veterinair-Anatomisch Instituut, Utrecht; Dr. W. Meise, Staatliche Museen für Tierkunde und Völkerkunde, Dresden; Ir. J. Reijser, Geological Survey, Bandoeng, Java; Dr. J. Roux, Musée d'Histoire Naturelle, Basel; Prof. Dr. Max Weber, Eerbeek.

The text-figures were all drawn by Mr. M. A. Koekkoek, while the photographs shown on the plates illustrating this paper were made by Mr. H. Cornet; to both I wish to express my heartiest thanks.

While studying the literature on mammalian cheekteeth it became evident that some confusion exists in the denomination of these teeth. In zoological publications it is usual to number the premolars as well as the molars from in front backwards, while in veterinary publications (Scheidt, 1894, p. 435—439, pl. XII fig. 5; Ellenberger & Baum, 1915, p. 206; Andres, 1926, p. 244) the premolars are numbered in the opposite direction. More-

over in zoology the indices attached to the letters denominating the different teeth are generally used to express the homology of these teeth with those of the primitive mammalian series, which, as far as the cheek-teeth of the placental mammals are concerned, is supposed to consist of four premolars and three molars (Friant, 1933, p. 17; cf. also Weber, 1927, p. 244). In recent Felidae the number of cheekteeth has been much reduced; except in a few aberrant cases the foremost premolar of the primitive mammalian series is absent, while in the lower jaw the anterior two premolars of that series are absent. The formula for the cheekteeth of the permanent set in the recent Felidae thus may be indicated as follows:

$$\frac{P^2 P^3 P^4 M^1}{P_3 P_4 M_1}$$

No uniformity exists, however, in this respect, and several authors use other denominations for the premolars. Pocock (1916 b, p. 308) when describing the toothchange in *Uncia uncia* (Schreb.) indicates the posterior premolar of the mandible by the symbol pm_3 ; a few lines lower down, the same tooth is indicated with the usual symbol pm_4 , however, with the addition "of the normal mammalian series". In other papers this author (Pocock, 1916 a, 1916 d) uses the usual denominations. Birula (1915) in his paper on *Aelurina planiceps* (Vig. et Horsf.) (= *Ictailurus planiceps*) only gives serial numbers to the premolars that are present in this species, thus coming to the formula: $\frac{prm. 1 \quad prm. 2 \quad prm. 3 \quad mol. 1}{prm. 1 \quad prm. 2 \quad mol. 1}$

Another problem encountered is the homology of the carnassials of the Felidae. In zoological literature (e.g., Mivart, 1881, p. 29, fig. 12; Pocock, 1916 a, 1916 c; Birula, 1915; Friant, 1933, p. 43, fig. 16) and in some veterinary publications (Keller, 1905, p. 103; Andres, 1926, p. 244; Reighard & Jennings, 1928, p. 226) the lower carnassial of the Felidae is considered to be a molar, while in some of the older german veterinary publications (references in: Andres, 1926, p. 247) it is classed with premolars. That the lower carnassial is not preceded by a deciduous tooth has been shown already in the figures of the toothchange in the lion by Owen (1845, pl. 127, fig. 4), Blainville (1843, pl. XIV) and Weber (1904, p. 181, fig. 139; 1927, p. 257, fig. 195), in the tiger by Blainville (1843, pl. XIV), and recently again for the domestic cat by Andres (1926). Since Andres published his paper, this view has also penetrated into the german veterinary textbooks (Ellenberger & Baum, 17th ed.; fide Krediet, in litt. 1935). Several skulls of young *Prionailurus bengalensis* (Kerr), three of young *Panthera tigris* (L.), two of young *Leopardus pardalis* (L.), one of *Profelis temminckii* (Vig. et Horsf.), *Neofelis nebulosa* (Griff.), *Pardofelis marmorata* (Mart.) and of a species of *Lynx* were examined by me, and in none of them did I find a trace of a deciduous tooth preceding

the lower carnassial. Neither does Pocock (1916b) make any reference to such a tooth in *Uncia uncia* (Schreb.). We may therefore safely conclude that the lower carnassial of the Felidae is a true molar (M_1). Hilzheimer (1906, p. 113) in his description of *Felis deliensis* refers to the cheekteeth of the lower jaw as P_4 , M_1 and M_2 ; as in all the species examined the second cheektooth of the permanent set is preceded by a deciduous tooth, and as the second cheektooth of *Felis deliensis* Hilzh. does not differ from that in specimens of *Felis catus* L. (of which *deliensis* is a synonym, cf. p. 39) I do not believe that this view can be accepted. The carnassial of the upper jaw is generally considered to be a premolar, but Kretzoi (1929, p. 1349) states that the upper carnassial of the Aeluroidea is M^1 . In the skulls of young Felidae examined by me the permanent upper carnassial is always preceded by a deciduous tooth and therefore is classed with the premolars. Among the fossil specimens a lower milk-carnassial of *Panthera tigris* (L.) was found; for comparison with this tooth I examined a number of lower milk-carnassials of different species of the Malay Archipelago, and it became evident that the structure of this tooth is variable within the species. Six of the variations found in *Prionailurus bengalensis* (Kerr), together with milk-carnassials of other species are shown in figs. 1—11. In the smaller species of Indo-Australian Felidae the cheekteeth of the different species resemble each other very much, and within a species the development of the cusps of the premolars shows a distinct variation; these variations will be described under the separate species. For further comparisons some indices of the teeth of the lower jaw were calculated:

$$1. \text{ length-index: } \frac{\text{length of tooth} \times 100}{\text{length of } P_3-M_1 \text{ together}}$$

$$2. \text{ breadth-index: } \frac{\text{breadth of tooth} \times 100}{\text{length of tooth}}$$

$$3. \text{ height-index („indice dentaire” of Friant, 1933, p. 43): } \frac{\text{height of tooth} \times 100}{\text{length of tooth}}$$

It proved that within a species these indices showed a distinct variation, and that in most cases the ranges of variation of the different species overlapped.

Besides for the teeth, indices were also calculated for some measurements of the lower jaw. As these were chiefly used in the smaller cats to enable comparisons to be made with the type of *Felis microgale* Dubois, the standard measurement used was that of the three cheekteeth taken together (measured at the base of the crowns), the only larger measurement that could be taken with certainty in the fossil. Indices were cal-

culated for the length of the diastema, for the height of the lower jaw at four different places (in front of P_3 , P_4 , M_1 , and behind M_1) and of the breadth of the lower jaw in front of M_1 (breadth-index I). All these indices were calculated as follows: $\frac{\text{measurement} \times 100}{\text{length of } P_3-M_1 \text{ together}}$. Of the breadth of the mandible in front of M_1 a second index (breadth-index II) was calculated: $\frac{\text{breadth of jaw} \times 100}{\text{height of jaw in same region}}$. The range of variation for the smaller species of Felinae of the Malay Archipelago and for *Prionailurus rubiginosus* (Is. Geoffr.) is shown in table II. For *Panthera tigris* (L.), of which more complete fossil jaws were available, an other length-index was calculated, which will be mentioned when dealing with that species.

In this paper I have adopted the classification of the Felidae as it has been built up by Pocock (1916b, 1916c, 1916d, 1917a, 1917b, 1932) on external and osteological characters. This does not mean that I believe all genera recognized by Pocock to be valid, but the material at hand is far from sufficient to allow an attempt at revising this group. The genus *Zibethailurus* Sev. I have not retained as a separate genus as I do not find sufficient differences from *Prionailurus* Sev.; Pocock (1917b, p. 331) mentioned already that the separating of these two genera might be not justified, and in a later paper (1932, p. 765) he wrote, when dealing with the Fishing Cat, "*Prionailurus*, or *Zibethailurus*, *viverrinus*". Recently Kretzoi ¹⁾ (1929) published an extensive paper on the classification of the Aeluroidea, which, however, bears a provisional character, as the new groups proposed by him are only very shortly described. With some of the changes proposed by Kretzoi I cannot agree, e.g., the inclusion of *Puma* Jard. in the Pantherinae and the establishing of a new subfamily Neofelinae for the genus *Neofelis*. I have retained Pocock's division of the recent Felidae into three subfamilies, a division also supported by Sonntag (1923, p. 149) on evidence derived from the structure of the tongue.

Preceding the notes on the different species I shall give a list of the recent species of Felidae known from the Malay Archipelago, mentioning the islands on which each of them have been found, as well as a short historical account of the fossil Felidae of Java.

1) The restriction of the name Carnivora to a subordo including only the Arctoidea, Musteloidea and Herpestoidea does not seem to me an improvement, as for a long time the name has been used in a more general sense.

Subfamily Felinae.

- Neofelis nebulosa* (Griff.): Sumatra, Batoe Is., Borneo.
Profelis temminckii temminckii (Vig. et Horsf.): Sumatra.
Prionailurus viverrinus (Benn.): Java; Sumatra? (cf. p. 13).
Prionailurus bengalensis javanensis (Desm.): Java, Bali.
Prionailurus bengalensis sumatranus (Horsf.): Sumatra, Nias.
Prionailurus bengalensis borneoensis nov. subsp.: Borneo.
Pardofelis marmorata marmorata (Mart.): Sumatra, Borneo.
Badiofelis badia (Gray): Borneo.
Ictailurus planiceps (Vig. et Horsf.): Sumatra, Borneo.
Felis catus L.: feral on several islands (cf. p. 42).

Subfamily Pantherinae.

- Panthera tigris sumatrae* Pocock: Sumatra.
Panthera tigris sondaica (Temm.): Java.
Panthera tigris balica (Schwarz): Bali.
Panthera pardus melas (Cuvier): Java.

Remains of fossil Felidae were first discovered in Java by Dubois (Anonymous, 1891 a, p. 14; 1891 c, p. 15; 1892, p. 15; 1893 a, p. 12; 1893 b, p. 12; Dubois, 1891, p. 92). The occurrence of *Panthera tigris* (L.) in the postpliocene of Java is mentioned by Grevé (1895, p. 19). In a preliminary account of the Kendeng-fauna, Dubois (1907, p. 454) mentioned a species, which was equal in size to tiger and lion, and proposed the new name *Felis groeneveldtii* for it. In a later paper (Dubois, 1908, p. 1266—1267) three species of cats were described: *Felis oxygnatha* Dubois, *Felis trinilensis* Dubois (substitute name for *Felis groeneveldtii* Dub. of the preliminary paper), *Felis microgale* Dubois.

Stremme (1911 a, p. 55; 1911 b, p. 86, pl. XVI figs. 3, 4, pl. XVIII fig. 1) described a new species and genus, *Feliopsis palaeojavanica*, which had been collected at Trinil by the Selenka-expedition. An account of the fossil Felidae known from Java (up to 1933) was published by Von Koenigswald (1933, pp. 6—21), who mentions the following species: *Felis palaeojavanica* (Stremme); *Felis tigris soloensis* Koenigswald; *Felis* cf. *pardus* Linn.; *Felis oxygnatha* Dub., as possibly identical with *F. palaeojavanica*; *Felis groeneveldtii* Dub., as possibly identical with *F. tigris*; *Felis* sp. I, *Felis* sp. II, unidentifiable remains. Unidentifiable remains of Felidae are also mentioned by Stehlin (1925, p. 2). To this list must be added *Felis* cf. *tigris* L. and the Machairodontine *Epimachairodus zwierzyckii* Koenigs-

wald (Von Koenigswald, 1934, p. 190). Dammerman (1932, 1934 a, 1934 b) described a prehistoric fauna from an "abri sous roche" at Sampoeng, C. Java; among the remains found here this author (Dammerman, 1932, p. 31; 1934 b, p. 485) mentions *Felis bengalensis* (= *Prionailurus bengalensis* (Kerr)). This species is also mentioned for the Sampoeng-fauna by Von Koenigswald (1934, p. 199) together with a second small species of cat, which perhaps might be related to the recent *Prionailurus rubiginosus* (Is. Geoffr.) of British India and Ceylon. Dammerman (1934 b, p. 485) mentions also the occurrence of *Felis tigris* (= *Panthera tigris* (L.)) in the Sampoeng-fauna.

Re-examination of the type-specimens of Dubois' species convinced me that:

1. *Felis groeneveldtii* Dub. (*F. trinilensis* Dub.), *Felis oxygnatha* Dub., *Feliopsis palaeojavanica* Stremme and *Felis tigris soloensis* Koeningsw. are identical with *Panthera tigris* (L.) sp.

2. *Felis microgale* Dub. is identical with *Prionailurus bengalensis* (Kerr) sp.

Besides the recent species recorded from the Archipelago I examined also the following species, as they were mentioned by Dubois (1908) in the diagnosis of his fossil species: *Felis rubiginosa* (= *Prionailurus rubiginosus* (Is. Geoffr.)), *Felis catus* (= *Felis silvestris* Schreb.), *Felis chaus* Schreb.¹), *Felis leo* (= *Panthera leo* (L.)), *Felis uncia* (= *Uncia uncia* (Schreb.)). Moreover I examined for comparisons *Otocolobus manul* (Pall.) and *Acinonyx jubatus* (Schreb.).

The examination of the Felidae, which have been enumerated by Jentink (1887, 1892) in his osteological and systematic catalogues of the mammal-collections in the Leiden Museum, showed that it was necessary to check the identifications as several of the specimens had been wrongly labelled. Notes on the changes which have to be made in these catalogues are incorporated in the present paper. Unless otherwise stated the specimens are in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden.

The synonymies given are not supposed to be complete, as a number of papers, especially older ones, were not available for examination. References to fossil specimens are preceded by †.

SYSTEMATICAL PART

Neofelis nebulosa (Griff.) (fig. 3).

Felis nebulosa Griffith, Descr. Vert. Anim., Carn., 1821, p. 37 (non vidi); Griffith, Animal Kingd., vol. 2, 1837, p. 453, pl.; Horsfield, Zool. Journ., vol. 1, 1825, p. 551,

1) For the authority of this species see Allen (1920).

552; Horsfield, Bull. Sc. Nat. et Geol., vol. 6, 1825, p. 401; Geoffroy-St.-Hilaire & F. Cuvier, Hist. Nat. Mamm., vol. 3, 1829, pl.; Lesson, Hist. Nat. Gén. Mammif., vol. 5, 1836, p. 345; Brandt, Mém. Ac. Imp. Sci. St. Pétersb., ser. 6, sc. math. phys. nat., vol. 8, 1856, p. 191; Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 387, 388, 391; Blandford, Faun. Brit. Ind. 1888, p. 56, 72, fig. 17; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 213, 220; Jentink, Cat. Syst., 1892, p. 98; Everett, P.Z.S., 1893, p. 495; Hose, Mamm. Borneo, 1893, p. 17; Bateson, Mat. Var., 1894, p. 224; Lydekker, Handbook, 1895, p. 117, pl. X; Matschie, SB. Ges. Natf. Fr. Berl., 1895, p. 195; Flower, P.Z.S., 1900, p. 324; Beccari, Wanderings, 1904, p. 37, 277; Schneider, Zool. Jahrb. Syst., vol. 23, 1905, p. 102, 145; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 206, 323; Van Balen, Dierenwereld, vol. 1, 1914, p. 362, 365, 2 figs.; Robinson & Kloss, J. Fed. Mal. St. Mus., vol. 8, pt. 2, 1918, p. 73; Pocock, Ann. Mag. N.H., ser. 8, vol. 19, 1917, p. 119, 128, 133, fig. 9; Br. v. Gr., Trop. Nat., vol. 22, 1921, p. 163, fig. 1; Jacobson, J. Fed. Mal. St. Mus., vol. 10, 1921, p. 238; Sonntag, P.Z.S., 1923, p. 131, 133, 137, 140, 149, fig. 19; Chasen, Singapore Naturalist, pt. 4, 1924, p. 80 and pt. 5, 1925, p. 87; Dammerman, Tectona, vol. 19, 1926, p. 617; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 53; Dammerman, Treubia, vol. 12, 1930, p. 133; Jacobson, Trop. Nat., vol. 22, 1933, p. 162; Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 74, 133.

Felis nebulosus, Chenu, Encycl. Hist. Nat., 1853, p. 172.

Felis (Neofelis) nebulosa, Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 76.

Neofelis nebulosa, Pocock, Ann. Mag. N.H., ser. 8, vol. 20, 1917, p. 343; Gyldenstolpe, Kungl. Sv. Vet. Ak. Handl., vol. 60, pt. 6, 1919, p. 55; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 56; Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 75.

Felis (Zibethailurus) nebulosa, Trouessart, Cat. Mamm., 1897, p. 356; Trouessart, Cat. Mamm., suppl., 1904, p. 269.

Felis macrocelis, Horsfield, Zool. Journ., vol. 1, 1825, p. 543 et seq., pl. 21; Horsfield, Bull. Sc. Nat. et Geol., vol. 6, 1825, p. 401; Lesson, Man. Mamm., 1827, p. 189; Temminck, Mon. Mamm., vol. 1, 1825, p. 102; Fischer, Syn. Mamm., 1829, p. 201 and 1830, p. 367; Geoffroy-St.-Hilaire & F. Cuvier, Hist. Nat. Mamm., vol. 3, pt. 50, 1829; Horsfield, Isis, 1830, p. 825; Lesson, Hist. nat. Gén. Mammif., vol. 5, 1836, p. 345; Martin, P.Z.S., 1836, p. 107, 108; Martin, L'Institut, vol. 5, 1837, p. 263; Schlegel, Essai Phys. Serp., vol. 1, 1837, p. 235, 236, 241; Martin, Isis, 1838, p. 208; Müller, Verh. Nat. Gesch. Overz. Bez., Zool., Zoogd., 1839, tab.; Wagner, Suppl. II Schreber, Säugeth., 1841, p. 489; Schinz, Syst. Verz., vol. 1, 1844, p. 433; Wagner, Abh. math. physik. Kl. bayer. Ak. Wiss., vol. 4, pt. 2, 1845, p. 82, 98; Müller, Arch. Natg., 12, 1846, vol. 1, p. 112; Blyth, J. As. Soc. Beng., vol. 22, 1853, p. 591; Bruyn Kops, Tijdschr. Taal-Land-Volkenk., vol. 2, 1854, p. 481; Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 58, VI; Gray, P.Z.S., 1867, p. 260, 261; Pelzeln, Festschr. k. k. zool. bot. Ges. Wien, 1876, p. 67; Jentink, Aardr. Weekbl., vol. 2, 1881, p. 290; Mivart, The Cat, 1881, p. 398, 431, 496, figs. 168, 169; Mohnicke, Pflanz.Thierleb., 1883, p. 408; Jentink, Cat. Ost., 1887, p. 83; Snelleman, Midden Sumatra, IV, 1, Fauna, pt. 1, 1887, p. 21, 22; Jentink, Notes Leyd. Mus., vol. 11, 1889, p. 22; Hagen, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 7, 1890, p. 91; Jentink, Cat. Syst., 1892, p. 98; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 206.

Felis macroscelis, Wiegman, Isis, 1831, p. 283; Wiegman, Bull. Sc. Nat. et Géol., vol. 27, 1831, p. 183; Waterhouse, Cat. Mamm. Zool. Soc., 1838, p. 30; Pöppig, Illustr. Naturg., vol. 1, 1851, p. 98, 102, fig. 374; Chenu, Encycl. Hist. Nat., 1853, p. 172; Giebel, Säugeth., 1855, p. 869; Schlegel, Dierentuin, 1872, p. 34; Grevé, Zool. Jahrb. Syst., vol. 6, 1891, p. 65; Grevé, Congr. Int. Zool. Moscou, vol. 1, 1892, p. 162, 168; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 20, 53, 97.

Uncia macroscelis, Gray, Ann. Mag. N. H., ser. 2, vol. 14, 1854, p. 394; Horsfield, Ann. Mag. N. H., ser. 2, vol. 16, 1855, p. 104.

- Panthera (Uncia) macrocelis*, Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 387.
Panthera macrocelis, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 431, 483.
Leopardus macroscelis, Gray, Cat. Bones Mamm. B. M., 1862, p. 62.
Neofelis macrocelis, Gray, P.Z.S., 1867, p. 266, fig. 3; Gray, Cat. Carn. Mamm. B. M., 1869, p. 13, fig. 3; Gray, Ann. Mag. N. H., ser. 4, vol. 14, 1874, p. 353; Cope, Proc. Ac. Philad., 1879, p. 173; Cope, Ann. Mag. N. H., ser. 5, vol. 5, 1880, p. 41; Hagen, Ausland, vol. 54, 1881, p. 555; Hagen, Aardr. Weekbl., vol. 2, 1881, p. 278; Snelleman, Midden Sumatr., IV, 1, Fauna, pt. 1, 1887, p. 21; Ihering, Arch. Natg., 76, 1910, vol. 1, pt. 2, p. 135.
Tigris macroscelis, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 483.
Felis microcelis, Griffith, Anim. Kingd., vol. 2, 1873, p. 453.
Felis diardii, G. Cuvier, Rech. Ossem. foss., 1823, p. 437; Desmoulins, Dict. class. hist. nat., vol. 3, 1823, p. 495; Fischer, Syn. Mamm., 1829, p. 206 and 1830, p. 371; Martin, P.Z.S., 1836, p. 107; Martin, L'Institut, vol. 5, 1837, p. 263; Martin, Isis, 1838, p. 208; Chenu, Encycl. Hist. Nat., 1853, p. 202, fig.; Brandt, Mém. Ac. Sci. St. Pétersb., ser. 6, sc. math. phys. nat., vol. 8, 1856, p. 191; Blyth, P.Z.S., 1863, p. 183; Elliot, Mon. Felidae, pt. 6, 1880, pl. and text; Ménégaux, Mammif., p. 256.
Panthera diardi, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 487.
Uncia diardi, Trouessart, Bull. Soc. Et. Sc. Angers, suppl. 1884, 1885, p. 99.
Uncia macroceloides, Gray, Ann. Mag. N. H., ser. 2, vol. 1854, p. 394.
Felis macroceloides, Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 58.

Specimens examined:

- 1 ex., Borneo, leg. Diard, cat. syst.: a, mounted, cat. ost.: b, skeleton.
 1 ex., ♂, Sumatra, from Rotterdam Zoo, 7. I. 1873, cat. syst.: b, mounted, cat. ost.: b, skeleton.
 1 ex., ♂, Pangkalan Brandan, Sumatra, from Rotterdam Zoo, rec. 8. X. 1924 (imported shortly before), reg. no. 1349, flat skin + skeleton.
 1 ex., ♀ juv., Tebing Tinggi, Sumatra, from Rotterdam Zoo, rec. 7. IX. 1929, reg. no. 1772, flat skin + skeleton.
 1 ex., ♀, Deli, Sumatra, purchased of Blazer, rec. 11. IX. 1929, reg. no. 1780, flat skin + skeleton.
 1 ex., ♂, Sumatra, from Rotterdam Zoo, rec. 24. VII. 1931, reg. no. 1981, flat skin + skeleton.
 1 ex., Asahan, Sumatra, XII. 1905, leg. De Bussy, Mus. Amst., skull, atlas and axis.
 1 ex., Sumatra, Sumatra Exp., 1878, cat. ost.: c, skull.
 1 ex., ♂, Tandjong Morawa, Deli, Sumatra, leg. Dr. B. Hagen, 1882, cat. ost.: d, skull.
 2 ex., juv., Batoe Is. (between Padang and Anjerbangies), 1877, cat. syst.: c, d, mounted.
 1 ex., Teypore, Assam, don. F. Day, 1877, cat. syst.: e, mounted.

The colour of the sumatran specimens is somewhat variable; skin no. 1349 is of a general ochreous colour, like that found in some specimens of *Pardofelis marmorata* (Mart.); in the other specimens the colour between the spots is yellowish grey or brownish grey. In the young specimen no. 1772 the spots on the back are filled up with black, and not as in the other specimens brownish with only a black border; the fur

between the spots is greyish white. From comparison of this young specimen with that mentioned by Jentink (1892, p. 98) it became clear that the latter could not belong to this species, but is a kitten of *Pardofelis marmorata* (Mart.). The lower milk-carnassial of specimen no. 1772 is shown for comparison with that of other species in fig. 3.

Distribution in the Archipelago: Borneo, Sumatra and the Batoe Is. Kloss (1928) does not mention this species in his list of the mammals of the island-chain west of Sumatra; probably he overlooked the reference to the Batoe Is. made by Jentink (1892, p. 98).

Profelis temminckii temminckii (Vig. et Horsf.) (fig. 4).

Felis temminckii Vigors & Horsfield, Zool. Journ., vol. 3, 1827, p. 451¹⁾; Vigors & Horsfield, Bull. Sc. Nat. et Géol., vol. 19, 1829, p. 105; Vigors & Horsfield, Isis, 1830, p. 826; Lesson, Hist. Nat. Gén. Mammif., vol. 5, 1836, p. 352; Waterhouse, Cat. Mamm. Zool. Soc., 1838, p. 32; Wagner, Suppl. II Schreber, Säugeth., 1841, p. 540; Wagner, Abh. math.-physikal. Kl. bayer. Ak. Wiss., vol. 4, pt. 2, 1845, p. 82; Chenu, Encycl. Hist. Nat., 1853, p. 205; Brandt, Mém. Ac. Imp. Sci. St. Pétersb., ser. 6, sc. math. phys. nat., vol. 8, 1856, p. 191; Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 62; Gray, P.Z.S., 1874, p. 322, 323; Elliot, Mon. Felidae, pt. 6, 1880, pl. and text; Blanford, Fauna Brit. Ind., 1888, p. 56, 75; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 213, 222; Everett, P.Z.S., 1893, p. 495; Hose, Mamm. Borneo, 1893, p. 19; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 75; Lydekker, Handbook, 1895, p. 120; Matschie, SB. Ges. Natf. Fr. Berl., 1895, p. 195; Flower, P.Z.S., 1900, p. 325; Ménégau, Bull. Mus. Paris, 1905, p. 72, 384; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 208, 323; Ménégau, Mammif., p. 267; Van Balen, Dierenwereld, vol. 1, 1914, p. 368; Robinson & Kloss, J. Fed. Mal. St. Mus., vol. 8, pt. 2, 1918, p. 73; Dammerman, Tectona, vol. 19, 1926, p. 617; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 53, 56; Dammerman, Treubia, vol. 12, 1930, p. 133; Bourdelle & Rode, C. R. Soc. Biogéogr., vol. 9, 1932, p. 66, 68, 69.

Felis (Felis) temmincki, Trouessart, Bull. Soc. Et. sc. Angers, suppl. 1884, 1885, p. 103.

Felis temmincki, Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 133.

Catus temminckii, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 431, 518.

Panthera temminckii, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 518.

Pyrofelis temminckii, Gray, Ann. Mag. N.H., ser. 4, vol. 14, 1874, p. 354.

Felis (Catopuma) temminckii, Trouessart, Cat. Mamm., 1897, p. 364; Trouessart, Cat. Mamm., suppl., 1904, p. 274.

Felis (Profelis) temmincki, Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 75.

Profelis temminckii, Pocock, Ann. Mag. N.H., ser. 8, vol. 20, 1917, p. 344, 345; Gyldenstolpe, Kungl. Sv. Vet. Ak. Handl., vol. 60, pt. 6, 1919, p. 55; Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 74; Pocock, P.Z.S., 1932, p. 752, 754, fig. 4 c, d.

Profelis temminckii temminckii, Pocock, P.Z.S., 1932, p. 754, pl. II.

1) In the text is referred to pl. suppl. 22, but I have not been able to find this plate; not in vol. 3 nor in the following volumes, present in the Leiden University Library and in the Library of Teyler's Stichting, Haarlem.

- Profelis (Felis) temminckii*, Bourdelle & Rode, C. R. Soc. Biogéogr., vol. 9, 1932, p. 68.
- Felis minuta* var. *temminckii*, Giebel, Säugeth., 1855, p. 878; Grevé, Zool. Jahrb. Syst., vol. 6, 1891, p. 80.
- Felis moormensis* var. *temminckii*, Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 388.
- Felis (Catopuma) moormensis* var. *temminckii*, Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 387.
- Felis moormensis*, Chenu, Encycl. Hist. Nat., 1853, p. 146; Elliot, P.Z.S., 1871, p. 759; Jentink, Cat. Ost., 1887, p. 82; Jentink, Cat. Syst., 1892, p. 97.
- Felis moormensis*, Schlegel, Dierentuin, 1872, p. 34.
- Felis mormöensis*, Schlegel, Dierentuin, 1872, p. III.
- Felis minuta* var. *moormensis*, Grevé, Zool. Jahrb. Syst., vol. 6, 1891, p. 80.
- Serval minutus*, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 2, 1868, p. 518.
- Felis aurata*, Blyth, P.Z.S., 1863, p. 185; Sclater, P.Z.S., 1867, p. 815, 816, pl. 36; Mivart, The Cat, 1881, p. 401, 496.
- Leopardus auratus*, Gray, P.Z.S., 1867, p. 265.
- Uncia auratus*, Cope, Proc. Ac. Philad., 1879, p. 173; Cope, Ann. Mag. N.H., ser. 5, vol. 5, 1880, p. 41.

Specimens examined:

- 1 ex., ♂, Fort de Kock, Sumatra, from Rotterdam Zoo, 1865, cat. syst.: a, mounted, cat. ost.: b, skull.
- 1 ex., ♂, Fort de Kock, Sumatra, from Rotterdam Zoo, 1863, cat. syst.: b, mounted, cat. ost.: a, skull.
- 1 ex., Sumatra, don. Dr. J. J. Haver Droeze, 15. XI. 1913, reg. no. 315, skull only.
- 1 ex., ♂ juv., Deli, Sumatra, leg. L. P. de Bussy, reg. no. 647, skin + skull.
- 1 ex., ♀, Tebing Tinggi, Sumatra, from Rotterdam Zoo (imported 9. VII. 1926, † 30. XI. 1927), reg. no. 1613, mounted, skull.
- 1 ex., ♂, Sawah Loento, Djambi, Sumatra, rec. 9. II. 1929, purchased from P. A. C. Spanier, reg. no. 1732, skin + skull.
- 1 ex., ♂, Solok, Padang Highlands, Sumatra, from Rotterdam Zoo, rec. 12. XI. 1915 (imported 27. III. 1912), reg. no. 555.
- 1 ex., Solok, Padang Highlands, Sumatra, leg. Delprat, don. M. Weber, 1891, Mus. Amst., skull.

All the specimens examined by me belong to the red colour phase, and do not show any special point of interest. Melanistic specimens seem to be very rare in the Archipelago, only one definite record (Dammerman, 1930, p. 133) existing of a black specimen being captured in Sumatra; black specimens are also known from the Asiatic continent (cf. Dammerman, 1930, p. 133; Joynson, 1924, p. 313). It is possible, as stated by Dammerman, that the records of black panthers being seen in Sumatra were based on melanistic specimens of *Profelis temminckii*. In some specimens the frontal and the premaxillary have long processus between the nasal and the maxillary; the processus sometimes nearly meet leaving the nasal and maxillary in contact over a very short distance only, in this respect resembling the condition found in some specimens of *Lynx lynx* (L.). In fig. 4

the lower milk-carnassial of a young male from Deli, Sumatra, is shown for comparison with that of other species.

Distribution in the Archipelago: Sumatra. The species has been mentioned from Borneo, but no positive evidence exists as to its occurring there.

Prionailurus viverrinus (Benn.).

- Felis viverrinus* Bennett, P.Z.S., 1833, p. 68; Bennett, Isis, 1835, p. 543.
Felis viverrina, Elliot, Mon. Felidae, pts. 1—3, 1878, pl. and text; Mivart, The Cat, 1881, p. 401, figs. 170, 171; Jentink, Cat. Ost., 1887, p. 83; Blanford, Fauna Brit. Ind., 1888, p. 55, 76, fig. 16; Grevé, Zool. Jahrb. Syst., vol. 6, 1891, p. 78; Jentink, Cat. Syst., 1892, p. 99; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 72, 97; Lydekker, Handbook, 1895, p. 123, pl. XI; Matschie, SB. Ges. Natf. Fr. Berl., 1895, p. 194; Flower, P.Z.S., 1900, p. 325; Holding, P.Z.S., 1906, p. 574; Bartels, Bull. Dept. Agric. Ind. Néerl., no. 20 (zool. no. 3), 1908, p. 14;—Koningsberger, Java Zool. Biol., pt. 10, 1914, p. 442; Jacobson, Trop. Nat., vol. 6, 1917, p. 70; Jacobson, Trop. Nat., vol. 7, 1918, p. 175; Dammerman, Hand. 3de Ned. Ind. Natw. Congr., 1924, p. 342; Beaufort, Zoogeogr., 1926, p. 54; Sody, Tectona, vol. 19, 1926, p. 56, 58; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 52; Dammerman, Treubia, vol. 11, 1929, p. 6, 34; Sody, Natk. Tijdschr. Ned. Ind., vol. 89, 1929, p. 164; Chasen & Kloss, J. Siam Nat. Hist. Soc., suppl. vol. 8, pt. 2, 1930, p. 65; Sody, Trop. Nat. vol. 20, 1931, p. 152, fig.; Sody, Trop. Nat., vol. 21, 1932, p. 165; Ménégaux, Mammif., p. 255.
Felis viverrina, Grevé, Congr. Int. Zool. Moscou, vol. 1, 1892, p. 168.
Felis viverrina, Delsman, Trop. Nat., vol. 21, 1932, p. 209.
Felis (Zibethailurus) viverrina, Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 387; Trouessart, Cat. Mamm., vol. 1, 1897, p. 355; Trouessart, Cat. Mamm., suppl., 1904, p. 269.
Zibethailurus viverrinus, Pocock, Ann. Mag. N.H., ser. 8, vol. 20, 1917, p. 341.
Prionailurus, or *Zibethailurus*, *viverrinus*, Pocock, P.Z.S., 1932, p. 765.
Leopardus viverrinus, Gray, List specim. mamm.B.M., 1843, p. 43; Gray, Cat. Bones mamm. B.M., 1862, p. 64.
Serval viverrina, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 431 and vol. 59, sect. 1, 1869, p. 645.
Galeopardus viverrinus, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 59, sect. 1, 1869, p. 644.
Galeopardus viverrina, Matschie, SB. Ges. Natf. Fr. Berl., 1895, p. 198; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, no. 2, 1928, p. 56.
Catolynx viverrina, Cope, Proc. Ac. Philad., 1879, p. 171; Cope, Ann. Mag. N.H., ser. 5, vol. 5, 1880, p. 40.
Viverriceps bennettii Gray, P.Z.S., 1867, p. 268, fig. 5; Gray, Cat. Carn. Mamm. B.M., 1869, p. 16, fig. 5; Gray, Ann. Mag. N.H., ser. 4, vol. 14, 1874, p. 93, 353; Ihering, Arch. Natg., 76, 1910, vol. 1, pt. 2, p. 135.
Felis leucojalamus (Diard M.S.), Jentink, Cat. Ost., 1887, p. 83; Jentink, Cat. Syst., 1892, p. 99.
"Vischkat", Delsman, Trop. Nat., vol. 20, 1931, p. 176; Sody, ibidem.
"Mangrovekat", D(elsman), Trop. Nat., vol. 21, 1932, p. 50, fig.

Specimens examined:

- 1 ex., ♂, Tandjong Priok, Java, I. 1924, leg. P. Busselaar, rec. from Buitenzorg Museum (no. 593), reg. no. 1701, skin + skull.

- 1 ex., ♂, Kali Woengo, 12 km west of Semarang, Java (in sugar cane plantations), leg. G. D. Lewis; from Amsterdam Zoo, 29. XII. 1934, Mus. Amst., skin and skull.
 1 ex., "Singapore", leg. Diard, cat. syst.: b, mounted, cat. ost.: b, skull.
 1 ex., "Inde, Bengale", cat. syst.: a, mounted.
 1 ex., ♂, from Rotterdam Zoo, 8. XII. 1863, cat. syst.: c, mounted.
 1 ex., ♂, from Rotterdam Zoo, 23. V. 1864, cat. syst.: d, mounted, skeleton no. 119.
 1 ex., ♀, from Rotterdam Zoo, 26. XI. 1875, cat. syst.: e, mounted, cat. ost.: d, skull.
 1 ex., ♂, Neighbourhood of Batavia, from Rotterdam Zoo, reg. no. 2310 skin + skull.

Jentink (1887, p. 83) refers skull "c" to a mounted specimen from Nepal, and this is also mentioned in the systematic catalogue (Jentink, 1892, p. 99). The mounted specimen "a" is labelled "Inde, Bengale" and no mention of Nepal is made. Moreover the skull does not belong to *Prionailurus viverrinus* at all, but to *Leopardus pardalis* (L.) (cf. p. 47). In 1908 the species was recorded for the first time from the Archipelago. Up to the present time definite records exist only for Java, where this species occurs not only along the north coast, but also on the west coast (D(elsman), 1932, p. 50, fig.). Its presence in Sumatra has not yet been definitely proved, but D(elsman) (1932, p. 50) mentions a statement by Mr. Piepers that this species is not uncommon along the river-mouths of Southern Sumatra. Several authors (Blanford, 1888, p. 55, 76; Flower, 1900, p. 325) mention this species from the Malay Peninsula but no actual records seem to exist (Chasen & Kloss, 1930, p. 65). Our Museum possesses a specimen labelled "Singapore", but as the species has not been recorded from that island in recent times (it is not mentioned by Chasen 1924, 1925) this locality-record seems extremely doubtful to me.

Distribution in the Archipelago: Java; Sumatra?

Prionailurus bengalensis (Kerr) sp. (Pl. III fig. 1, 4).

- Felis bengalensis* Kerr, Anim. Kingd., 1792, p. 51; Allen, Bull. Am. Mus. N. H., vol. 7, 1895, p. 188; Sonntag, P.Z.S., 1923, p. 131, 133, 137—140, 149.
 † *Felis bengalensis*, Dammerman, Donnée provisoire etc., 1932, p. 31.
Felis (Prionailurus) bengalensis, Weber, Säugetiere, vol. 2, 1928, p. 320.
Prionailurus bengalensis, Pocock, Ann. Mag. N.H., ser. 8, vol. 20, 1917, p. 347; Pocock, P.Z.S., p. 762, 764, figs. 5a, b.
Felis minuta, Dubois, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 25, 1908, p. 1267.
 † *Felis microgale* Dubois, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 25, 1908, p. 1267; Stremme, Centralbl. Min. Geol. Pal., 1911, p. 55; Stremme, Pithecanthropus-Schichten, 1911, p. 141; Martin, Palaeozool. Kenntn. Java, 1919, p. 107; Van Es, Age of Pithecanthropus, 1931, p. 31; Van der Maarel, Leidsche Geol. Med., vol. 5, 1931, p. 472; Von Koenigswald, Wet. Med. Mijnb. Ned. Ind., no. 23, 1933, p. 20, 27; Von Koenigswald, Ing. Ned. Ind., vol. 1, no. 11, sect. 4, 1934, p. 196.
 † *Felis macrogale* Kretzoi, Xe Congr. Int. Zool. Budapest (1927), vol. 2, 1929, p. 1293 (err. typ.).

The recent specimens from the Malay Archipelago may be grouped into three subspecies, which differ chiefly in colour-characteristics. In the series examined by me the differences between the javanese subspecies and the races from Sumatra and Borneo are greatest, but it must be noted that specimens with a general greyish colour like that of javanese specimens do occur among those from the Malay Peninsula (Hinton, in litt.). Unhappily I had only a few specimens from continental Asia for comparison, so that I cannot arrive at definite conclusions as to the relationship between the subspecies inhabiting the Malay Archipelago and those of the Asiatic continent.

The skull of this species shows some variations, which do not suffice, however, to separate the races. The nasals may be rather broad, or they may be very narrow, giving the rostrum a pinched appearance as in *Prionailurus viverrinus* (Benn.). The length of the suture formed by the frontal branch of the maxillary and the nasal is very variable, and so is the extent to which the nasals reach beyond the frontal branches of the maxillaries. The orbit generally is open behind, but the postorbital processes of frontal and malar may become very long, so as to be narrowly separated, or even they may fuse, as is shown by a few specimens. Of the teeth the upper second premolar (P^2) is perhaps most variable. In some specimens it is very small and one-rooted, in others it has two roots placed in the same sagittal plane, and which are incompletely separated. To the latter group probably belongs the bornean specimen described by Bateson (1894, p. 224; *Felis minuta*) as having a partially two-rooted anterior upper premolar. In a few specimens P^2 has three roots, which may stand very close together, giving the alveolus a trilobate outline (fig. 19) or the lingual root may be placed in a separate alveolus (fig. 18). The other teeth of the upper jaw do not show any special point of interest as regards variations, those of the lower jaw will be dealt with in the discussion of the status of *Felis microgale* (cf. p. 16). It may be mentioned that in one jaw out of the thirty examined by me I found an additional premolar (P_2) present in the right mandible (cf. p. 17, 27; pl. II fig. 5). The development of the cusps of the lower milk-carnassial (p_4) is subject to great variations; six different cases are shown in figs. 5 to 10.

Besides the specimens mentioned under the subspecies the following lower jaws were examined by me in the British Museum:

- Reg. no. 124a, Java, Horsfield.
- " " 9.1.5.592, ♂, Tasikmalaja, Preanger, Java, leg. Shortridge, don. Balston.
- " " 77.12.10.13, ♂, Negror, Philippine Is.
- " " 76.5.2.5, ♂, mainland off Labuan.

- Reg. no. 10.4.25.5, ♀, Hainan, M. Wucki, don. Alan Ouston.
 " " 1.5.10.1, ♀, Kuala Lumpur, Selangor, don. A. L. Butler.
 " " 57.12.7.2, ♀, Burma, (cotype of *F. wagati* Gray).
 " " 58.12.7.6, ♀, S. Burma (cotype of *F. wagati* Gray).
 " " 27.12.1.70, ♀, Backan, Tonkin, leg. Delacour & Lowe.
 " " 120a, ♀, China, leg. J. R. Reeves (cotype of *F. chinensis* Gray).
 " " 11.6.1.2, ♂, Shensi, China, leg. P. Anderson, don. Duke of Bedford.
 " " 21.8.2.6, ♂, Mokokkum, Naga Hills, leg. J. C. Mills (*F. microtis* M.-Edw.).
 " " 26.10.8.27, ♀, Tons Valley, don. B.B. Osmaston.
 " " 32.3.1.21, ♂, Tigu Shola, Palni Hills, Bombay Nat. Hist. Soc.
 " " 58.6.24.50, ♀, Nepal (type of *F. nipalensis* Vig. et Horsf.).

The type of *Felis microgale* Dubois is the fragment of a left lower jaw from Trinil, Collectie Dubois, reg. no. 1484 (pl. III figs. 1, 4); it forms part of the collections made on the directions by Prof. Dubois after his departure from Java, and which were received in the Netherlands in 1900. It may be described as follows:

The fragment consists of the corpus of the left mandible, broken off at a slight distance behind the molar; its greatest horizontal length is 34.8 mm. The anterior part of the masseteric fossa is still just visible. The symphysis menti is slightly damaged, the incisivi are lost; the tip of the canine is broken off, and its root is partly exposed. Third and fourth premolars present; molar present, but paraconid and protoconid broken. The jaw is rather high and flat; its breadth in front of M_1 as compared to the height in the same region is somewhat less than the average found in a series of twenty nine recent lower jaws, but it falls well within the range of variation of *Prionailurus bengalensis* (Kerr). The lower border of the jaw is faintly curved, the concavity at the lingual side. The canine has a groove on its outer surface; P_3 with a very small anterior cusp, a large median cusp, and a small, but distinct posterior one; P_4 with small, but distinct anterior and posterior cusps and a large median cusp. Cingulum of the three cheekteeth well developed, falling within the variation of the specimens of *Prionailurus bengalensis* (Kerr) examined by me. P_3 and P_4 are placed in line, P_4 just behind P_3 ; the anterior extremity of M_1 reaches forward lingually of the posterior extremity of P_4 . The measurements of the fossil fragment are given together with the range of variation of twenty nine recent jaws of *Prionailurus bengalensis* (Kerr) and of jaws of other species (table I).

For a discussion of the status of *Felis microgale* Dubois it is necessary to examine the original description (Dubois, 1908, p. 1267) as well as to make comparisons between the fossil specimen and jaws of recent species of Felidae. It is clear that species of a very much greater size than the fossil, the Pantherinae and the larger Felinae (*Neofelis nebulosa* (Griff.),

Profelis temminckii (Vig. et Horsf.), *Prionailurus viverrinus* (Benn.), *Felis chaus* Schreb.) need hardly be taken into consideration. Though specimens of these species were examined, the comparisons were chiefly restricted to those species of the subfamily Felinae which inhabit the Malay Archipelago and the Asiatic continent and which resembled the fossil species in the size of the lower jaw. Arranged according to the length of the three cheekteeth of the lower jaw taken together, these species are:

<i>Prionailurus rubiginosus</i> (Is. Geoffr.)	15.0—16.7 mm (7 ex.)
<i>Prionailurus bengalensis</i> (Kerr)	17.5—20.7 mm (29 ex.)
<i>Pardofelis marmorata</i> (Mart.)	20.9—23.4 mm (8 ex.)
<i>Badiofelis badia</i> (Gray)	22.1—23.1 mm (3 ex.)
<i>Ictailurus planiceps</i> (Vig. et Horsf.)	23.4—24.6 mm (4 ex.)

The difference between the species is not very great, and in some cases it may be proved to be even less when more specimens can be examined. Still these measurements are of some value to characterize these species. The length of the three cheekteeth taken together is 19.9 mm in the type of *Felis microgale* Dub., this measurement falls well within the range of variation of *Prionailurus bengalensis* (Kerr), while it is too large for *Prionailurus rubiginosus* (Is. Geoffr.) and too small for *Pardofelis marmorata* (Mart.) and the other species.

In the original description Dubois (1908, p. 1267) compared *Felis microgale* to *Felis minuta* (= *Prionailurus bengalensis* (Kerr)), *Felis catus* (= *Felis silvestris* Schreb.), *Felis rubiginosa* (= *Prionailurus rubiginosus* (Is. Geoffr.)), and *Felis chaus* Schreb. In the following the characters used by Dubois to separate *Felis microgale* from the recent species mentioned will be discussed together with those used by me in my comparisons.

1. Canine of the lower jaw. In his description of *Felis microgale*, Dubois (1908, p. 1267) states that his species differs from *Felis silvestris* Schreb. in the presence of a groove on the outer surface of the canine; in this character it agreed with *Prionailurus bengalensis* (Kerr). A groove on the outer surface of the lower canine was found, however, not only in the fossil and in *Prionailurus bengalensis* (Kerr), but also in *Felis silvestris* Schreb., as well as in a great number of other species, e.g., *Felis catus* L., *Prionailurus rubiginosus* (Is. Geoffr.), *Prionailurus viverrinus* (Benn.), *Ictailurus planiceps* (Vig. et Horsf.), *Neofelis nebulosa* (Griff.), *Panthera tigris* (L.), *Panthera pardus* (L.), etc. (The groove is absent in the *Acinonychia*).

2. Lower second premolar (P_2). The absence of P_2 is mentioned by Dubois (1908, p. 1267) as a difference between *Felis microgale* and *Prionailurus bengalensis* (Kerr). Several authors (among others Matthew, 1910, p. 294; Pocock, 1916 a, p. 276) mention the absence of the lower second premolar as a typical character of the recent Felidae. An additional premolar in the lower jaw has been recorded, however, in a few aberrant cases (Lydekker, 1878, p. 2, pl. 2; Bateson, 1894, p. 223; Pocock, 1916 a, p. 273) for different species: *Panthera tigris* (L.); *Puma concolor* (L.); *Felis silvestris* Schreb.; *Felis silvestris* Schreb. or *ocreata* Gmel.; *Felis catus* L. To this list may be added *Prionailurus bengalensis* (Kerr), as I found an additional anterior premolar in the right mandible of a specimen from Borneo. Its presence, however, is exceptional, and I do not believe that its being found in one out of thirty lower jaws (and then on one side only) is sufficient to use its absence in *Felis microgale* Dub. as a specific difference from *Prionailurus bengalensis* (Kerr).

3. Lower third premolar (P_3). In the series of lower jaws of *Prionailurus bengalensis* (Kerr) examined by me I also checked the variations in the cusps of P_3 . Generally this tooth has three cusps: a large cusp in the middle, with a small cusp in front of it, and another small one behind it. The two small cusps are, however, variable in size; the posterior one is sometimes absent (cat. ost.: e pl. II fig. 3) or very weak; in other specimens (pl. II fig. 4) it is well developed. The small anterior cusp is always present, but it largely varies in size. In the original description of *Felis microgale* Dub. the presence of an accessory cusp on P_3 is mentioned as a difference from *Prionailurus bengalensis* (Kerr). It is possible that Dubois only had *bengalensis*-specimens for comparison in which the posterior small cusp was absent, and that he, therefore, believed this to be characteristic for *bengalensis*, which is, however, not the case, as is shown above. Dubois (1908, p. 1267) also mentions that in the presence of this accessory cusp the fossil agrees with *Felis silvestris* Schreb. The cingulum in *Felis silvestris* Schreb. is variable in width; in some specimens it is equal to that of the fossil as mentioned by Dubois (1908, p. 1267), in others it is slightly narrower. The comparisons showed that the structure of P_3 agrees very well with that found in *Prionailurus bengalensis* (Kerr) and the other small cats from the Malay Archipelago; the development of the small anterior and posterior cusp is, however, subject to variations, and therefore differences in size of these small cusps are of no great systematic value.

4. Lower fourth premolar (P_4). In his description of *Felis microgale*, Dubois gives comparative notes on the tooth in the fossil, *Prionailurus* Zool. Meded. XVIII

bengalensis (Kerr), *Prionailurus rubiginosus* (Is. Geoffr.) and *Felis silvestris* Schreb. *Felis microgale* is stated (Dubois, 1908, p. 1267) to differ from *Prionailurus rubiginosus* (Is. Geoffr.) in the anterior cusp of P₄; I could not find any difference between P₄ of these two species except in size. A second character of *Felis microgale* given by Dubois is that the cingulum of P₄ is stronger in the fossil than in *Prionailurus bengalensis*

TABLE I
Range of variation of teeth- and jaw-measurements, in mm

	<i>Prionailurus rubiginosus</i>	Fossil	<i>Prionailurus bengalensis</i>	<i>Pardofelis marmorata</i>	<i>Badiofelis badia</i>	<i>Ictailurus planiceps</i>
Length P ₃ —M ₁	15.0—16.7	19.9	17.5—20.7	20.9—23.4	22.1—23.1	22.3—24.6
" P ₃	3.7—4.3	5.3	4.4—5.6	4.9—6.2	5.8—6.0	5.2—7.2
" P ₄	5.2—5.5	7.0	5.5—7.5	7.7—8.3	7.5—8.1	7.7—9.0
" M ₁	6.3—6.9	7.8	6.7—8.4	8.1—10.0	8.6—9.3	7.8—8.6
Breadth P ₃	1.8—2.1	2.5	2.0—2.7	2.5—3.3	2.8—3.2	2.4—2.8
" P ₄	2.0—2.5	3.1	2.7—3.3	3.6—4.0	3.1—3.7	2.6—3.4
" M ₁	2.4—2.8	3.5	2.8—3.6	3.7—4.2	3.5—4.0	2.9—3.5
Height P ₃	2.9—3.3	3.9	3.1—4.1	3.4—4.3	4.3	4.6—5.5
" P ₄	3.3—3.8	5.0	4.0—4.8	5.0—5.8	5.6—5.8	5.0—5.6
" M ₁	3.7—4.3	—	4.6—5.8	5.7—6.6	5.3—6.4	5.1—6.1
" C	6.8—7.8	(7.9+)	7.3—11.5	10.4—11.6	10.6	11.0—12.8
Length C	2.9—4.6	4.5	3.5—4.8	5.4—6.4	5.0—5.4	5.2—6.4
Diastema	4.2—5.3	5.8	4.2—7.1	3.5—6.4	4.4—4.6	2.9—7.0
Height of jaw in front of P ₃	7.0—8.5	8.7	7.3—9.6	10.0—12.8	9.5—12.3	9.5—10.8
" " " P ₄	7.1—8.6	9.3	7.3—10.3	8.7—12.0	9.8—11.9	9.0—10.6
" " " M ₁	7.5—8.8	9.9	8.1—10.7	8.9—12.6	10.3—11.8	9.5—11.3
Height of jaw behind M ₁	7.5—8.9	10.4	8.6—11.3	9.7—13.3	11.0—12.6	10.2—11.9
Breadth of jaw in front of M ₁	3.6—4.3	4.6	4.3—5.8	5.6—6.6	5.3—6.4	4.2—5.4

(Kerr), while it is as wide as in *Felis silvestris* Schreb. Examination of the series of 29 lower jaws of *P. bengalensis* (Kerr) showed that the width of the cingulum is variable in this species, and that the type of *microgale* falls well within the range of variation of *bengalensis*. In the specimens of *Felis silvestris* Schreb. examined by me the cingulum is slightly narrower than in the fossil, but the difference is not very great.

Examination of the indices of the teeth and jaw of the type of *Felis microgale* Dubois and the five malayan species of Felinae that were used for comparison shows that the range of variation of these indices (table II) overlaps in most species. The differences between the fossil and the recent

species are generally very small and not of very great value, but it is remarkable that the fossil shows differences, however small they may be from all other species except *Prionailurus bengalensis*. Moreover the fossil agrees with the latter species in all its actual measurements except the height of P₄, which exceeds the range of variation found in *bengalensis* by 0,2 mm. The actual measurements in which the type of *Felis microgale*

TABLE II

Range of variation of indices of teeth- and jaw-measurements (cf. p. 4,5).

	<i>Prionailurus rubiginosus</i>	Fossil	<i>Prionailurus bengalensis</i>	<i>Pardofelis marmorata</i>	<i>Badiofelis badia</i>	<i>Ictailurus planiceps</i>
Length-index P ₃ . . .	23.2-26.6	26.1	24.4-28.8	25.2-27.7	25.5-26.4	23.0-29.2
" P ₄ . . .	31.1-34.8	35.1	30.5-36.8	35.0-36.8	33.9-35.6	32.9-37.9
" M ₁ . . .	40.3-43.3	39.1	37.4-42.6	38.0-42.8	38.3-40.2	34.1-37.6
Breadth-index P ₃ . . .	42.8-54.0	47.1	42.8-53.1	45.9-60.0	48.2-54.2	37.6-51.9
" P ₄ . . .	37.7-46.1	44.2	37.3-51.6	46.7-50.0	41.3-46.8	33.3-42.8
" M ₁ . . .	34.7-43.0	44.8	36.8-47.8	40.0-45.4	40.6-43.0	34.1-43.2
Height-index P ₃ . . .	67.4-86.8	73.5	61.2-86.3	65.5-70.4	71.6-72.8	74.1-107.6
" P ₄ . . .	61.8-73.0	71.4	59.7-78.1	62.5-70.7	69.1-73.4	62.2-71.4
Length-index C . . .	18.2-29.6	22.6	18.6-25.1	23.8-28.1	22.6-23.7	22.8-26.1
Index diastema . . .	26.4-32.9	29.1	18.6-39.6	16.1-29.0	19.3-20.3	12.2-29.9
Index height of jaw in front of P ₃ . . .	45.1-52.7	43.7	40.8-48.3	46.0-55.0	42.9-54.1	40.5-47.5
" " " P ₄ . . .	45.5-48.6	46.7	40.4-52.2	40.0-51.8	44.3-52.4	37.9-44.7
" " " M ₁ . . .	48.3-54.6	49.7	43.4-54.3	41.0-53.8	45.4-51.9	42.1-48.2
Index height of jaw behind M ₁	48.3-54.0	52.2	43.1-59.7	46.0-60.4	49.3-55.5	44.7-51.7
Breadth-index of jaw I .	22.3-28.6	23.1	22.0-28.1	24.7-28.2	22.4-27.7	18.8-23.2
" " of jaw II .	40.9-55.8	46.4	43.4-60.9	49.5-62.9	51.4-60.9	42.7-49.5

Dub. falls within the range of variation of the other species are indicated in table I.

Seeing that the type of *Felis microgale* Dub. agrees in all characters with *Prionailurus bengalensis* (Kerr), except a small difference in the height of P₄, I arrive at the conclusion that it cannot be separated specifically from *Prionailurus bengalensis* (Kerr). Another question is, whether the fossil is identical with any of the recent subspecies of *bengalensis*. In my opinion the remains are too scanty to allow such an identification. Judging by the measurements taken from eight lower jaws of *Prionailurus bengalensis javanensis* (Desm.) the fossil is slightly larger and it is quite well possible that it does not belong to the subspecies now living in Java. If it should be proved, when more complete remains become available, that the

fossil form is different from the recent subspecies of *Prionailurus bengalensis* (Kerr), the name *Prionailurus bengalensis microgale* (Dubois) is available for it.

***Prionailurus bengalensis sumatranus* (Horsf.) (figs. 5—8, 18, 22).**

Felis sumatrana Horsfield, Zool. Res. Java, 1821, (13th) pl. and text; Cuvier, Rech. Ossem. foss., 1823, p. 436; Desmoulins, Dict. Class. hist. nat., vol. 3, 1823, p. 495; Cuvier, Règne Anim., nouv. éd., vol. 1, 1829, p. 165; Lesson, Hist. Nat. Gén. Mammif., vol. 5, 1836, p. 351; Griffith, Anim. Kingd., vol. 2, 1837, p. 484; Waterhouse, Cat. Mamm. Zool. Soc., 1838, p. 31; Gervais, Hist. Nat. Mamm., 1855, p. 86, fig.; Brandt, Mém. Ac. Imp. Sci. St. Pétersb., sér. 6, sc. math. phys. nat., vol. 8, 1856, p. 191; Gray, P.Z.S., 1867, p. 400; Gray, Cat. Carn. Mamm. B.M., 1869, p. 26; Elliot, Mon. Felidae, pt. 10, 1882, pl. of *F. javensis* fig. 2; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 223, 224; Jentink, Cat. Syst., 1892, p. 102; Matschie, SB. Ges. Natf. Fr. Berl., 1895, p. 194; Sanchez y Sanchez, An. Soc. Esp. Hist. Nat., ser. 2, vol. 9, 1900, p. 204; Schneider, Zool. Jahrb. Syst., vol. 23, 1905, p. 103, 145; Lyon, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 658; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 53.

Felis sumatrensis, Schlegel, Essai Phys. Serp., vol. 1, 1837, p. 229; Bruyn Kops, Tijdschr. Ind. Taal-Land-Volkenk., vol. 2, 1854, p. 481.

Leopardus sumatranus, Gray, List spec. Mamm. B.M., 1843, p. 43; Gray, Cat. Bones Mamm. B.M., 1862, p. 64.

Felis (Leopardus) sumatranus, Horsfield, Cat. Mamm. E. Ind. Cy., 1851, p. 48.

Panthera sumatrana, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 491.

Prionailurus sumatranus, Pocock, Ann. Mag. N.H., ser. 8, vol. 20, 1917, p. 339.

Felis undata sumatrana, Fischer, Syn. Mamm., 1829, p. 205.

Felis (Prionailurus) minuta var. *sumatrana*, Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 387.

Felis (Oncoïdes) bengalensis sumatrana, Trouessart, Cat. Mamm., 1897, p. 358; Trouessart, Cat. Mamm., Suppl., 1904, p. 271.

Felis bengalensis sumatrana, Robinson & Kloss, J. Fed. Mal. St. Mus., vol. 8, pt. 2, 1918, p. 73; Robinson & Kloss, J. Fed. Mal. St. Mus., vol. 7, 1919, p. 262, 301; Ménégau, Mammif., p. 259.

Felis minuta Temminck, Mon. Mamm., vol. 1, 1825, p. 130; Lesson, Man. Mamm., 1827, p. 189; Schlegel, Essai Phys. Serp., vol. 1, 1837, p. 229; Müller, Verh. Nat. Gesch. Overz. Bez., Zool., 1839, p. 29, 52, 54, table; Wagner, Suppl. II Schreber, Säugeth., 1841, p. 509; Schinz, Syst. Verz., vol. 1, 1844, p. 447; Wagner, Abh. math. physik. Kl. bayer. Ak. Wiss., vol. 4, pt. 2, 1845, p. 82, 98; Chenu, Encycl. Hist. Nat., 1853, p. 135, fig. on p. 144; Giebel, Säugeth., 1855, p. 878; Brandt, Mém. Ac. Imp. Sci. St. Pétersb., ser. 6, sc. math. phys. nat., vol. 8, 1856, p. 191; Schlegel, Handl. Dierk., vol. 1, 1857, p. 23; Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 388; Gray, P.Z.S., 1867, p. 273; Gray, Cat. Carn. Mamm. B.M., 1869, p. 26; Schlegel, Dierentuin, 1872, p. 34; Gray, Ann. Mag. N.H., ser. 4, vol. 13, 1874, p. 55; Gray, Ann. Mag. N.H., ser. 4, vol. 14, 1874, p. 355; Cope, Proc. Ac. Philad., 1879, p. 172; Cope, Ann. Mag. N.H., ser. 5, vol. 5, 1880, p. 40; Jentink, Aardr. Weekbl., vol. 2, 1881, p. 290; Mivart, The Cat., 1881, p. 415, 496; Mohnicke, Pflanz. Thierl., 1883, p. 407; Jentink, Notes Leyd. Mus., vol. 5, 1883, p. 177; Jentink, Cat. Ost., 1887, p. 85; Snelleman, Midden Sumatra, IV, 1, Fauna, 1, 1887, p. 22; Jentink, Notes Leyd. Mus., vol. 11, 1889, p. 22; Hagen, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 7, 1890, p. 92; Grevé, Zool. Jahrb. Syst.,

vol. 6, 1891, p. 79; Jentink, Cat. Syst., 1892, p. 102; Sanchez y Sanchez, An. Soc. Esp. Hist. Nat., ser. 2, vol. 9, 1900, p. 281, 289; Van Balen, Dierenwereld, vol. 1, 1914, p. 369.

Serval minutus, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 491.

Felis javanensis, Cantor, J. As. Soc. Beng., vol. 15, 1846, p. 244; Brandt, Mém. Ac. Imp. Sci. St. Pétersb., ser. 6, sc. math. phys. nat., vol. 8, 1856, p. 191.

Felis (Felis) javanensis, Trouessart, Bull. Soc. Et. Sci. Angers, Suppl. 1884, 1885, p. 106.

Felis javensis, Elliot, Mon. Felidae, pt. 10, 1882; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 73, 97.

Felix bengalensis, Raffles, Trans. Linn. Soc., vol. 13, 1852, p. 249; Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 60; Elliot, Mon. Felidae, pts. 1—3, 1878, pl. and text; Mivart, The Cat, 1881, p. 403; Blanford, Faun. Brit. Ind., 1888, p. 55, 78; Modigliani, Ann. Mus. Civ. Gen., ser. 2, vol. 7, 1889, p. 239; Modigliano, Viaggio Nias, 1890, p. 685; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 214, 223; Grevé, Congr. Int. Zool. Moscou, vol. 1, 1892, p. 168; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 73, 97; Flower, P.Z.S., 1900, p. 325; Lydekker, Handbook, 1895, p. 126; Stone and Rehn, Proc. Ac. Philad., 1902, p. 136; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 209, 323; Dammerman, Treubia, vol. 11, 1929, p. 34; Lydekker, Wild Life, vol. 2, p. 132.

Felis undata, Rosenberg, Mal. Arch., 1878, p. 182; Hagen, Ausland, vol. 54, 1881, p. 555; Hagen, Aardr. Weekbl., vol. 2, 1881, p. 278; Jentink, Aardr. Weekbl., vol. 2, 1881, p. 290.

Felis punctulata (Temm. M. S.) Elliot, Mon. Felidae, pt. 10, 1882, p. 2 of text of *F. javensis*; Jentink, Cat. Syst., 1892, p. 102.

Felis punctatula Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 73.

Felis tingia Lyon, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 658.

Felis bengalensis tingia, Robinson & Kloss, J. Fed. Mal. St. Mus., vol. 8, pt. 2, 1918, p. 73.

Specimens examined:

- 1 ex., ♂, Palembang, Sumatra, leg. S. Müller, cat. syst.: d, mounted (type of *F. punctulata* (Temm. M.S.) Elliot).
- 2 ex., juv., Padang, Sumatra, leg. S. Müller, cat. syst.: e, f, mounted.
- 1 ex., ♂ imm., Soekamananti, Ophir distr., Sumatra, 200 m, 25. VIII. 1917, leg. E. Jacobson, collector's no. 381, reg. no. 1013, skin + skull.
- 1 ex., ♀ imm., Fort de Kock, Agam, W. coast of Sumatra, 920 m, 1. VII. 1917, leg. E. Jacobson, collector's no. 368, reg. no. 1013, skin + skull.
- 1 ex., ?, Padang, Sumatra, XII. 1913, leg. Bekker, don. E. Jacobson, collector's no. 3641, reg. no. 991, skin + skull.
- 1 ex., ?, Belawan Estate near Toentoengan, Deli, Sumatra, IV. 1918, leg. Van Heyst, don. E. Jacobson, reg. no. 1013, skin.
- 2 ex., ad., juv., Deli, Sumatra, leg. Dr. L. P. de Bussy, 10. VII. 1916, reg. no. 647, skins (with skull inside).
- 2 ex., imm., juv., Deli, Sumatra, leg. De Bussy, Mus. Amst., skins and skulls.
- 1 ex., juv., Deli, Sumatra, leg. De Bussy, Mus. Amst., skin and skull.
- 1 ex., ♀ imm., Pagar Alam, Sumatra, 19. IV. 1919, leg. Jhr. F. C. van Heurn, skin.
- 1 ex., juv., Pagar Alam, Sumatra, 4. V. 1919, leg. Jhr. F. C. van Heurn, skin.
- 1 ex., juv., Serdang E. Sumatra, 8. XII. 1911, leg. F. K. Baron van Dedem, reg. no. 258, cat. syst.: c², flat skin.

- 1 ex., ?, Soerian, Solok, Sumatra, don. P. O. Stolz, z. I. 1912., reg. no. 263, cat. syst.: b², flat skin.
 1 ex., juv., Sumatra, Sumatra Exp., 1879, cat. ost.: d, skeleton.
 3 ex., 1 ad., 2 juv., Tandjong Morawa, Deli, Sumatra, leg. Dr. B. Hagen, 1882, cat. ost.: t, r, s, skulls.
 1 ex., juv., Singalang, Sumatra, leg. O. Beccari, 1878, Mus. Civ. Gen., no. 2807.
 1 ex., Nias, leg. E. Modigliani, 1886, Mus. Civ. Gen., no. 2805.

The general colour of all sumatran specimens but one is ferruginous and not brownish grey as in those from Java. Of the four dark longitudinal lines on the head and neck the inner two are very narrow, the outer two being broader, but the difference is not so strongly marked as in bornean specimens. The markings are dark brown to blackish; the spots on the sides generally are elongate, but they may be very small and roundish, and then are more numerous. The latter is the case in a specimen from Palembang to which Temminck (in M. S.) had given the name *Felis punctulata*; a description of it was given by Elliot in the text of *Felis javensis*. In the skin of a young specimen from Serdang the spots are exceedingly numerous and placed close together. Lyon (1908, p. 658) examined two cats, which must be referred to this subspecies. One of these came from the Sumatran mainland and had a grayer colour than young examples from Borneo and the Malay Peninsula; this specimen was referred by Lyon to *Felis sumatrana*. The other was collected on Tebing Tinggi Id., east coast of Sumatra; it had a brighter (more reddish) colour than the other specimen, and though it was smaller, it had in the upper jaw teeth that were slightly larger than those of the *sumatrana*-specimen. If larger series are examined, it is shown that similar differences in the size of the teeth are found between specimens of one and the same species, in this and other species, and they are of no great systematic value. In the short note on the specimen referred to *sumatrana* by Lyon, this author points out that Horsfield's plate shows an animal which is distinctly gray, even grayer than the plate of *Felis javanensis*. Horsfield describes the colour as being "ferruginous, inclining to yellowish gray"; in this respect the plate is incorrect, as Dr. Hinton, who examined the type, kindly informs me. The specimen from Solok is more or less intermediate between grey and ferruginous specimens, it is greyish with a distinct yellowish tinge on the posterior part of the back, distinctly ferruginous on the shoulders and neck. I do not believe that on the differences mentioned by Lyon *Felis tingia* can be retained as a separate species or subspecies. A specimen of *Prionailurus bengalensis* from Nias Id. has been mentioned by Modigliani (1889, p. 239), but this probably escaped the notice of Boden Kloss (1928) when preparing his list of the mammals known from the islands west of

Sumatra. Through the courtesy of Prof. Dr. O. de Beaux, Genua, I received the skull of this specimen for examination. Judging by its size this skull belongs to an adult animal (condylobasal length = 74.9 mm), but is not quite normal; in the lower jaw the teeth of the definite set are all present, but in the upper jaw P³ has only partly erupted on the left side, while it has not erupted on the right. The left mandible shows a pit below the anterior root of M₁ and below this pit the jaw is thicker than is usual. Except these abnormalities, no differences from other specimens could be found. Unhappily the skin of the Nias-specimen has been mounted and could not be sent over for examination, but Prof. de Beaux kindly supplied me with excellent photographs and notes on several specimens of *P. bengalensis*. The general colour of the Nias specimen is more grayish and it is less heavily spotted than is usual in *P. b. sumatranus*. Prof. de Beaux remarks that it may represent a distinct subspecies, but to solve this question a more extensive material should be examined. The variations of the lower milkcarnassial of four specimens of this subspecies are shown in figs. 5 to 8. In a specimen from Padang, Sumatra (leg. Bekker) the upper second premolar is distinctly three-rooted (fig. 18a—c).

Distribution in the Archipelago: Sumatra, Nias.

Prionailurus bengalensis javanensis (Desm.) (fig. 9).

Felis javanensis, Desmarest, Nouv. Dict. Hist. Nat., 2nd ed., vol. 6, 1816, p. 115; Desmarest, Mammalogie, vol. 1, 1820, p. 229; Horsfield, Zool. Res. Java, 1821, (1st) plate + text, and in text of *Felis sumatrana*; Cuvier, Rech. Ossem. foss., 1823, p. 436; Desmoulin, Dict. class., vol. 3, 1823, p. 495; Geoffroy-St.-Hilaire & Cuvier, Hist. Nat. Mamm., vol. 3, pt. 53, 1826, in text of "chat de Java", pl.; Brayley, Zool. Journ., vol. 3, 1827, p. 393; Lesson, Manuel Mamm., 1827, p. 165; Cuvier, Règne Animal, vol. 1, 1829, p. 165; Lesson, Hist. Nat. Gén. Mammif., vol. 5, 1836, p. 351; Blainville, Ostéogr., vol. 2, pt. 12, 1843, p. 35, 59, 62; Cantor, J. As. Soc. Beng., vol. 15, 1846, p. 244; Chenu, Encycl. Hist. Nat., 1853, p. 135, 202; Gervais, Hist. Nat. Mammif., 1855, p. 86; Brandt, Mém. Ac. Imp. Sc. St. Pétersb., ser. 6, sc. math. phys. nat., vol. 8, 1856, p. 191; Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 60; Blyth, P.Z.S., 1863, p. 185; Gray, P.Z.S., 1867, p. 274, 400; Gray, Cat. Carn. Mamm. B. M., 1869, p. 26; Milne-Edwards, Rech. hist. nat. Mamm., 1872, p. 217; Elliot, P.Z.S., 1871, p. 760, 761; Gray, Ann. Mag. N. H., ser. 4, vol. 13, 1874, p. 54; Cope, Proc. Ac. Philad., 1879, p. 172; Cope, Ann. Mag. N. H., ser. 5, vol. 5, 1880, p. 40; Mivart, The Cat, 1881, p. 416, 431; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 223, 224; Bateson, Mater. Var., 1894, p. 224; Matschie, SB. Ges. natf. Fr. Berl., 1895, p. 195; Sanchez y Sanchez, An. Soc. Esp. Hist. Nat., ser. 2, vol. 9, 1900, p. 204; Thomas & Wroughton, P. Z. S., 1909, p. 385; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, no. 2, 1928, p. 53; Ménégaux, Mammif., p. 259.

Felis (Felis) javanensis, Trouessart, Bull. Soc. Et. Sci. Angers, Suppl. 1884, 1885, p. 106.

Leopardus javanensis, Gray, List. spec. Mamm. B. M., 1843, p. 43; Gray, Cat. Bones Mamm. B. M., 1862, p. 63.

Felis (Leopardus) javanensis, Horsfield, Cat. Mamm. Mus. East India Cy., 1851, p. 48.

Panthera javanensis, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 493.

Felis undata javanensis, Fischer, Synops. Mamm., 1829, p. 205.

Felis minuta var. *javanensis*, Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 387.

Felis (Oncoïdes) bengalensis javanensis, Trouessart, Cat. Mamm., vol. 1, 1897, p. 358; Trouessart, Cat. Mamm., suppl., 1904, p. 271.

Felis bengalensis javanensis, Schwarz, Zool. Timor, no. 2, 1914, p. 124; Dammerman, Treubia, vol. 11, 1929, p. 34; Sody, Natk. Tijdschr. Ned. Ind., vol. 89, 1929, p. 164.

Felis javanica, Schlegel, Essai Phys. Serp., vol. 1, 1837, p. 229; Jentink, Cat. Syst., 1892, p. 102.

Felis bengalensis javanicus, Frechkop, Bull. Mus. roy. Hist. Nat. Belg., vol. 10, pt. 14, 1934, p. 18.

Felis javensis, Gray, Ann. Mag. N. H., ser. 4, vol. 14, 1874, p. 354; Elliot, Mon. Felidae, pt. 10, 1882, pl. and text; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 73.

Leopardus javensis, Veth, Java, vol. 1, 1875, p. 253.

Felis minuta, Temminck, Mon. Mamm., vol. 1, 1825, p. 130; Lesson, Man. Mamm., 1827, p. 189; Lesson, Hist. Nat. Gén. Mammif., vol. 5, 1836, p. 351; Schlegel, Essai Phys. Serp., vol. 1, 1837, p. 22; Müller, Verh. Nat. Gesch. Overz. Bez., Zool., 1839, p. 29, 52, 54, table; Wagner, Suppl. II, Schreber, Säugeth., 1841, p. 509; Schinz, Syst. Verz., vol. 1, 1844, p. 447; Wagner, Abh. math. physik. Kl. bayer. Ak. Wiss., vol. 4, pt. 2, 1845, p. 82, 98; Temminck, Coup-d'oeil, Poss. Néerl., vol. 1, 1846, p. 324; Giebel, Säugeth. 1855, p. 878; Brandt, Mém. Ac. Imp. sci. St. Pétersb., ser. 6, sc. math. phys. nat., vol. 8, 1856, p. 191; Schlegel, Handl. Dierk., vol. 1, 1857, p. 23; Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 387, 388; Schlegel, Dierentuin, 1872, p. 34; Veth, Java, vol. 1, 1875, p. 253; Jentink, Aardr. Weekbl., vol. 2, 1881, p. 290; Mivart, The Cat, 1881, p. 415, 496; Jentink, Cat. Ost., 1887, p. 85; Jentink, Notes Leyd. Mus., vol. 11, 1889, p. 22; Weber, Zoolog. Ergebn., vol. 1, 1890, p. 94, 209; Grevé, Zoolog. Jahrb. Syst., vol. 6, 1891, p. 79; Jentink, Cat. Syst., 1892, p. 102; Kohlbrugge, Natk. Tijdschr. Ned. Ind., vol. 55, 1895, p. 185 and same volume, 1896, p. 281; Sanchez y Sanchez, An. Soc. Esp. Hist. Nat., ser. 2, vol. 7, 1898, p. 104 and ser. 2, vol. 9, 1899, p. 204, 206, 235, 240, 289; Jacobson, Notes Leyd. Mus., vol. 30, 1911, p. 31; Hollister, Phillip. J. Sc., vol. 7, sect. D, 1912, p. 24; Koningsberger, Java Zool. Biol., pt. 5, 1912, p. 218; Van Balen, Dierenwereld, vol. 1, 1914, p. 369.

Felis minutus, Weber, Zool. Ergebn., vol. 1, 1890, p. 97.

Felis bengalensis, Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 60; Mivart, The Cat, 1881, p. 403, fig. 172; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 223; Lydekker, Handbook, 1895, p. 126, pl. XIII; Flower, P. Z. S., 1900, p. 325; Koningsberger, Med. Plantent., no. 54, 1903, p. 16, pl. I fig. 2; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 209; Sody, Natk. Tijdschr. Ned. Ind., vol. 87, 1927, p. 198; Ménégau, Mammif., p. 259; Lydekker, Wild Life, vol. 2, p. 132.

? *Felis undata*, Desmarest, Nouv. Dict. Hist. Nat., 2nd. ed., vol. 6, 1816, p. 115.

Felis undata, Jentink, Aardr. Weekbl., vol. 2, 1881, p. 290.

Panthera undata, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 496.

Specimens examined:

- 1 ex., ♀, Java, from the Temminck Collection, cotype of *F. minuta*, cat. syst.: g, mounted.
 1 ex., ♀ imm., Java, from the Temminck Collection, cotype of *F. minuta*, cat. syst.: i, mounted.

- 1 ex., juv., Java, cotype of *F. minuta*, cat. syst. : p, mounted.
 1 ex., ad., W. Java, leg. Boie and Macklot, cat. syst. : h, mounted.
 1 ex., ♂, Java, V. 1834, cat. syst. : j, mounted.
 1 ex., juv., Java, leg. Kuhl and Van Hasselt, cat. syst. : k, mounted.
 2 ex., juv., Java, leg. Junghuhn, 1862, 1864, cat. syst. : l, m, mounted.
 2 ex., juv., Java, leg. De Vriese, 1863, cat. syst. : n, o, mounted.
 2 ex., ♂♀, Tirtasari, Java, 26. IV. 1910 and 4. V. 1910, leg. H. W. v. d. Weele, skins and skulls.
 1 ex., ♀ juv., Tjandjak (Buitenzorg), Java, 20. VII. 1909, leg. H. W. v. d. Weele, skin and skull.
 1 ex., ♂ juv., Buitenzorg, 15. VIII. 1909, leg. H. W. v. d. Weele, skin and skull.
 2 ex., ♀♀ juv., Tjomas, Salak, Java, 31. VII. 1909, leg. H. W. v. d. Weele, skins and skulls.
 1 ex., ad., Tangkoeban Prahoe, ± 1000 m, Java, 19. VII. 1926, leg. Jhr. F. C. van Heurn, reg. no. 1559, skin and skull.
 1 ex., Pasoeroean, Java, don. Lebret, from Amsterdam Zoo, 29. VII. 1931, Mus. Amst., skin and skull.
 1 ex., juv., Java, leg. Kuhl and Van Hasselt, cat. ost. : a, skeleton.
 1 ex., imm., Java, leg. Kuhl and Van Hasselt, cat. ost. : b, skeleton.
 1 ex., ad., Java, leg. Blume, cat. ost. : e, skull.
 1 ex., ad., Java, leg. Reinwardt, cat. ost. : f, skull.
 1 ex., ad., Java, cat. ost. : h, skull.

General colour dark brownish-grey, not ferruginous as in Sumatran specimens; the colour is darkest on the middle of the back and lightest on the sides. The four dark longitudinal lines on head and neck are all rather narrow, and of about equal width on the neck, or the inner ones may be slightly broader than the outer set. The markings are blackish brown; they consist of longitudinal series of elongate dark spots on the middle of the back, and of roundish dark spots on the sides and limbs. Young specimens are much lighter with a very faint brownish tinge. Only one specimen resembles the sumatran subspecies in its distinctly ferruginous colour; it is a young one collected by Junghuhn in Java (cat. syst. : l), no exact locality being known. As Dr. Hinton (in litt.) kindly informs me grey specimens like those from Java are also known from the Malay Peninsula. From the latter region I had only three specimens for comparison (Malacca¹); leg. Diard, cat. syst. : a, b, c), which were distinctly ferruginous and had larger black spots than found in the javanese (and sumatran) races. Therefore I must leave it to future workers to draw conclusions as to the status of the javanese subspecies and of that inhabiting the Malay Peninsula.

Skull "g" of Jentink's osteological catalogue belongs to *Oncilla pardionoides* (Gray).

¹ In the Netherlands and other countries on the continent, it was (and is still) usual to use the name Malacca for the whole of the Malay Peninsula.

Distribution: Long this subspecies has been supposed to be confined to Java, but recently Frechkop (1934, p. 18) recorded two specimens from the island of Bali. Zollinger (1850, p. 78) mentioned *Felis minuta* from the island of Soembawa; probably this record refers to a feral domestic cat (cf. p. 43). *Felis bengalensis* or a feral domestic cat is mentioned from Lombok by Everett (in Hartert, 1896, p. 593), in all probability it was a wild domestic cat.

***Prionailurus bengalensis borneoensis* nov. subsp. (figs. 10, 19; Pl. II figs. 4, 5).**

Felis minuta var. *borneoensis* Jentink, Cat. Syst., 1892, p. 103 (nom. nud.).

Felis minuta, Müller, Verh. Nat. Gesch. Overz. Bez., Zool., 1839, p. 29, 52, 54, table; Wagner, Suppl. II Schreber, Säugeth., 1841, p. 509; Schinz, Syst. Verz., vol. 1, 1844, p. 447; Wagner, Abh. math. phys. Kl. bayer. Ak. Wiss., vol. 4, pt. 2, 1845, p. 82, 98; Giebel, Säugeth., 1855, p. 878; Schlegel, Handl. Dierk., vol. 1, 1857, p. 23; Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 387, 388; Schlegel, Dierentuin, 1872, p. 34; Mivart, The Cat, 1881, p. 415, 496; Jentink, Cat. Ost., 1887, p. 85; Jentink, Notes Leyd. Mus., vol. 11, 1889, p. 22; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 214, 223; Jentink, Cat. Syst., 1892, p. 102; Bateson, Mat. Var., 1894, p. 224; Kohlbrugge, Natk. Tijdschr. Ned. Ind., vol. 55, 1895, p. 181, 185; Van Balen, Dierenwereld, vol. 1, 1914, p. 369.

Felis bengalensis, Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 60; Blanford, Fauna Brit. Ind., 1888, p. 55, 78; Thomas, P. Z. S., 1892, p. 227; Everett, P. Z. S., 1893, p. 495; Hose, Mamm. Borneo, 1893, p. 19; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 73, 97; Lydekker, Handbook, 1895, p. 126; Flower, P. Z. S., 1900, p. 325; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 209; Lyon, Proc. U. S. Nat. Mus., vol. 33, 1907, p. 559; Lyon, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 115; Shelford, Natural. Borneo, 1916, p. 28; Dammerman, Treubia, vol. 11, 1929, p. 34; Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 74, 75; Ménégau, Mammif., p. 259; Lydekker, Wild Life, vol. 2, p. 132.

Panthera sumatrana, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 491.

Felis javensis, Elliot, Mon. Felidae, pt. 10, 1882; Grevé, Nova Acta Ac. Caes., Leop. Carol., vol. 63, 1895, p. 73, 97.

Felis (Felis) javanensis, Trouessart, Bull. Soc. Et. Sci. Angers, Suppl. 1884, 1885, p. 106.

Felis javanensis, Casto de Elera, Cat. Sist. Fauna Filip., vol. 1, 1895, p. 30.

Felis undata, Matschie, SB. Ges. natf. Fr. Berl., 1895, p. 195; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 53.

Felis (Oncoïdes) bengalensis undata, Trouessart, Cat. Mamm., vol. 1, 1897, p. 358; Trouessart, Cat. Mamm., Suppl., 1904, p. 271.

Felis bengalensis undata, Robinson & Kloss, J. Fed. Mal. St. Mus., vol. 7, 1919, p. 262.

Prionailurus bengalensis undata, Gyldenstolpe, Kungl. Sv. Vet. Ak. Handl., vol. 60, pt. 6, 1919, p. 27, 55, pl. 4 fig. 3, pl. 5 fig. 2.

Specimens examined:

Type:

1 ex., ♂, Rantau, S. E. Borneo, leg. F. C. E. van Putten, 29. III. 1916 (collector's no. 126), reg. no. 467, skin.

Paratypes:

- 2 ex., ♂♂, Rantau, S. E. Borneo, leg. F. C. E. van Putten, 3. IV. 1916 (collector's no. 134) and 15. IV. 1916 (collector's no. 162), reg. no. 467, skins.
- 1 ex., Rantau, S. E. Borneo, leg. F. C. E. van Putten (collector's no. 251), reg. no. 467, skull.
- 1 ex., juv., Kapoeas, Borneo, leg. Schwaner, cat. syst.: r, mounted.
- 1 ex., Bandjermassin, Borneo, leg. Schwaner, cat. syst.: q, mounted.
- 1 ex., Doesoen, Borneo, leg. S. Müller, cat. syst.: s, mounted.
- 1 ex., ♀, W. Coast of Borneo, leg. Teysmann, 1877, cat. syst.: t, mounted.
- 1 ex., juv., W. Coast of Borneo, leg. Teysmann, 1877, cat. syst.: u, mounted, cat. ost.: m, skull.
- 3 ex., juv., E. S. E. Borneo, leg. C. Bock, 1879, cat. syst.: v, w, x, mounted; cat. ost.: l, n, o, skulls.
- 1 ex., Marabok, Broenei, Borneo, XII. 1899, purchased from Rolle, 1901, skin.
- 1 ex., ♀, W. Coast of Borneo, leg. Teysmann, 1877, cat. ost.: i, skull.
- 1 ex., Borneo, cat. ost.: k, skull.
- 1 ex., juv., Sarawak, Borneo, leg. Doria & Beccari, Mus. Civ. Gen., reg. no. 2802, skull.

Examination of the bornean specimens enumerated by Jentink (1887, p. 86) in his osteological catalogue showed that some of them do not belong to *Prionailurus bengalensis* at all. Skull "j" differs from *bengalensis* in the mesopterygoid fossa, which is lanceolate instead of broadly rounded anteriorly; this is also the case with skull "u". Besides examining the skulls of undoubted *Prionailurus bengalensis* in our Museum, I looked through a large series of skulls of this species in the British Museum, but I failed to find a single skull with a lanceolate mesopterygoid fossa. In his systematic catalogue Jentink (1892, p. 103: a²) mentions a very young specimen, collected in S. E. Borneo by C. Bock, 1879, which he refers to this species. Instead of a single young cat, the bottle contained two very young rodents!

The general colour of the specimens examined by me is ferruginous, often inclined to tawny. In literature it is mentioned that Bornean specimens have a brighter colour than those from Sumatra (cf. Gyldenstolpe, 1919, p. 27), but this is not the case in those examined by me; they are generally darker, but not brighter in colour. Of the four longitudinal dark lines on head and neck the inner two are narrow, while the outer two are very broad, the difference between the two sets being much larger than in *Prionailurus bengalensis sumatranus* (Horsf.). The markings are very dark, approaching to black. The spots on the back are elongate and large; they are darker than in *sumatranus* and fewer in number.

The skull from Rantau, S. E. Borneo, is remarkable for two features: 1. the upper second premolar is three-rooted, the roots being placed together, giving the alveolus a trilobate outline (fig. 19); 2. in the right mandible an additional anterior premolar (P₂) is present (pl. II fig. 5).

As far as I am aware, the occurrence of P_2 in *Prionailurus bengalensis* had not yet been recorded, though it was known to occasionally be present in other species (cf. p. 17). The lower milkcarnassial of one of the specimens is shown in fig. 10. In the skull of a young specimen from Sarawak (Mus. Civ. Gen.) the infraorbital foramen is subdivided by a horizontal bony bar.

None of the specimens was measured in the flesh; the type skin measures head + body $50\frac{1}{2}$ cm, tail $18\frac{1}{2}$ cm approximately.

TABLE III
Cranial measurements of *Prionailurus bengalensis* (Kerr) sp., in mm

	Condylobasal length	Greatest length	Zygomatic width	postorbital constriction	width of braincase	alveolar length P_3-M_1	alveolar length P_3-M_1	length of P^4 .	length of M_1
<i>P.b. sumatrana</i>									
(Horsf.)									
cat. ost.: t . .	79.4	88.0	56.4	25.8	38.2	17.1	19.1	9.8	7.2
reg. no. 991 .	85.0	92.3	62.4	22.8	39.5	15.7	19.1	9.6	7.8
Nias, Mus. Gen., no. 2805	75.5	81.9	51.9	27.7	39.5	—	20.8	10.9	8.4
<i>P.b. javanensis</i>									
(Desm.)									
cat. ost.: e . . .	76.3	83.1	55.1	24.6	38.4	16.7	19.0	9.9	7.1
" f . . .	78.2	83.8	—	26.2	38.1	15.5	18.3	9.8	7.2
" g . . .	81.3	88.8	57.7	25.8	38.6	16.4	18.5	10.0	7.3
Tirtasari ♂ . . .	77.0	84.0	54.0	27.2	38.2	15.8	18.5	9.8	7.8
" ♀ . . .	74.0	80.7	50.6	27.6	35.9	15.8	17.5	10.0	7.4
<i>P.b. borneoensis</i> nov. subsp.									
reg. no. 467 .	83.0	89.1	58.0	25.7	38.6	17.8	20.2	10.0	7.9
cat. ost.: i . . .	—	—	62.6	23.5	40.6	16.2	19.2	10.0	7.3
" l . . .	72.2	79.4	51.7	26.0	38.5	16.2	18.6	9.8	7.5
" o . . .	82.0	88.0	57.9	23.9	38.4	17.0	20.2	10.1	8.2

Distribution: Borneo, and perhaps the Philippine Islands. *Prionailurus bengalensis* has been recorded from the Philippines by several authors (Elera, 1895, p. 31; Sanchez, 1900, p. 281; Hollister, 1912, p. 24 and 1913, p. 336; Allen, 1910, p. 15; Thomas, 1898, p. 387), but I had no specimens for examination.

In recent literature this subspecies is known as *Prionailurus bengalensis undatus* (Desm.). *Felis undata* Desmarest (1816, p. 115) was originally described from Java, and the original description does not contain any points that make it probable that the bornean subspecies was meant (cf.

infra), and therefore the name is not available for it. This leaves the subspecies without a name and I should have hesitated to give a new one, were it not that Jentink (1892, p. 103) used the name var. *borneoensis* for a bornean specimen. In Jentink's publication it is a nomen nudum, and I am not aware of its being published later with the necessary indications, but its being cited in the above synonymy, which is followed by some notes on the colour-characters, believed by me to be sufficient to recognize the race, as well as its being accompanied by other references to papers in which notes on the subspecies may be found, is already enough to give the name *borneoensis* a definite status according to the international Rules of Zoological Nomenclature.

Distribution in the Archipelago: Borneo.

Felis undata Desm.

Felis undata Desmarest, Nouv. Dict. Hist. Nat., 2nd ed., vol. 6, 1816, p. 115; Desmarest, Mammal., 1820, p. 230; G. Cuvier, Rech. Ossem. foss., 1823, p. 438; Horsfield, Zool. Res. Java, 1821, in text of *Felis javanensis*; Lesson, Man. Mamm., 1827, p. 188; Fischer, Syn. Mamm., 1829, p. 205.

Felis undulata, Horsfield, Zool. Res. Java, 1821, in text of *Felis javanensis*, and in text of *F. sumatrana*.

The first description of this species was given by G. Cuvier (1809, p. 160), who did not, however, give it a scientific name; this it received from Desmarest (1816, p. 115), who named it *Felis undata*. The specimen on which this species was based is stated to have been collected by Leschenault in Java, and to have been presented by him to the Paris Museum. As Dr. P. Rode kindly informs me this specimen is not to be found in the Paris Museum, and no mention of it is made in the old registers of that museum. Thus probably no type being in existence, the original description is the most important clue to the identity of this species. Of *Felis undata* Desmarest writes that the colour is dirty grey, and that the markings are "plutôt des ondes que des taches". It must be noted that in young specimens of *Prionailurus bengalensis javanensis* (Desm.) the general colour may be described as dirty grey, and that the markings on the back may fuse over a shorter or longer distance into longitudinal bands, which are more or less undulating, and that these might be named "ondes". Thus judging by the original description only, I should conclude that *Felis undata* Desm. is a synonym of *Prionailurus bengalensis javanensis* (Desm.), a conclusion which is also in agreement with the terra typica. In the original description I do not find any points which make it necessary or even probable that *Felis undata* Desm. is identical with the bornean race. Trouessart (1897,

p. 358; 1904, p. 271) mentions *undata* as the bornean race of *bengalensis*, but he did not trouble himself very much about the type-localities, for he used *minuta* for a race of *bengalensis* occurring in the Malay Peninsula and the Philippine Islands, while *Felis minuta* was originally described by Temminck from specimens from Java and Sumatra, and therefore it is a synonym of *Prionailurus bengalensis javanensis* (Desm.) and *P. b. sumatranus* (Horsf.).

It is, however, possible that *Felis undata* Desm. must be referred to another species than *Prionailurus bengalensis* (Kerr), or even to another genus. Besides the descriptions by G. Cuvier (1809, p. 160) and Desmarest (1816, p. 115; 1820, p. 230) some other descriptions may be taken into consideration. G. Cuvier (1823, p. 438) described the species again, and this time his description contains some more facts. The colour is described as yellowish grey with wavy markings and less distinctly marked bands; the rings on the end of the tail being more clouded ("plus nuageux"). The specimen is stated to be a young one, and the following measurements are given: length of head "deux pouces" = 54 mm¹⁾, length of body: "treize pouces" = 351 mm, and the length of the tail: "sept (pouces) et demie" = 192½ mm. As was done also in the original description the specimen is compared to the "Chat sauvage indien... qui se trouve au Japon" of Vosmaer (1773, pl. 13), and this time it is said to resemble also a South-African cat. In the same year Desmoulins (1823, p. 495) wrote about this species: "Chat du Cap, de Péron et Delalande, *Felis undata* de la mammalogie". These notes by authors, who, as Cuvier, have examined the type, seem to me to be very important. The statement by Cuvier of the resemblance to a South-African species, and also that by Desmoulins, make it probable that *Felis undata* belongs to another genus than *Prionailurus*. In this respect it is interesting to note that Horsfield (1821) referred specimens from E. Java to *Felis undata*, stating that this species has the markings placed transversely; now *Prionailurus bengalensis* can hardly be described as having the markings transverse, and neither can this apply to any other species of Java (or Borneo). Horsfield's remarks might perhaps indicate a specimen resembling in markings a domestic cat of the *torquata*-type (striped tabby).

With regard to the possible identity of *Felis undata* Desm. I arrive at the following alternate conclusions:

1. it may be identical with *Prionailurus bengalensis*, and then it is a synonym of *P. b. javanensis* (Desm.) (cf. also Elliot, 1871, p. 761);

1) 1 "pouce" = 27 mm.

2. it may be a species, which is altogether different from *Prionailurus bengalensis*, and in this case it may be a feral domestic cat; but in no way there is any evidence, or even probability, that it is identical with the bornean subspecies of *Prionailurus bengalensis*.

***Prionailurus rubiginosus* (Is. Geoffr.).**

Felis rubiginosa Is. Geoffroy-St.-Hilaire, Mammif. Voy. Bélanger, 1834, p. 129, 140, pl. 6.

Specimens examined:

1 ex., ?, "Nepaul", purchased from Frank, 1865, cat. syst.: a, mounted.
1 ex., ♀, Colombo, Ceylon, leg. Diard, 1859, cat. syst.: b, mounted.

In the British Museum I examined the lower jaws of the following specimens:

reg. no. 48.8.12.4, Nellore, India.
" " 92.6.4.1, ♂, Kandy, 4000 ft., Ceylon.
" " 20.2.8.5, Bogawantalawa, Ceylon.
" " 856b, Ceylon.
" " 74.4.21.1, Central Ceylon.
" " 15.3.1.49, ♂, Weligatta, S. Prov., Ceylon.

The first mentioned specimen originally was labelled "Nepaul", but on the board on which the specimen is mounted, is written in English (by Elliot?): "This never came from Nepál. It is *F. rubiginosa* Is. Geoffr." Afterwards the label was changed into "Indes orientales", and with this indication it was mentioned by Jentink (1892, p. 105). The species does not occur in the Archipelago, but Von Koenigswald (1934, p. 199) mentions a small cat which might be related to *Prionailurus rubiginosus* (Is. Geoffr.) among the mammals occurring in the prehistoric Sampoeng-fauna of Java. It is not mentioned, however, by Dammerman (1934b) in his account of the prehistoric mammals of the Sampoeng cave.

***Pardofelis marmorata marmorata* (Mart.) (figs. 11, 20).**

Felis marmorata Martin, P. Z. S., 1836, p. 108; Martin, l'Institut, vol. 5, 1837, p. 263; Martin, Isis, 1838, p. 208; Waterhouse, Cat. Mamm. Zool. Soc., 1838, p. 30; Wagner, Suppl. II Schreber, Säugeth., 1841, p. 490, pl. C a; Schinz, Syst. Verz., vol. 1, 1844, p. 442; Wagner, Abh. math. physik. Kl. bayer. Ak. Wiss., vol. 4, pt. 2, 1845, p. 82; Cantor, J. As. Soc. Beng., vol. 15, 1846, p. 244; Chenu, Encycl. Hist. Nat., 1853, p. 181; Giebel, Säugeth., 1855, p. 874; Brandt, Mém. Ac. Imp. Sc. St. Pétersb., ser. 6, sc. math. phys. nat., vol. 8, 1856, p. 191; Schlegel, Handl. Dærk., vol. 1, 1857, p. 23; Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 388; Blyth, P. Z. S., 1863, p. 183; Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 59; Schlegel, Dierentuin, 1872, p. 34; Elliot, Mon. Felidae, pt. 8, 1881, pl. and text; Hagen, Ausland, vol. 54,

1881, p. 555; Hagen, Aardr. Weekbl., vol. 2, 1881, p. 278; Jentink, Aardr. Weekbl., vol. 2, 1881, p. 290; Mivart, The Cat, 1881, p. 404, 431, 496, fig. 173; Jentink, Cat. Ost., 1887, p. 83; Blanford, Fauna Brit. Ind., 1888, p. 56, 74, fig. 18; Grevé, Zool. Jahrb. Syst., vol. 6, 1891, p. 65; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 213, 221; Grevé, Congr. Int. Zool. Moscou, vol. 1, 1892, p. 168; Jentink, Cat. Syst., 1892, p. 98; Everett, P. Z. S., 1893, p. 495; Hose, Descr. Acc. Mamm. Borneo, 1893, p. 18; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 53, 97; Lydekker, Handbook, vol. 1, 1895, p. 117, pl. X; Matschie, SB. Ges. natf. Fr. Berl., 1895, p. 195; Flower, P. Z. S., 1900, p. 325; Koningsberger, Med. Plantent., no. 54, 1902, p. 17; Schneider, Zool. Jahrb. Syst., vol. 23, 1905, p. 102, 145; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 207, 223; Ihering, Arch. Natg., 76, 1910, vol. 1, no. 2, p. 119, 134; Van Balen, Dierenw., vol. 1, 1914, p. 368; Schwarz, Zool. v. Timor, pt. 2, 1914, p. 124; Robinson & Kloss, J. Fed. Mal. St. Mus., vol. 8, pt. 2, 1918, p. 73; Robinson & Kloss, J. Fed. Mal. St. Mus., vol. 7, 1919, p. 261; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, 1928, p. 56; Dammerman, Treubia, vol. 11, 1929, p. 34; Sody, Natk. Tijdschr. Ned. Ind., vol. 90, 1930, p. 276; Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 74, 133.

Leopardus marmoratus, Gray, List specim. Mamm. B. M., 1843, p. 42; Gray, Cat. Bones Mamm. B. M., 1862, p. 63.

Felis (Pardofelis) marmorata, Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 387; Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 76.

Pardofelis marmorata, Pocock, Ann. Mag. N. H., ser. 8, vol. 20, 1917, p. 340; Allen, Bull. Am. Mus. N. H., vol. 41, 1919, p. 338; Gyldenstolpe, Kungl. Sv. Vet. Ak. Handl., vol. 60, no. 6, 1919, p. 28, 55, pl. IV fig. 6, pl. V fig. 1; Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 74; Pocock, P. Z. S., 1932, p. 744.

Pardofelis marmorata marmorata, Pocock, P. Z. S., 1932, p. 745, 747, pl. 1, text-figs. 1, 2 a, c-e.

Catolynx marmoratus, Gray, P. Z. S., 1867, p. 267; Gray, Cat. Carn. Mamm. B. M., 1869, p. 16; Gray, Ann. Mag. N. H., ser. 4, vol. 14, 1874, p. 253; Cope, Proc. Ac. Philad., 1879, p. 171; Cope, Ann. Mag. N. H., ser. 5, vol. 5, 1880, p. 40; Ihering, Arch. Natg., 76, 1910, vol. 1, no. 2, p. 134.

Panthera marmorata, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 488.

Pardus marmoratus, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 488.

Galeopardus marmoratus, Matschie, SB. Ges. Natf. Fr. Berl., 1895, p. 199; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, 1928, p. 53.

Felis (Zibethailurus) marmorata, Trouessart, Cat. Mamm., 1897, p. 355; Trouessart, Cat. Mamm. Suppl., 1904, p. 269.

Felis badia (part.), Schneider, Zool. Jahrb. Syst., vol. 23, 1905, p. 104, 145, 163 (nec Gray).

Uncia marmorata, Gray, Ann. Mag. N. H., ser. 2, vol. 14, 1854, p. 394; Horsfield, Ann. Mag. N. H., ser. 2, vol. 16, 1855, p. 104.

Specimens examined:

- 1 ex., ♀, Lahat, Sumatra, Schneider, 1877, cat. syst.: a, mounted, cat. ost.: a, skull.
- 1 ex., ♀, Serbadjadi, Deli, Sumatra, 22. X. 1915, leg. L. P. de Bussy, reg. no. 647: skin (skull inside).
- 1 ex., ♂, Belawan, Deli, from Rotterdam Zoo, rec. 30. VI. 1928, reg. no. 1686, flat skin.
- 1 ex., juv., Priaman, W. Sumatra, don. F. von Faber, cat. syst.: f (*Felis macrocelis*), skin + skull.

- 1 ex., ?, Bedagei, Sumatra, Schneider, 1902, Mus. Basel, reg. no. 1416, flat skin, reg. no. 3855, skull.
 1 ex., ?, Bandjermassin, Borneo, leg. Schwaner, cat. syst.: b, mounted.
 1 ex., ♀, Kuala Pelah, Negri Sembilan, Malay States, 27. XI. 1911, leg. P. H. Hennesy (States Mus. no. 112/14), don. E. Jacobson, Mus. Leid. reg. no. 1013: skin + skull.

Besides complete skulls the lower jaws of the following specimens were examined in the British Museum:

- Reg. no. 55.12.24.254, type.
 " " 76.9.20.1, N.W. Borneo.
 " " 190b, Malacca.
 " " 113/14, Babu Tiga.

The specimens from Lahat, Bandjermassin and Kuala Pelah show the markings very distinctly, but in three other Sumatran specimens the markings are not so distinct. In the skin from Serbadjadi and Belawan they are rather clear on the middle of the back; in that from Bedagei the markings are very indistinct. I do not think that this is due to age, as the skull of the Bedagei-specimen is about as large as that of the specimen from the Malay Peninsula in which the markings are very distinct. The bornean skin is of a general ochreous-brown colour, while the others are more greyish brown.

Pocock (1932) distinguishes three subspecies of *Pardofelis marmorata* (Mart.), one of which, *P. m. charltoni* (Gray) is distinguished by the rich ochreous-brown colour and the thicker fur. For comparison with the malayan specimens mentioned above I examined two mounted skins of specimens, said to have come from the Himalaya (Mus. Leid., cat. syst.: c, d; skulls, cat. ost.: b, c). These skins are much less ochreous-brown than the skin from Borneo, and I do not find a great difference in the thickness of the fur. I do not, however, attach great importance to these Himalayan specimens, as both were bought from a dealer, who was not very careful about locality-records.

In literature (Gray, 1867a, p. 259; 1869, p. 16; Ihering, 1910, p. 119) it has been mentioned that this species resembled the lynxes in having the nasal bones separated from the maxillaries by processus of the premaxillaries and frontals; this does not hold good, however, for all skulls examined by me. In the specimen from Lahat the processus of the frontal and that of the premaxillary meet on the right side, but on the left side they just fail to meet; in the other skulls I examined, the processus of frontals and premaxillaries are separated by the nasals and maxillaries forming a suture. This seems also to be the case in the skull figured by Pocock (1932, fig. 2a). In the specimen from the Malay Peninsula the

infraorbital foramen of the left side is divided by a horizontal bony bar into two superposed foramina (fig. 20).

Within the Malay Archipelago *Pardofelis marmorata* (Mart.) has been proved to occur in Sumatra and Borneo. Numerous references exist in literature as to its occurrence in Java, but up to the present time no definite proofs are available; probably all these references were caused by the uncertainty as to the origin of the type, which was stated to have been collected in Java or Sumatra.

The specimen from Bedagei (Mus. Basel, no. 1416) is that which was identified by Matschie as *Felis badia*, and as such it was mentioned by Schneider, who, however, expressed already his doubts as to the correctness of the identification, and pointed out that it resembled more *Felis marmorata* Mart.

Badiofelis badia (Gray).

Felis badia Gray, P. Z. S., 1874, p. 322, pl. 49; Elliot, Mon. Felidae, pt. 7, 1880, pl. and text; Mivart, The Cat, 1881, p. 419, 496; Grevé, Zool. Jahrb. Syst., vol. 6, 1891, p. 99; Thomas, P. Z. S., 1892, p. 227; Everett, P. Z. S., 1893, p. 495; Hose, Mamm. Borneo, 1893, p. 20; Lydekker, Handbook, 1895, p. 122; Jentink, Notes Leyd. Mus., vol. 23, 1901, p. 91; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 210, 323; Van Balen, Dierenwereld, vol. 1, 1914, p. 371; Shelford, Natur. Borneo, 1916, p. 20; Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 74.

Felis (Felis) badia, Trouessart, Bull. Soc. Et. Sci. Angers, Suppl. 1884, 1885, p. 103.

Puma badia, Gray, Ann. Mag. N. H., ser. 4, vol. 14, 1874, p. 353.

Felis (Catopuma) badia, Trouessart, Cat. Mamm., 1897, p. 365; Trouessart, Cat. Mamm., Suppl., 1904, p. 274.

Felis (Pardofelis) badia, Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 74.

Pardofelis badia, Pocock, Ann. Mag. N. H., ser. 8, vol. 20, 1917, p. 340; Gyldenstolpe, Kongl. Sv. Vet. Ak. Handl., vol. 60, pt. 6, 1919, p. 55.

Badiofelis badia, Pocock, P. Z. S., 1932, p. 749, figs. 3 a & b, 4 a & b.

Felis temminckii (part.), Matschie, SB. Ges. natf. Fr. Berl., 1895, p. 195; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 53.

Specimen examined:

1 ex., ♀, Upper Mahakkam-rivier, Borneo, 1900, leg. Dr. Nieuwenhuis, cat. syst.: a, skin.

Lower jaws of the following specimens examined in the British Museum:

reg. no. 56.9.19.16, type.

" " 88.8.13.1.

" " 95.5.7.3.

Of this species Jentink (1901, p. 91) described a specimen in the Leiden Museum. Unhappily the skull has been mislaid, so that I had to content myself with studying the skin and a superficial examination of three skulls in the British Museum. The skin examined by me belongs to the greyish colourphase, and does not show any special point of interest. Something is

wrong with the skull measurements given by Jentink, for he mentions the width between the orbitae as being 61 mm, which agrees better with a tiger than with a cat of the size of *Badiofelis badia* (Gray).

The species has been mentioned by Schneider (1905, p. 104) from Sumatra, but both specimens mentioned by this author belong to other species, one to *Pardofelis marmorata* (Mart.) (cf. p. 34), the other to *Felis catus* L. (cf. p. 40).

As far as I am aware the species is known only from Borneo. Banks (1931, p. 74) mentions it as occurring also in Indo-China, but I have not been able to trace a record for this country.

Ictailurus planiceps (Vig. et Horsf.) (figs. 12—17).

Felis planiceps Vigors & Horsfield, Zool. Journ., vol. 3, 1827, p. 450, pl. 12; Vigors & Horsfield, Bull. Sc. Nat. et Géol., vol. 19, 1829, p. 105; Vigors & Horsfield, Isis, 1830, p. 1826; Lesson, Hist. Nat. Gén. Mammif., vol. 5, 1836, p. 352; Waterhouse, Cat. Mamm. Zool. Soc., 1838, p. 32; Müller, Verh. Nat. Gesch. Overz. Bez., Zool., 1839, p. 29, table; Wagner, Suppl. II Schreber, Säugeth., 1841, p. 541; Schinz, Syst. Verz., vol. 1, 1844, p. 467; Wagner, Abh. math. physik. Kl. bayer. Ak. Wiss., vol. 4, pt. 2, 1845, p. 82; Cantor, J. As. Soc. Beng., vol. 15, 1846, p. 245; Owen, Odontography, 1845, p. 487; Chenu, Encycl. Hist. Nat., 1853, p. 146, 205; Gervais, Hist. Nat. Mamm., vol. 2, 1855, p. 87, fig.; Giebel, Säugeth., 1855, p. 886; Brandt, Mém. Ac. Imp. Sci. St. Pétersb., ser. 6, sc. math. phys. nat., vol. 8, 1856, p. 191; Schlegel, Handl. Dierkunde, vol. 1, 1857, p. 23; Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 388; Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 62; Blyth, P. Z. S., 1863, p. 185; Gray, P. Z. S., 1867, p. 399; Schlegel, Dierentuin, 1872, p. 34; Gill, Ann. Mag. N. H., ser. 4, vol. 13, 1874, p. 16; Elliot, Mon. Felidae, pts. 4—5, 1879, pl. and text; Jentink, Aardr. Weekbl., vol. 2, 1881, p. 290; Mivart, The Cat, 1881, p. 417, 496, 513, figs. 177, 178; Mohr, Pflanz. Thierl., 1883, p. 407; Jentink, Cat. Ost., 1887, p. 84; Blanford, Faun. Brit. Ind., 1888, p. 53; Jentink, Notes Leyd. Mus., vol. 11, 1889, p. 22; Hagen, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 7, 1890, p. 92; Grevé, Zool. Jahrb. Syst., vol. 6, 1891, p. 99; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 213, 222; Jentink, Cat. Syst., 1892, p. 99; Thomas, P. Z. S., 1892, p. 227; Everett, P. Z. S., 1893, p. 495; Hose, Mamm. Borneo, 1893, p. 20; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 76, 97; Lydekker, Handbook, 1895, p. 121; Jentink, Notes Leyd. Mus., vol. 19, p. 41; Flower, P.Z.S., 1900, p. 326; Schneider, Zool. Jahrb. Syst., vol. 23, 1905, p. 103, 145; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 209; Holding, P.Z.S., 1906, p. 574; Van Balen, Dierenwereld, vol. 1, 1914, p. 369; Pocock, Ann. Mag. N.H., ser. 8, vol. 19, 1917, p. 122; Chasen, Singapore Naturalist, no. 4, 1924, p. 81; Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 74; Ménégau, Mammif., p. 265.

Felis (Felis) planiceps, Trouessart, Cat. Mamm., 1897, p. 361; Trouessart, Cat. Mamm., suppl., 1904, p. 273.

Felis (Ictailurus) planiceps, Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 387, 388; Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 76.

Ictailurus planiceps, Pocock, Ann. Mag. N.H., ser. 8, vol. 20, 1917, p. 342; Allen, Bull. Mus. N.H., vol. 41, 1919, p. 340; Pocock, P.Z.S., 1932, p. 766, figs. 5 e, f.

Felis (Ailurina) planiceps, Trouessart, Bull. Soc. Et. Sci. Angers, Suppl. 1884, 1885, p. 100.

Aelurina planiceps, Gray, Ann. Mag. N.H., ser. 4, vol. 14, 1874, p. 93, 353; Birula, Ann. Mus. Zool., Petrogr., vol. 19 (1914), 1915, p. 92. pl. I.

Ailurin planiceps, Lyon, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 659; Lyon, Proc. U. S. Nat. Mus., vol. 40, 1911, p. 114; Robinson & Kloss, J. Fed. Mal. St. Mus., vol. 8, pt. 2, 1918, p. 74.

Ailurun planiceps, Gyldenstolpe, Kungl. Sv. Vet. Ak. Handl., vol. 60, pt. 6, 1919, p. 55.

Chaus? planiceps, Gray, List. spec. Mamm. B. M., 1843, p. 44; Gray, Cat. Bones, Mamm. B. M., 1862, p. 65.

Viverriceps planiceps, Gray, P.Z.S., 1867, p. 269, fig. 6; Gray, Cat. Carn. Mamm. B. M., 1869, p. 17, fig. 6; Gray, Ann. Mag. N. H., ser. 4, vol. 14, 1874, p. 93; Ihering, Arch. Natg., 76, 1910, vol. 1, pt. 2, p. 135.

Catus planiceps, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 431; Matschie, SB. Ges. natf. Fr. Berlin, 1895, p. 199; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 56.

Ailurogale planiceps, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 60, sect. 1, 1870, p. 249.

Catolynx planiceps, Cope, Proc. Ac. Philad., 1879, p. 171; Cope, Ann. Mag. N. H., ser. 5, vol. 5, 1880, p. 40.

Plethaelurus planiceps, Cope, Proc. Am. Phil. Soc., vol. 20, 1882, p. 475.

Felis cavifrons Schinz, Syst. Verz., vol. 1, 1844, p. 467 (Mus. name).

Felis temminckii, Jentink, Cat. Ost., 1887, p. 84.

Felis strepsilura (Diard M. S.), Jentink, Cat. Syst., 1892, p. 99 (nom nud.).

Specimens examined:

- 1 ex., Deli, Sumatra, Dr. B. Hagen, 1885, cat. syst.: a, mounted; cat. ost.: b, skeleton.
- 1 ex., ♂, Bokka, Borneo, leg. S. Müller, cat. syst.: b, mounted; cat. ost.: a, skeleton.
- 1 ex., Borneo, leg. Schwaner, cat. syst.: c, mounted.
- 1 ex., Borneo, leg. Diard, cat. syst.: d, mounted (on the board on which this specimen is mounted three references: "Schwaner", "Java" and "*Felis strepsilura*" have been struck out).
- 1 ex., Marabok, Brunei, Borneo, XII. 1899, purchased from Rolle, III. 1901, skin.
- 1 ex., Southern base of Mt. Kenepai, Borneo, 27. XII. 1893, leg. Büttikofer, Borneo Exp., collector's no. 25, skin.
- 1 ex., Borneo, cat. ost.: c, skull.
- 1 ex., ♂, Palembang, Sumatra, from Rotterdam Zoo, rec. 23. VIII. 1924 (imported: 6. V. 1924); reg. no. 1334, skin + skull.
- 1 ex., ♂, Koeala Simpang, N.W. Coast Atjeh, Sumatra, don. Périn, from Amsterdam Zoo, rec. 6. V. 1926, Mus. Amst., skull.
- 1 ex., Loc ?, Mus. Amst., no. 595, skull.

Lower jaws of the following specimens were examined in the British Museum:

- reg. no. 79. 11. 21. 627, ♂, Proc. Wellesley.
- reg. no. 60. 5. 4. 51., East India House Collection.
- reg. no. 122a, Sumatra.

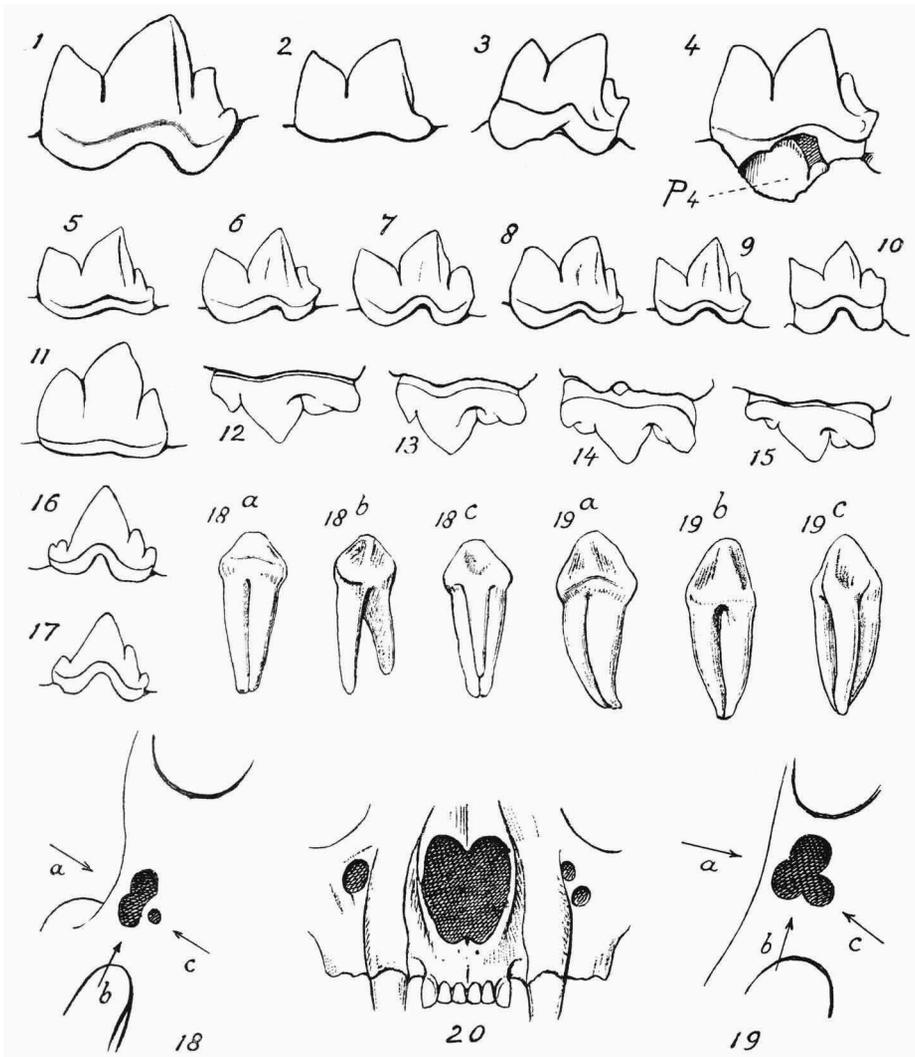
As pointed out by Pocock (1932, p. 766) the name *Ailurin* proposed by Gervais (1855, p. 87) for a group of cats of which *Felis planiceps* was the sole representative, has no admissible status under the international rules of zoological nomenclature, and therefore I cannot agree with Lyon (1908,

p. 658; 1911, p. 114), Robinson & Kloss (1918, p. 74) and Gyldenstolpe (1919, p. 55), who use *Ailurin* as the generic name for this cat. Its latinized form *Aelurina* proposed by Gill (1872, p. 60) and the generic names *Ailurogale* Fitzinger (1870, p. 249) and *Plethaelurus* Cope (1882, p. 475) are all preoccupied by *Ictailurus* Severtzow (1858, p. 387—388), which therefore is the valid name for the genus. As the most important character of the genus several authors (Gervais 1855, p. 87, fig.; Cope, 1882, p. 475; Lyon 1908, p. 659) mention the strongly developed upper second premolar, which is compressed and two-rooted, while in the other genera P² is stated to be very small and one-rooted. As shown above (p. 14) P² is very variable in other species and may be two- or three-rooted in *Prionailurus bengalensis* (Kerr), but it never becomes so large as in *Ictailurus planiceps*. It is interesting to note that this premolar may be absent in *Ictailurus planiceps*; this is the case in the specimen from Deli, presented to the Leiden Museum by Dr. B. Hagen. In this skull the upper second premolar is absent on both sides and no trace of an alveolus was found. Moreover the very short distance between P³ and the canine (3.9 mm) shows that no room for P² is left. Comparison of some measurements of this skull with those of two other specimens, given in the following table, shows that P³ and P⁴ are larger in the Deli specimen than in the others, which, however, have larger skulls; also the distance from the infraorbital foramen to the front border of the canine is relatively shorter than in the other two specimens (i. e., 35.3% of the length of the upper jaw in skull "b": 41.0 and 41.5% in skull "a" and "c").

Measurements in mm

	skull b	skull a	skull c
condylobasal length	83.8	94.4	—
length upper jaw	37.3	37.8	41.6
length of P ²	—	4.1	4.3
length of P ³	8.4	7.6	7.6
length of P ⁴	12.0	11.3	11.3
distance C-P ³	3.9	6.8	7.7
dist. C-for. infraorb.	13.2	15.5	17.3

The absence of P² in *Ictailurus planiceps* (Vig. & Horsf.) is a rare occurrence, as I found it to be present in all the other specimens examined by me; it is also present in the 14 skulls of this species in the British Museum, as Dr. Hinton kindly informs me. The shortness of the snout of the Deli specimen seems to be also evident from the short diastema in the



Figs. 1—11, left lower milk-carnassials (p_4) of: fig. 1, *Panthera tigris sumatrae* Poc., reg. no. 991; fig. 2, *Panthera pardus melas* (Cuv.), cat. ost.: c; fig. 3, *Neofelis nebulosa* (Griff.), reg. no. 1772; fig. 4, *Profelis t. temminckii* (Vig. et Horsf.), reg. no. 647; fig. 5, *Prionailurus bengalensis sumatranus* (Horsf.), Mus. Civ. Gen., no. 2807; fig. 6, id., reg. no. 1013, coll. no. 368; fig. 7, id., cat. ost.: d; fig. 8, id., reg. no. 1013, coll. no. 381; fig. 9, *P. b. javanensis* (Desm.), cat. ost.: b; fig. 10, *P. b. borneoensis* Brong., Mus. Civ. Gen., no. 2802; fig. 11, *Pardofelis m. marmorata* (Mart.), cat. syst.: f. Fig. 12—15, *Ictailurus planiceps* (Vig. et Horsf.), left P_4 , fig. 12, cat. ost.: b; fig. 13, id., Atjeh. Mus. Amst.; fig. 14, Mus. Amst., no. 595; fig. 15, cat. ost.: a. Figs. 16—17, id. left P_4 ; fig. 16, cat. ost.: b; fig. 17, cat. ost.: a. Fig. 18, *Prionailurus bengalensis sumatranus* (Horsf.), reg. no. 991, alveolus of P^2 ; figs. 18 a—c, id., three views of P^2 , from the directions indicated in fig. 18; fig. 19, 19 a—c, the same of *P. b. borneoensis* Brong., reg. no. 467. Fig. 20, *Pardofelis marmorata marmorata* (Mart.), no. 112/14, front view of skull.

Figs. 1—3 $\times 1\frac{1}{2}$; figs. 4—17 $\times 2\frac{1}{4}$; figs. 18—19 $\times 3\frac{3}{4}$; fig. 20 $\times 1\frac{1}{8}$.

lower jaw, which measures only 2.9 mm, while varying from 4.6 to 7 mm in the other specimens examined. The other teeth show some variations in the development of the cusps. The lower third premolar generally has three cusps, a large one in the middle with a smaller one in front and behind. In skull "b" the posterior small cusp of P_3 is absent while in skulls "a", reg. no. 1334 and Amsterdam no. 595 it is present, though very weak. P_4 also generally has three cusps, but the cingulum may form small additional cusps anteriorly and posteriorly (figs. 16, 17). The parastyl of the upper carnassial sometimes shows traces of a division into two distinct cusps. Some of the variations of this tooth are shown in figs. 12 to 15. In the skull of the Atjeh specimen the infraorbital foramen is subdivided by a horizontal bony bar on both sides of the skull. Subdivision of the foramen infraorbitale is found in several other species too. Owen (1834, p. 2) mentioned it for asiatic specimens of *Panthera leo* (L.) and Satunin (1909, p. 231, 250, figs. 7, 8) for *Acinonyx*, while it was found by me on the left side of the skull in *Pardofelis marmorata marmorata* (Mart.) (fig. 20), on both sides of the skull in a young *Prionailurus bengalensis borneoensis* Brongersma (Mus. Civ. Gen., reg. no. 2802), in *Leptailurus serval* (Müll.), and on the right side in a female *Puma concolor* (L.) (reg. no. 1301).

Distribution in the Archipelago: Sumatra, Borneo.

***Felis catus* L.** (fig. 21, pl. I figs. 1—4, pl. II figs. 6—7).

Felis catus Linnaeus, Syst. Naturae, ed. X, 1758, p. 42; Pocock, P.Z.S., 1907, p. 149; Hollister, Philipp. J. Sci., vol. 7, sect. D., 1912, p. 24; Schwarz, Zool. Timor, pt. 2, 1914, p. 115, 124.

Felis megalotis Müller, Verh. Nat. Gesch. Overz. Bez., Zool., 1839, p. 29, 54, tab.; Müller, Friep's Neue Notizen, vol. 15, 1840, p. 280; Wagner, Suppl. II Schreber, Säugeth., 1841, p. 540; Schinz, Syst. Verz., vol. 1, 1844, p. 446; Wagner, Abh. mathem. physik. Kl. bayer. Ak. Wiss., vol. 4, pt. 2, 1845, p. 82; Temminck, Coup-d'oeil Possess. Néerl., vol. 3, 1849, p. 175; Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 388; Blyth, P.Z.S., 1863, p. 186; Gray, P.Z.S., 1867, p. 275; Pelzeln, Festschr. k.k. Zool. bot. Ges. Wien., 1876, p. 63; Wallace, Geograph. distrib. Anim., vol. 1, 1876, p. 422; Cope, Proc. Ac. Philad., 1879, p. 172; Cope, Ann. Mag. N. H., ser. 5, vol. 5, 1880, p. 41; Mivart, The Cat, 1881, p. 417, 431, 496; Mohnicke, Pflanz. Thierl., 1883, p. 407, 412; Jentink, Cat. Ost., 1887, p. 87; Jentink, Tijdschrift Kon. Ned. Aardr. Gen., ser. 2, vol. 6, 1889, p. 250; Jentink, Notes Leyd. Mus., vol. 13, 1891, p. 219; Jentink, Cat. Syst., 1892, p. 106; Weber, Säuget., 1904, p. 530; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 208; Van Balen, Dierenwereld, vol. 1, 1914, p. 363, 368; Weber, Säuget., 2nd. ed., vol. 2, 1928, p. 320; Van Heurn, Natk. Tijdschr. Ned. Ind., vol. 92, 1932, p. 68; Sody, Natk. Tijdschr. Ned. Ind., vol. 93, 1933, p. 61; Ménégau, Mammif., p. 265.

Felis megalotis, Gray, Cat. Carn. Mamm. B. M., 1869, p. 33.

Felis (Felis) megalotis, Trouessart, Cat. Mamm., 1897, p. 361; Trouessart, Cat. Mamm., Suppl., 1904, p. 273.

Felis (Otailurus) megalotis, Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 388.

- Catus megalotis*, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. I, 1868, p. 431.
- Panthera megalotis*, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. I, 1868, p. 513.
- Felis minuta* var. *megalotis*, Giebel, Säugeth., 1855, p. 878; Grevé, Zool. Jahrb. Syst., vol. 6, 1891, p. 79.
- Felis (Felis) domestica* var. *megalotis*, Trouessart, Bull. Soc. Et. Sci. Angers, Suppl. 1884, 1885, p. 103.
- Felis bengalensis* var. *megalotis*, Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 75.
- Serval minutus*, Fitzinger, SB. Ak. Wiss. Wien., math. naturw. Cl., vol. 58, sect. I, 1868, p. 513.
- Felis domestica*, Elliot, Mon. Felidae, 1883; Jentink, Cat. Ost., 1887, p. 87; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 233; Jentink, Cat. Syst., 1892, p. 104; Lydekker, Handbook, 1895, p. 156; Thomas, Ann. Mag. N. H., ser. 6, vol. 18, 1896, p. 245; Thomas, Trans. Z. S., vol. 14, 1898, p. 378, 387.
- Felis* sp., Jentink, Notes Leyd. Mus., vol. 5, 1883, p. 177.
- Felis caligata*, Jentink, Cat. Syst., 1892, p. 105 (specimen: g).
- Felis badia*, Schneider, Zool. Jahrb. Syst., vol. 23, 1905, p. 104.
- Felis deliensis* Hilzheimer, Zool. Anz., vol. 30, 1906, p. 112.
- ? *Felis minuta*, Zollinger, Verh. Batav. Gen., vol. 23, 1850, p. 78.
- Felis bengalensis* or a feral domestic cat, Everett, in Hartert, Novit. Zool., vol. 3, 1896, p. 593; "a wild cat", Doherty, J. As. Soc. Beng., vol. 60, 1891, p. 148; Hartert, Novit. Zool., vol. 3, 1896, p. 578; "eine unmächtige kleine Katze", Müller, Arch. Natg., 12, 1846, vol. 1, p. 112. Also cf. Pocock, Ann. Mag. N. H., ser. 8, vol. 20, 1917, p. 333; Allen, Bull. Am. Mus. N. H., vol. 41, 1919, p. 340.

Specimens examined:

- 1 ex., ♀, Timor, leg. Müller & Macklot, type of *Felis megalotis* Müll., cat. syst.: a, mounted, cat. ost.: a, skull.
- 1 ex., ♂, Timor, leg. Kleian, don. Dr. H. ten Kate, 1891, Mus. Amst., mounted skin, skull.
- 1 ex., juv., Rotti, leg. Dr. H. ten Kate, cat. syst.: b, mounted, cat. ost.: b, skull.
- 1 ex., ♂, Deli, Sumatra, type of *Felis deliensis* Hilzh. purchased from Hoffmann, Museum, Strasbourg.
- 1 ex., ♂, Boeroe (Achterwal), 28. IX. 1867, leg. Hoedt, cat. syst.: d, mounted, cat. ost.: h, skull.
- 1 ex., ?, Priaman, W. Sumatra, leg. F. von Faber, 1883, cat. syst.: *F. caligata*, g, mounted.
- 1 ex., ♀, Soerabaja, Java, don. Mrs. E. Mathijssen, VI. 1892, cat. syst.: *F. domestica*, f, mounted, cat. ost.: j, skull + tail-vertebrae.
- 3 ex., juv., Soerabaja, Java, don. Mrs. E. Mathijssen, VI, 1892, cat. syst.: *F. domestica*, g, h, mounted; i, alc. (young of cat. syst.: f).
- 7 skulls, Loc.?, Zoological Laboratory, Leiden.
- 3 skulls, Loc.?, Veterinary-Anatomical Institute, Utrecht.
- 1 skull, ♂ (siamese), Mr. W. K. Hirschfeld, Bloemendaal.
- 1 skull, ♀ (tortoise-shell), Mr. W. K. Hirschfeld, Bloemendaal.
- 1 skull, ♂ (siamese), Mus. Amsterdam.
- 1 skull, ♀, Mus. Amsterdam.

After examination of the types I arrive at the conclusion that both *Felis deliensis* Hilzheimer and *Felis megalotis* S. Müller must be referred

to the synonymy of *Felis catus* L. For *Felis megalotis* this has been mentioned already by several authors but I was unable to find any reference to this effect for *Felis deliensis*.

Through the courtesy of Dr. A. Burr I received from the Strasbourg Museum the skull and skin on which Hilzheimer based his *Felis deliensis*. Schneider (1905, p. 104) referred this specimen to *Felis badia* Gray, but a year later it was described by Hilzheimer (1906, p. 112) as the type of a new species. The specimen was purchased for the Strasbourg Museum from Mr. Hoffmann, and was stated to have come from Deli, Sumatra. That the specimen does not belong to *Badiofelis badia* (Gray) is evident from the structure of its skull, as well as from the characteristics of the skin. In his description Hilzheimer compared this specimen to domestic cats, mentioning several differences in the skull, which led him to describe it as a new species. These differences may be first discussed.

According to Hilzheimer the canines were stronger developed than in domestic cats, even than in those which were of larger size. Comparison with a domestic cat from the island of Boeroe shows that the canines are about just as large in both skulls; the skull of a domestic cat of the siamese breed also has canines of the same size.

In the type of *deliensis* the temporal ridges meet just posterior to the fronto-parietal suture, which according to Hilzheimer never is the case in domestic cats.

Examination of the type-skull shows that these ridges indeed do meet on the foremost part of the parietals; they are continued backwards for some distance, being separated by a narrow groove; on the hindermost part of the skull they fuse into the sagittal crest. In *Felis catus* L. the ridges generally are not placed so near to each other, but among the specimens examined by me I found several skulls in which the space between the temporal ridges is very narrow indeed. In the skull of a female domestic cat from Soerabaja, Java, the temporal ridges are only very feebly developed, but they certainly stand very close together. Moreover Reighard & Jennings (1928, p. 51) mention that in domestic cats the sagittal crest may extend forwards on to the cranial part of the parietals. Taking into consideration that the type-skull of *F. deliensis* belonged to an adult male, the difference from the skull of the adult female from Soerabaja can only be given the value of a difference due to sex, and not of specific value.

The nasals of *F. deliensis* are short, their posterior extremity is situated anteriorly to a line connecting the posterior extremities of the frontal branches of the maxillaries. The length of the nasals, however, is rather variable in domestic cats. In the female skull from Soerabaja the nasals

just reach the level of the posterior extremities of the frontal branches of the maxillaries. In the other skulls examined, the nasals are projecting beyond the maxillaries, but in a few specimens they are shorter, just as in the skull of *Felis deliensis*. Similar variations were found in other species, e.g., in *Felis ocreata* Gmel., and to me they do not appear to be of specific value. The flat frontal region, which is slightly concave, is found not only in *Felis deliensis*, but also in domestic cats. The partition of the auditory bulla arises at some distance from the auditory meatus, just as in *Felis catus* L. In the characters of the skull of the type of *Felis deliensis* I do not find any differences which allow its specific separation from *Felis catus*. The skin is of a very dark chestnut colour, on the middle of the back almost black, with here and there a few white hairs. On the ventral surface three white spots are present: one on the throat, one shortly behind the forelimbs and the third one at the penis. The female from Soerabaja is similarly coloured, being slightly darker and without white spots. Of this female we possess also three kittens, which are of a more greyish colour, and which show distinct markings on the head; the throat and belly are whitish, while in two of these the hindfeet are white. The ears of *F. deliensis* are covered on the outer surface with black hairs, and no trace of a light spot is found; in these characters it agrees very well with the domestic cats used for comparison. As I cannot find characters in the skull and skin of *Felis deliensis* Hilzh. which warrant its specific distinction, I conclude that this species must be referred to the synonymy of *Felis catus* L.

Felis megalotis was first described by Müller from a female collected by him in Timor. Later (Jentink, 1892, p. 106) it also became known from the neighbouring island of Rotti. Recently its distribution was discussed by Van Heurn (1932, p. 68) and Sody (1933, p. 61); these authors showed that in literature several records exist on wild cats from other islands of the Lesser Sunda chain. Zollinger (1850, p. 76) mentions a wild cat from Soembawa, which on p. 78 of his paper he refers to *Felis minuta*. Everett (in Hartert, 1896b, p. 593) mentions a wild cat from Lombok, which either was *Felis bengalensis* or a feral domestic cat, while Doherty (1891, p. 148; also in Hartert, 1896a, p. 578) mentions a wild cat from Soemba. Recently Van Heurn (1932, p. 68) added Flores to the list of Lesser Sunda Islands from which wild cats were known; he received verbal evidence from a European resident of the island that wild cats occur on E. Flores, while a native chief assured him that they are also found near the town of Endeh in Flores. Thus we see that in the Lesser Sunda Islands wild cats have been mentioned from Lombok, Soembawa,

Flores, Timor and Rotti, but only on the latter two islands specimens have been captured. That *Prionailurus bengalensis* (Kerr), of which *Felis minuta* is a synonym, should reach so far eastward is very improbable; at present it is known to occur eastward as far as Bali (Frechkop, 1934, p. 18), but no evidence exists as to its occurring on the other Lesser Sunda Islands. Feral domestic cats have been recorded also from other islands in the Malay Archipelago. Thomas (1896, p. 245) mentions a feral domestic cat which was taken at an altitude of 6500 feet on Mt. Bonthain, S. Celebes and also the occurrence of ferals on the island of Luzon in the Philippines (Thomas, l.c.; Hollister, 1912, p. 24). The type of *Felis deliensis* Hilzh. may also have been a feral, and probably the cat from Priaman, W. Sumatra, which will be discussed below, is another example.

Most authors who referred *Felis megalotis* to the synonymy of *Felis catus* L., did so without stating their reasons. The only exceptions are, as far as I am aware, Elliot (1883) and Schwarz (1914, p. 124). Elliot examined the type in the Leiden Museum and concluded that it was a hybrid, probably between a domestic cat and *Felis chaus* Schreb., and that the locality record was wrong. As other specimens have been taken in Timor, the latter conclusion is wrong and this makes the first conclusion very improbable, as *Felis chaus* does not occur in the Archipelago. Schwarz, who examined three specimens pointed out that the colour-pattern as well as the teeth (especially P⁴) were those of a domestic cat.

Besides the type, a mounted female and skull, I examined a mounted male and its skull from Timor in the Amsterdam Museum, and a young specimen from Rotti in the Leiden Museum. Examination of the skull shows that it is in no way related to *Prionailurus bengalensis* (Kerr). This is especially evident from the structure of the auditory bulla (figs. 21, 22), which has its partition arising at a greater distance from the auditory meatus than in *Prionailurus*, and completely agreeing in this respect with *Felis catus*. The skull of the male and female of *F. megalotis* have the same broad mesopterygoid fossa, a distinct external pterygoid crest which is slightly better developed in the female than in the male; the notch in the palatal border of the orbit and the strongly developed antero-interior lobe (protoconus) of the upper carnassial. Indeed I cannot find between these skulls and those of the domestic cats examined by me any difference, which cannot be ascribed to differences in age or sex.

The skins of the adult specimens are marked with a reddish tinge; that of the young one is more greyish. Spots are only very faintly indicated, but they appear to be arranged as in domestic cats of the striped tabby type (cf. Pocock, 1907); in the three specimens examined by Schwarz the

markings were quite distinct, the spots being arranged in transverse series. The ears are of a uniform colour on the outer surface. The domestic cat from Boeroe resembles these specimens very much, the reddish tinge is less apparent, the specimens being much more greyish and the markings being more distinct. The tails of the specimens examined by me are long, while they are usually stated to be short in the domestic cats from Java and Sumatra, but it is well known that the length of the tail is subject to wide variations (cf. Von Martens, 1862, p. 11 on domestic cats from

TABLE IV
Cranial measurements of *Felis catus* L., in mm

	condylobasal length	greatest length	zygomatic width	postorbital constriction	width of braincase	alveolar length P ³ —M ¹	alveolar length P ₃ —M ₁	length of P ⁴	length of M ₁
Timor ♂	89.3	96.5	67.1	29.4	42.6	19.1	21.8	11.8	9.2
" ♀	78.6	84.8	59.3	32.1	41.9	17.1	19.3	10.4	7.9
Deli ♂	79.9	87.5	63.1	26.9	39.6	16.2	19.4	9.8	7.4
Soerabaja ♀ . . .	76.9	84.0	57.3	30.1	40.2	17.3	18.6	9.9	7.3
Boeroe ♂	—	—	63.0	31.5	—	17.6	20.2	10.4	8.3
Siamese ♂	86.0	92.8	68.7	24.9	40.5	17.3	18.7	10.0	7.7
♀	81.1	88.6	58.2	29.3	41.5	16.4	18.7	8.4	5.6
♀	86.7	96.4	66.6	29.8	41.9	17.3	19.4	10.2	7.6
♀	80.0	84.9	60.8	29.6	40.6	16.4	18.2	9.7	7.1
Sex?	79.6	87.0	59.5	22.5	37.6	16.0	—	9.1	—

the Malay Archipelago). The ears are large and on this character Müller based the specific name, but the javanese specimens examined by me have ears that are just as large.

After examining these specimens I am convinced that the wild cats from Timor are feral domestic cats and I am glad to state that Prof. Max Weber (1935, in litt.) is also of this opinion.

Jentink (1883, p. 177) described a cat from Priaman, W. Sumatra, which approached *Felis caligata* Temm. (= *Felis ocreata* Gmel.) in its markings, but which he was unable to identify; in 1892 he mentioned it in his systematic catalogue of the mammal collection under the heading *Felis caligata* Temm., though with a point of interrogation. Unhappily the skull was not available for study, it being put in the mounted skin. The

specimen is of a brownish colour with transverse dark stripes on the sides of the body, and two dark longitudinal lines on the back; the ears without a light spot on the outer surface. In its markings it resembles in all respects the domestic cats of the striped tabby type, feral specimens of which have been described as *Felis torquata* F. Cuvier (one of the types in the Leiden Museum examined).

Felis silvestris Schreb.

Felis (catus) silvestris Schreber, Säugeth., vol. 3, 1777, p. 397.

Felis sylvestris, Pocock, P.Z.S., 1907, p. 149; Pocock, Ann. Mag. N. H., ser. 8, vol. 18, 1916, p. 272, figs. a—d.

Felis silvestris, Miller, Cat. Mamm. W. Europe, 1912, p. 457, figs. 96—98.

Felis catus, Jentink, Cat. Ost., 1887, p. 87.

Specimens examined:

- 1 ex., Forêt de Moladier, Allier, France, leg. E. Olivier, don. F. Lataste, B.M. reg. no. 19.7.7.2901, skull.
- 1 ex., ♂, Forêt de Moladier, near Moulins, E. France, leg. E. Olivier, don. F. Lataste, B.M. reg. no. 19.7.7. 3645, skull.
- 1 ex., Prov. Burgos, Spain, leg. Gonzalez, B.M. reg. no. 8.7.7.10, skull.
- 1 ex., Mafra, Portugal, XII. 1864, rec. from Lissabon Mus., cat. ost.: c, skull.
- 1 ex., from the Prince of Neuwied, 1865, cat. ost.: d, skull.

Jentink (1887, p. 87: b) mentioned the skull of an adult specimen as belonging to this species, but it proved to be the skull of a young lynx in tooth-change. One of the skulls from France (B.M. reg. no. 19.7.7.2901) has a very small and weak additional premolar in the left upper jaw, in front of P².

Felis ocreata Gmel.

Felis ocreata Gmelin, Anhang, Reise Bruce, 1791, p. 79 (non vidi).

Felis caligata, Jentink, Cat. Ost., 1887, p. 88.

Lyncus caracal, Jentink, Cat. Ost., 1887, p. 88 (skull: a).

The skull "a", mentioned by Jentink under *Lyncus caracal*, in reality belongs to *Felis ocreata* Gmel. This is, of course, also the case with the skulls mentioned by Jentink under *Felis caligata*.

Oncilla pardinoides (Gray).

Felis pardinoides Gray, P.Z.S., 1867, p. 400.

Felis minuta, Jentink, Cat. Ost., 1887, p. 85 (skull: g).

Cf. also Allen, Bull. Am. Mus. N. H., vol. 41, 1919, p. 358.

To this species belongs the skull "g" mentioned by Jentink (1887, p. 86) under *Felis minuta*.

Otocolobus J. F. Brandt

Otocolobus J. F. Brandt, Bull. sc. Ac. Imp. Sci. St. Pétersb., vol. 9, pt. 2/3 (194/195), 1842, p. 38 footnote; Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 386; Pocock, P.Z.S., 1907, p. 302; Birula, Ann. Mus. Zool. Petrogr., vol. 21, (1916) 1917, p. 130; Allen, Bull. Am. Mus. N.H., vol. 41, 1919, p. 338.

Manul, Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 390.

Octalobus, Elliot, Mon. Felidae, pt. 8, 1881 (in synonymy of *Felis manul* Pall.); Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 57 (in synonymy of *Felis manul*).

Catus (part.), Matschie, SB. Ges. natf. Fr. Berl., 1895, p. 198; Ihering, Arch. Natg., 76, 1910, vol. 1, pt. 2, p. 134.

Trichaelurus Satunin, Ann. Mus. Zool. St. Pétersb., vol. 9, (1904) 1905, p. 495; Satunin, Mitt. Kaukas. Mus., vol. 4, 1909, p. 232, 251; Pocock, Ann. Mag. N.H., ser. 8, vol. 20, 1917, p. 335; Allen, Bull. Am. Mus. N.H., vol. 41, 1919, p. 338; Kretzoi, Xe Congr. Int. Zool. Budapest (1927), vol. 2, 1929, p. 1327.

The nomenclature of this genus is somewhat confused. Satunin (1905, p. 495) believed that the name *Otocolobus* for this cat was first proposed by Severtzow (1858, p. 386) and that it was preoccupied by *Otocolobus* J. F. Brandt (1844, p. 382) for a rodent. That this view was wrong has been proved by Birula (1914, p. LVII); for, as this author showed, *Otocolobus* was first used for *Felis manul* by J. F. Brandt in 1842. The use of the name for a rodent in 1844 (J. F. Brandt, 1844, p. 382) was obviously due to a misprint (or a lapsus) for *Colobotus*, for Brandt wrote: "division C du sousgenre *Otocolobus*"; now in his paper (1844) no further mention of a subgenus *Otocolobus* is made, but he subdivides *Colobotus* into different sections among which "division C". The case is therefore just the opposite of that stated by Satunin who wrote that Brandt changed the name *Otocolobus* into *Colobotus*. Satunin overlooked also that if *Otocolobus* should have been preoccupied another name was available for it, as Severtzow (1858, p. 390) wrote that he would have liked better to use *Manul* as a subgeneric name for *Felis manul*. That he did not accept this name (Allen, 1919, p. 338) is of no importance. Be that as it may, the name *Otocolobus* as a generic name is available for *Felis manul* Pall., and must be used for it instead of the current *Trichaelurus*. Besides ordinary misprints, like *Otocalobus* (Pocock, 1917, p. 335) more serious changes are given in the synonymies by different authors, e.g., *Octalobus* by Elliot (1881) and Grevé (1895, p. 57).

Puma concolor (L.).

Felis concolor Linnaeus, Mantissa Plant., 1771, p. 522.

Felis pardus, Jentink, Cat. Ost., 1887, p. 82 (skull f).

To this species I refer the skull "f" mentioned by Jentink under *Felis pardus*, and which is labelled Sumatra.

Leopardus pardalis (L.) (pl. I fig. 5).

- Felis tigrina*, Schlegel, P.Z.S., 1866, p. 419; Bateson, Mater. Var., 1894, p. 226.
Felis pardalis, Hensel, Morph. Jahrb., vol. 5, 1879, p. 541; Bateson, Mater. Var., 1894, p. 226.
Felis viverrina, Jentink, Cat. Ost., 1887, p. 83 (skull c); Jentink, Cat. Syst., 1892, p. 99 (skull c).

After making careful comparisons I arrive at the conclusion that the skull "c" mentioned by Jentink (l.c.) under *Felis viverrina* does not belong to that species, but must be referred to *Leopardus pardalis* (L.). In the left lower jaw it has an accessory small tubercular molar (pl. I fig. 5) behind the lower carnassial. In all probability this is the specimen described by Schlegel (1866, p. 419) as *Felis tigrina*, as it is the only one in the collection showing this variation. A similar specimen, which also has a small additional molar behind the carnassial, has been described by Hensel (1879, p. 541).

Panthera tigris (L.) sp. (fig. 27, pl. III figs. 2—3, pl. IV, pl. V figs. 1, 2, 4, pl. VI, VIII, pl. IX figs. 1—4, pl. X).

- Felis tigris* Linnaeus, Systema Naturae, ed. X, vol. 1, 1758, p. 41; Busk, Proc. Roy. Soc. Lond., vol. 18, 1870, p. 544, pl. 8; Busk, P.Z.S., 1874, p. 146, pl. 24; Hiltzheimer, Zool. Anz., vol. 28, 1905, p. 594, 6 figs.; Leche, Zool. Jahrb. Syst., vol. 38, 1915, p. 316, figs. 70, 71; Sonntag, P.Z.S., 1923, p. 131, 133, 139, 140, 149, fig. 18; Chasen, Singapore Naturalist, no. 4, 1924, p. 80, and no. 5, 1925, p. 88; Dammerman, Treubia, vol. 8, 1926, p. 316; Banks, J. Mal. Br. Roy. As. Soc., vol. 9, pt. 2, 1931, p. 78.
† *Felis tigris*, Brandt, Bull. Ac. Imp. Sci. St. Pétersb., vol. 15, 1871, p. 152; Tscherski, Mém. Ac. Imp. St. Pétersb., ser. 7, vol. 40, 1892, p. 17, 20, 45, 46, 57, pl. 1 figs. 1—5; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 19; Dammerman, Treubia, vol. 14, 1934, p. 481.
† *Felis tigris*, Tscherski, Mém. Ac. Imp. Sci. St. Pétersb., ser. 7, vol. 40, 1892, p. 51 (err. typ.).
Felis "tigris", Lyon, Proc. U. S. Nat. Mus., vol. 36, 1909, p. 490.
Tigris tigris, Pocock, Ann. Mag. N.H., ser. 8, vol. 18, 1916, p. 315.
Panthera tigris, Pocock, Ann. Mag. N. H., ser. 8, vol. 19, 1917, p. 121, 122, 132, fig. 12.
† *Felis* aff. *tigris*, Matthew & Granger, Bull. Am. Mus. N. H., vol. 48, 1923, p. 584, fig. 16.
† *Felis tigris soloensis* Von Koenigswald, Wet. Med. Mijnb. Ned. Ind., no. 23, 1933, p. 5, 14, 21, 26, 88, pl. VI fig. 2, pl. VII, pl. VIII fig. 8; Von Koenigswald, Ingen. in Ned. Ind., vol. 1, pt. 11, sect. 4, 1934, p. 191, 193, 194.
Tigris striatus Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 386.
Tigris regalis, Gray, Cat. Bones Mamm. B. M., 1862, p. 60; Gray, P.Z.S., 1867, p. 263; Gray, Ann. Mag. N. H., ser. 4, vol. 14, 1874, p. 353.
† *Felis groeneweldtii* Dubois, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 24, 1907, p. 454; Dubois, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 25, 1908, p. 1267; Martin, Palaeozool. Kennntn. Java, 1919, p. 120; Kretzoi, Xe Congr. Int. Zool. Budapest (1927), vol. 2, 1929, p. 1293; Van der Maarel, Leidsche Geol. Meded., vol. 5, 1931, p. 476; Von Koenigswald, Wet. Meded. Mijnb. Ned. Ind., no. 23, 1933, p. 5, 17, 19, 26, 99; Von Koenigswald, Ingen. in Ned. Ind., vol. 1, pt. 11, sect. 4, 1934, p. 191, 196.

† *Felis trinilensis* Dubois, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 25, 1908, p. 1266 (substitute name for *groeneveldtii*); Stremme, Centralbl. Min. Geol. Pal., 1911, p. 55; Stremme, Pithecanthropus-Schichten, 1911, p. 89; Martin, Palaeozool. Kennt. Java, 1919, p. 107, 120; Stehlin, Wet. Med. Mijnb. Ned. Ind., no. 3, 1925, p. 2; Kretzoi, Xe Congr. Int. Zool. Budapest (1927), vol. 2, 1929, p. 1293; Van Es, Age of Pithecanthropus, 1931, p. 31.

† *Leo trinilensis*, Kretzoi, Xe Congr. Int. Zool. Budapest (1927), vol. 2, 1929, p. 1325.

† *Felis oxygnatha* Dubois, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 25, 1908, p. 1266; Stremme, Centralbl. Min. Geol. Pal., 1911, p. 55; Stremme, Pithecanthropus-Schichten, 1911, p. 89; Martin, Palaeozool. Kenntn. Java, 1919, p. 107; Stehlin, Wet. Med. Mijnb. Ned. Ind., no. 3, 1925, p. 2; Van Es, Age of Pithecanthropus, 1931, p. 31; Van der Maarel, Leidsche Geol. Med., vol. 5, 1931, p. 472; Von Koenigswald, Wet. Med. Mijnb. Ned. Ind., no. 23, 1933, p. 5, 18, 26; Von Koenigswald, Ingen. in Ned. Ind., vol. 1, pt. 11, sect. 4, 1934, p. 196.

† *Felis oxygnathus*, Kretzoi, Xe Congr. Int. Zool. Budapest (1927), vol. 2, 1929, p. 1293.

† *Leo oxygnathus*, Kretzoi, Xe Congr. Int. Zool. Budapest (1927), vol. 2, 1929, p. 1325.

† *Feliopsis palaeojavanica* Stremme, Centralbl. Min. Geol. Pal., 1911, p. 55, 56, 86; Stremme, Pithecanthropus-Schichten, 1911, p. 86, pl. 16 figs. 3, 4, pl. 17 fig. 1; Martin, Palaeozool. Kennt. Java, 1919, p. 107; Stehlin, Wet. Med. Mijnb. Ned. Ind., no. 3, 1925, p. 2; Kretzoi, Xe Congr. Int. Zool. Budapest (1927), vol. 2, 1929, p. 1325; Van Es, Age of Pithecanthropus, 1931, p. 31; Van der Maarel, Leidsche Geol. Med., vol. 5, 1931, p. 472.

† *Felis palaeojavanica*, Von Koenigswald, Wet. Med. Mijnb. Ned. Ind., no. 23, 1933, p. 5, 6 et seq., 19, 21, 26, 88, 99, pls. I—IV, pl. V figs. 1—4, pl. VIII figs. 1—6; Von Koenigswald, Ingen. in Ned. Ind., vol. 1, pt. 11, sect. 4, 1934, p. 191, 193, 194.

† "tiger", Van Es, Fourth Pacific Sc. Congr. (Java, 1929), vol. 3, 1930, p. 336 (prehistoric).

† *Hijaena*, Anonymous, Verslag v. h. Mijneuzen, 3de kwartaal 1893, 1893, p. 15.

In *Panthera tigris* the posterior border of the palate shows some variations, which may be noted here. In some specimens the palate ends in a small pointed processus above the mesopterygoid fossa, but in one specimen (loc. ?, no. 389), the palatina are followed by a small pointed bone, which is rather loosely fixed by sutures to the palatina. In none of the other specimens examined by me did I find this bone, but it is probable that it got lost during the preparation of the skulls, for in a number of specimens the palate ends in a notch with rough borders in which the small bone may have fitted.

The recent tigers of the Malay Archipelago can be divided into three distinct subspecies, on which some notes will be given below. Although several records exist in the older literature (Gray, 1862, p. 60; 1867, p. 263; 1874, p. 353) which mention the occurrence of the tiger in Borneo, no conclusive evidence exists on this subject; in all probability these records were based on wrongly labelled specimens. The not occurring of the tiger in Borneo, while present in both Sumatra and Java, has given rise to the zoogeographical hypothesis that the tiger reached the Archipelago at a

time when Sumatra and Java were still connected, but when these islands were separated already from Borneo, probably relatively late in the pliocene. Should this prove to be true, the occurrence of a fossil tiger in the Trinil-fauna may be of some importance for the determination of the age of the Trinil-beds; this would support the conclusions arrived at by several authors that the Trinil-fauna probably should be referred to the middle pliocene.

From the prehistoric javanese Sampoeng-fauna the tiger has been recorded by Van Es (1930, p. 336) and Dammerman (1934 b, p. 481).

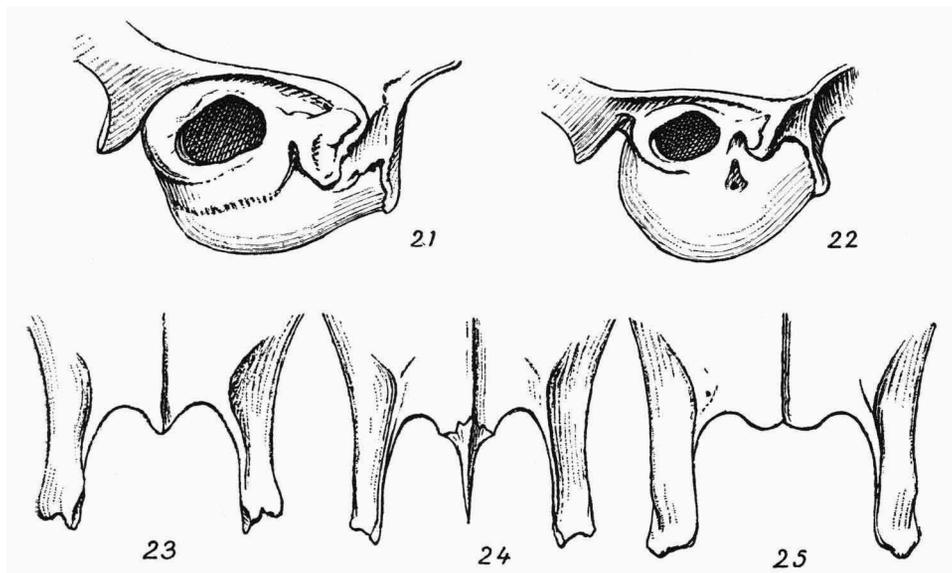


Fig. 21, *Felis catus* L., ♂, Timor (*F. megalotis* S. Müll.), left bulla; fig. 22, *Prionailurus bengalensis sumatranus* (Horsf.), cat. ost.: t, left bulla. fig. 23—25, variations in the posterior border of the palate of *Panthera tigris* (L.) sp.; fig. 23, *P. t. sumatrae* Poc., reg. no. 315; fig. 24, *P.t.* subspec., no. 389; fig. 25, *P.t. sondaica* (Temm.), cat. ost.: o.

Figs. 21—22, $\times 1\frac{1}{2}$; figs. 23—25, $\times \frac{3}{4}$.

Remains which could not be identified with certainty were mentioned by Von Koeningswald (1934, p. 191) as *Felis* cf. *tigris*.

Our knowledge of the early history of this species in continental Asia is also rather scanty. Matthew and Granger (1923, p. 584, fig. 16), described as *Felis* aff. *tigris* a fossil skull, jaws and limb bones from pliocene deposits at Yen-ching-kao (near Wan-shien, Sze-chuan), China; they did not find any differences between the complete fossil skull and the

recent tiger-skulls examined by them, but they considered it not impossible that a closer examination should reveal such differences. In the pliocene age the species had already a wide distribution. Brandt (1871, p. 152) mentions remains of tigers from a pliocene cave-fauna in the Altai Mts., while Tscherski (1892, p. 46, 47) mentions this species from Siberia (river-basin of the river Jana) and from the Island of Bolschoj Ljachow (off the north coast of Siberia). A doubtful record exists for the young-pliocene fauna of the Karnul Caves in British India (Lydekker, 1886 a, p. 120; 1886 b, p. 29; Dubois, 1888, p. 4; Pilgrim, 1932, p. 199); as stated by Lydekker it is not impossible that the fossils examined by him were those of a lion. Grevé (1895, p. 19) mentions the tiger from the postpliocene of Java, but it is not stated on what material he based this record; the occurrence in the pliocene of Java has been confirmed by Von Koenigswald (1933, p. 14) and also in the present paper. The wide distribution of the tiger in the pliocene makes it hardly probable that the species should have reached British India in historic times as supposed by Stewart (1903, p. 109), who did not find any allusion to it in the old British-Indian literature of the period prior to the arrival of the mohammedan conquerors in India.

The distinctive characters of the tiger skull as opposed to those of the lion have been discussed already by several authors (Owen, 1834 p. 1—2; Boule, 1906, p. 71—73; and others), but as has been shown by Pocock (1929, p. 507—508) there does not seem to be a single character which is absolutely characteristic for either of these species, as the range of variation of these characters overlap. In most cases, however, it will be possible to identify fossil specimens and recent skulls with almost perfect certainty as belonging to the one or the other of these species. The variation of the teeth of *Panthera tigris* (L.) has been studied by several authors (Busk, 1870, 1874; Hilzheimer, 1905; Pocock, 1930, p. 65, pl. 1 figs a—c), and it has been proved that great individual variations as to size and as to the development of the different cusps exist. Busk (1870, 1874) introduced the method of using odontograms for easy comparisons of the dentitions of the different species, but as in these odontograms only the measurements of a single specimen or the mean for a series of specimens are indicated, and not the range of variation of the species, this method did not seem very satisfactory to me. I believe that it is much more useful to compare the range of variation of the measurements of each tooth separately than to construct the odontograms as proposed by Busk.

In the following notes I shall first discuss the fossil species which I refer to the synonymy of *Panthera tigris* (L.) sp., and afterwards I give

some notes on the recent subspecies from the Malay Archipelago, as well as on the nomenclature of some of the races from the Asiatic Continent.

Fossil specimens were examined from the following localities: Trinil, Bangle, Djeroek, Kedoeng Broeboes, Kebon Doeren, and Tegoean.

no. 1479. Right lower jaw, Trinil, XII. 1891 (*Felis trinilensis*). A nearly complete right lower jaw, only the processus coronoideus being broken and the condyle slightly damaged. Incisivi lost, canine damaged (pl. V figs. 1, 4). The three cheekteeth (P_3 — M_1) stand in a curved series, with the concavity on the lingual side. Posterior extremity of P_3 just touching anterior extremity of P_4 ; M_1 with its anterior extremity situated lingually of the posterior extremity of P_4 . When placed on a flat table the lower jaw rests on this table at three different points: at the symphysis, at the processus angularis and at a point below P_4 . In most tigers the jaw rests only on the symphysis and the processus angularis, but some of the specimens examined by me also show the same bulging out below the cheekteeth. In all its characters the jaw is a real tiger jaw.

no. 1494. Two fragments of a left upper jaw, fitting well together, Trinil (pl. III fig. 3; pl. IV fig 2). I^2 present, but crown broken; other incisivi lost; canine present, only very slightly damaged. P^2 absent, but alveolus still present; P^3 and P^4 present, but slightly damaged. M^1 lost, but alveolus present. In all its characters this jaw agrees with that of *P. tigris*.

no. 1495. Fragment of right upper jaw, with a small part of the malar attached to it, Trinil (pl. III fig. 2; pl. IV fig. 1). The premaxillary is broken off; of the alveolus of the canine only the external and posterior borders are present. P^2 is absent, but the alveolus is still faintly indicated. P^3 and P^4 present, and only very slightly damaged. The anterior lingual cusp of P^3 which is small, but distinctly developed in the left upper jaw described above, is only very faintly indicated in this fragment. The small cusp which in tigers is often found on the buccal side of the anterior extremity of P^4 is absent. In this fragment the infraorbital foramen is completely preserved; it is situated just above the posterior root of P^3 . In most tigers it is situated above the anterior root of P^4 ; in such specimens the jaw bulges out over this root and below the infraorbital foramen. In our fragment where the foramen is situated above the (smaller) root of P^3 the jaw does not bulge out below the foramen, and therefore it seems as if the anterior basis of the zygomatic arch stands out more transversely than is usually in tigers. The difference is, however, only very small, and I do not think that any systematic (specific) value can be attached to it.

no. 1450. Fragment of a left upper jaw, Loc. ?; root of I^3 , root and

basal part of crown of canine present. Of P² only the root is preserved; P³ is much damaged.

no. 1496. Fragment of a right frontal with processus postorbitale, Trinil.

no. 1497. Kedoeng Broeboes, IV. 1892 (*Felis oxygnatha*).

- a. Fragment of right upper jaw with root of I³, part of canine, alveolus of P³ and a much damaged P⁴.
- b, c. Two fragments of left upper jaw, one with P⁴ and the alveolus of M¹, the other with the root of the canine.
- d, e. Fragments of squamosals with articular cavity for the mandible, the right one showing the cavity nearly complete, the left one incomplete.
- f. Fragment of right frontal with postorbital process.
- g. Fragment of right lower jaw with a fragment of M₁.

Besides these fragments this number contained several unidentifiable small skull-fragments.

no. 1867. Five canines.

- a. Right upper canine, Loc. ?
- b. Fragment of left upper canine, Djeroek.
- c. Right upper canine, Bangle.
- d. Left upper canine, Kedoeng Broeboes.
- e. Right lower canine, Kedoeng Broeboes.

no. 1868. Trinil.

- a. Left P³, anterior root broken off.
- b. Right P³ with a small fragment of the maxillary.
- c. Two fragments of a right P⁴.

no. 1869. Kebon Doeren.

- a. Fragment of the right maxillary with the alveolus for the canine.
- b. Fragment of the right mandible with fragments of P₄ and M₁.
- c. Fragment of the squamosal with articular cavity for the mandible.
- d. Fragment of the right malar.

no. 1963. Fragment of atlas, Kedoeng Broeboes.

no. 4233. Fragment of a left upper jaw with slightly damaged I³ and with the root of the canine. Loc. ?

no. 6219. Fragment of a left upper jaw with P³ and P⁴. P⁴ shows a feebly developed buccal cusp at its anterior extremity. Loc. ?

no. 6220. Left P⁴, Djeroek.

Several authors (Busk, 1874, p. 146, pl. 24; Hilzheimer, 1905, p. 594, figs. 1—6; Pocock, 1930, p. 65) have described the variations occurring in the cheekteeth of the tigers. From their writings and also from personal observation I became convinced that not too much stress must be

laid on small differences in the development of the different cusps. In his description of *Felis trinilensis* Dubois (1908, p. 1267) mentioned that in his new species the upper third and fourth premolar had a more simple structure than in the tiger. As far as P³ is concerned this perhaps refers to the fact that the small anterior cusp of this premolar which is placed on the lingual side is hardly discernible in specimen no. 1495, thus giving the anterior side of the tooth a smooth and rounded appearance. In another jaw (no. 1494) P³ has a distinctly developed anterior lingual cusp. In P⁴ the buccal cusp at its anterior extremity is present, but feebly developed in one specimen (no. 6219) and absent in another (no. 1495). Between the fossil teeth and those of recent tigers I did not find differences, which are important enough to warrant specific distinction of the fossil form.

In table V the range of variation of the actual measurements of the jaws and teeth of recent and fossil tigers is shown. In column I of this table I have given the range of variation in the recent specimens examined by me; column II gives the range of variation of recent tigers taken from the tables of measurements given by Busk (1874, p. 149, 150), Hilzheimer (1905, p. 59) and Pocock (1929). Busk gave his measurements in hundredths of an inch; to convert these measurements in mm, and keeping at the same time the same grade of exactness as used by Busk, I took one hundredth of an inch to be one fourth of a millimeter. Hilzheimer gave his measurements in fourths of a millimeter. Column III shows the variation of the fossil specimens examined by me, while in column IV the variation of the specimens described by Von Koenigswald (1933) is given.

Table V

Range of variation of the measurements of jaws and teeth of *Panthera tigris* (L.).

	I	II	III	IV
Upper jaw	104.6—132.6		121.3	
P ³	19.3— 22.8	20—25	19.7—25.3	23—28.5
P ⁴	30.3— 35.4	29—38	30.5—38.8	29—37.5
Lower jaw	169.8—216.6		195.2	
P ₃	13.7— 16.4	15—18½	15.2	15—19
P ₄	20.8— 23.0	21—26¼	22.0—22.9	±22—28.5
M ₁	23.0— 27.0	20—30	23.8	24—30

From this table it is evident that the fossil teeth may reach a slightly

larger size than those of recent tigers; the difference is, however, only very small, and not of specific value.

For the teeth I calculated a length index, which shows the relation between the length of the tooth and the jaw. This index was calculated as follows: $\frac{\text{length of tooth} \times 100}{\text{length of jaw}}$. The range of variation of the indices of the teeth of the recent and fossil tigers examined by me is shown in table VI.

Table VI

Length indices of cheekteeth of *Panthera tigris* (L.) sp.

	recent	fossil
P ³	16.8—18.8	16.2
P ⁴	26.1—29.7	25.1
P ₃	7.0— 8.6	7.8
P ₄	10.0—12.1	11.3
M ₁	11.9—15.0	12.2

TABLE VII

Measurements of fossil jaws and teeth of *Panthera tigris* (L.) sp., in mm

	Length of upper jaw	Length of canine (alv.)	Length of P ³	Width of P ³	Length of P ⁴	Width of P ⁴	Dias-tema		
Coll. Dub. no. 1494	121.3	25.1	19.7	10.0	30.5	±16.4	15.4		
" 1495	—	—	20.0	9.5	30.9	16.6	13.9		
" 6219	—	—	25.3	13.4	38.8	20.1	—		
" 1450	—	28.8	23.2	13.3	—	—	—		
" 4233	—	30.9	—	—	—	—	—		
" 1497	—	25.3	—	—	29.7+	±18.6	—		
	—	—	—	—	27.8+	±17.3	—		
	Length of mandible	Length of canine (alv.)	Length of P ₃	Width of P ₃	Length of P ₄	Width of P ₄	Length of M ₁	Width of M ₁	Dias-tema
Coll. Dub. no. 1479	195.2	23.4	15.2	7.3	20.0	10.8	23.8	12.1	20.4
" 1498	—	23.5	—	—	22.8	11.0	—	—	15.5
" 1499	—	—	—	—	22.9	11.0	20+	12.5	—

Comparison of the indices of the teeth of the recent tigers examined by me, with those of the fossil jaws shows that the indices for the lower cheekteeth fall well within the range of variation of the recent specimens, but that the indices for the upper premolars are slightly lower than the values found for those of the recent tigers; as the differences are only very small no great importance can be attached to them.

In the original description of *Felis oxygnatha* Dubois (1908, p. 1266) mentions only characters that were derived from the structure of the lower jaw and its teeth; therefore the following two fragments may be considered the types of that species, as they are the only ones among those registered as *Felis oxygnatha*, which show the characters mentioned in that description. The other fragments registered under this species have been dealt with above (p. 52).

no. 1498. Fragment of a right mandible, Kedoeng Broeboes. Symphysis slightly damaged, root of canine present, as well as roots of P_3 . P_4 well preserved, slightly worn; alveolus for anterior root of M_1 . Only one foramen mentale is present. In general appearance this jaw agrees very well with that of the tiger. The lower border seems to have been concave, turning slightly upwards behind the symphysis. The development of the roots show that P_3 was rather strongly developed. P_4 shows a tubercular development of the posterior cingulum which is also sometimes found in recent tigers. To the narrow chin which was mentioned by Dubois as a distinctive feature of the species, I do not attach very great importance, for the upper part of the symphysis is broken off, exposing the root of the canine, so that the width of the symphyseal part cannot be measured exactly. Moreover in the skull of a recent tiger (loc.?, no. 389) I measured the symphyseal part of each mandible as it was visible from above between the canine and the suture between the mandible; the left half measured 8.4 mm, the right one 11.6 mm, showing that the width of the symphyseal part of left and right mandible need not be the same in one specimen. The difference in the width of the symphysis between the fossil and recent tigers, if at all existent, seems to be only very small and of no specific value. Dubois also states that, as a consequence of the narrow chin, the canines are directed strongly obliquely outwards; if, however, the fossil fragment and a recent tiger-jaw are placed in exactly the same position the difference between the direction of the canines is only very slight, and probably due to individual variation. Moreover in the fossil only the root of the canine is present, and this seems to me to have very much the same position as in recent tigers.

no. 1499. The second fragment which served as a cotype for Dubois'

description of *Felis oxygnatha* is also a fragment of a right lower jaw, which is, however, much damaged and weathered. P_4 is present, the posterior cusp broken; M_1 is also damaged, small parts of the anterior and posterior extremity being broken off. Dubois (1908, p. 1266) mentions that the M_1 was relatively short. It is, however, very difficult to estimate its exact size as it is damaged, but judging by comparisons it will have been about just as long as P_4 . Now in recent tigers (at least those from the Archipelago) the lower molar is generally longer than the P_4 , but Hilzheimer (1905, p. 598) has shown that this is not always the case, for among the chinese tiger-skulls examined by him there were some in which molar and fourth premolar were equal in size, thus approaching more or less *Panthera pardus* (L.) in which the difference between these two teeth is very small. Moreover the actual measurements of the teeth agree very well with those of recent tigers, and therefore I do not hesitate to refer *Felis oxygnatha* to the synonymy of *Panthera tigris* (L.) sp.

Besides to *Panthera tigris* (L.), Dubois also compared this species to *Panthera leo* (L.), *Panthera pardus* (L.), *Neofelis nebulosa* (Griff.), *Uncia uncia* (Schreb.) and *Acinonyx jubatus* (Schreb.). As might be expected from the close relationship existing between these species the fossil specimens resemble *P. leo* and *P. pardus*; the resemblances to the other three species are only very slight and of no systematic importance.

To *Panthera tigris* (L.) sp. I also refer a fragment of the left lower jaw with a milkcarnassial (p_4) (pl. V fig. 2) which agrees in all characters with that of recent tigers (pl. V fig. 3). In the Collectie Dubois it was registered as *Hyaena* (no. 1481). This does not infer, however, that the other remains registered as *Hyaena* (from other localities) are also to be referred to *Panthera tigris*.

Feliopsis palaeojavanica was described by Stremme (1911 a, p. 56; 1911 b, p. 86, pl. 16 figs. 3, 4, pl. 17 fig. 1) from rather scanty remains. More complete specimens were studied by Von Koenigswald (1933, p. 6) who arrived at the conclusion that the genus *Feliopsis* could not be separated from the genus *Felis* in its wider sense. Von Koenigswald compared the fossil specimens to different species and subspecies: *Panthera tigris sondaica* (Temm.), *Panthera tigris tigris* (L.), *Panthera leo* (L.) and *Panthera leo spelaea* (Goldfuss). In the first place this author compared the ratio existing between the greatest length of the skull and the zygomatic width. This ratio is calculated by him to two points of decimals, but I believe this to be unnecessary as the greatest length of the fossil skull examined by Von Koenigswald is not exactly known. The greatest length actually measured is 373 mm, but according to Von Koenigswald 15 or

20 mm must be added for the part of the occiput which was broken off; in his calculations, however, he used 380 mm for the greatest length, thus adding only 7 mm. The ratio calculated from this measurement (380 mm) is 1.58 (in Von Koenigswald's paper it is given as 1.52; small differences are also found between some of the other calculations made by this author and those made by me); if we do add 15 mm to the greatest length actually measured, the ratio becomes 1.61, and if 20 mm is added it becomes 1.63. This I believe shows that even the first decimal is practically valueless if one of the measurements cannot be taken with the necessary exactness. Be that as it may, to get some idea of the range of variation of this ratio in *Panthera tigris* (L.) I calculated it for the tigerskulls in the Leiden Museum, for some of those in the British Museum, and also from the measurements given by Pocock (1929), Schneider (1905, p. 100), Robinson and Kloss (1918, p. 8), Goodwin (1933, p. 8) and from some of those given in Rowland Ward's Records (1922). The range of variation of the ratio between greatest length and zygomatic width is 1.3—1.8; the ratio 1.4 is most common, then following 1.5, while 1.3 occurs in a few cases only; 1.6, 1.7, and 1.8 were found in one case each, these latter three ratio's were calculated from the measurements of sumatran tigers given by Schneider. For the different subspecies the ratio's varied as follows:

<i>Panthera tigris tigris</i> (L.)	(22 ex.)	1.3—1.6
<i>Panthera tigris virgata</i> (Ill.)	(3 ex.)	1.4
<i>Panthera tigris amoyensis</i> (Hilzh.)	(2 ex.)	1.4—1.5
<i>Panthera tigris altaicus</i> (Temmm.)	(4 ex.)	1.4—1.5
<i>Panthera tigris tigris?</i> (from Malay Pen.)	(9 ex.)	1.3—1.5
<i>Panthera tigris sumatrae</i> Poc.	(13 ex.)	1.3—1.8 ¹⁾
<i>Panthera tigris sondaica</i> (Temmm.)	(15 ex.)	1.4—1.5
<i>Panthera tigris balica</i> (Schwarz)	(1 ex.)	1.5

This shows that the ratio is subject to a wide variation, and that the fossil skull described by Von Koenigswald falls within the range of variation of the recent species. For comparison I also calculated the same ratio for *Panthera leo* (L.). Von Koenigswald gives the variation of this ratio as 1.34—1.45. For my calculations I made use of the tables of measurements given by Allen (1924, p. 237) for three different subspecies. For

1) The ratio 1.3 was found in a sumatran tiger figured by Blainville (1843, p. 17). The measurements of this skull as given me by Dr. Rode differ slightly from those taken by Pocock (1929, p. 537) from Blainville's figure. The greatest length is 317 mm, the zygomatic width is 252 mm.

these three races the range of variation of the greatest length/zygomatic width-ratio is the following:

<i>Panthera leo azandica</i> (Allen)	(12 ex.)	1.4—1.6
<i>Panthera leo nyanzae</i> (Heller)	(15 ex.)	1.4—1.5
<i>Panthera leo massaica</i> (Neum.)	(21 ex.)	1.4—1.6

The measurements used were all taken from wild-killed lions, and it is interesting to note that lower values were found in specimens that were reared in captivity. Allen gives the measurements of four captive lions (2 ♂♂, 2 ♀♀), three of which show the ratio 1.3, the fourth 1.4. It is not impossible that the skull mentioned by Von Koenigswald as having the ratio 1.34 also belonged to a captive lion. As stated by Von Koenigswald the measurements used by him were taken from Boyd Dawkins' treatise on the cave-lion, and one of the skulls mentioned by Dawkins (1868, p. 60) as belonging to the Oxford Museum showed the low value for this ratio. As Professor E. S. Goodrich kindly informs me the skull is not now in the Oxford Museum so that it is impossible to ascertain whether it belonged to a Zoo-specimen. Several authors (Hollister, 1917, and 1918, p. 158—161, pl. 52—55; Wood Jones, 1918; Howell, 1925) have already pointed out that the skulls of lions which have been reared in captivity show marked differences from those of wild killed specimens, and that therefore it is unsafe to use skulls of captive lions for comparison.

Of *Panthera tigris* I examined only one distinctly abnormal skull; the snout was depressed above, somewhat resembling the condition in *Uncia uncia* (Schreb.), and the lower jaw was convex inferiorly like it is generally the case in lions. This skull belonged to a tiger which was born and reared in captivity. Another specimen had four incisivi in the left mandible and the normal three in the right mandible. As the outer three of the left side resembled most those of the right side, the medial left incisivus may be considered to be the additional one. In this specimen P₄ had three roots instead of two. The third (additional) root was very small and weak; it was placed in a separate alveolus on the buccal side near the middle of the tooth. That changes in the skulls of zoo specimens of *Panthera tigris* are rather scarce may possibly be due to the fact that in zoological gardens tigers are not reared from cubs to adults to such an extent as lions.

Judging by Von Koenigswald's description of the fossil skull and jaws which he identified as *Felis palaeojavanica* this fossil species resembles the recent *Panthera tigris* (L.) very much; its most striking feature being perhaps the great size of the skull. Now the size of this skull does not fall outside the range of variation of the species, though it is larger than that of the javanese subspecies (*Panthera tigris sondaica* (Temm.)).

The largest measurements for tigerskulls I find recorded by Rowland Ward (1922, p. 489). The six largest skulls mentioned by him show the following greatest length:

Locality	Length in inches	Length in mm ¹⁾
Cooch Behar	15¾	400
?	15¾	400
Assam	15 ³ / ₁₆	386
Cooch Behar	15 ¹ / ₈	384
Nepal	15	381
Bengal	15	381

Pocock (1929, p. 519) mentions a skull with a greatest length of 16 inches (= 406 mm).

These skulls seem to be about equal in size to the fossil skull described by Von Koenigswald. Unhappily I could not examine this fossil skull myself, but besides the description published by Von Koenigswald I had a series of good photographs of it, which made it possible for me to make some comparisons with the fossil specimens in the collectie Dubois.

After examining the skull-fragments and teeth, which were collected by Prof. Dubois, and after comparing them to the description given by Von Koenigswald of *Feliopsis palaeojavanica* Stremme, I do not find any important differences between *Felis trinilensis* Dubois and the former, nor do I find characters which warrant the specific distinction of these fossil forms from *Panthera tigris* (L.) sp.

Besides of *Felis palaeojavanica*, Von Koenigswald (1933, p. 14) gave descriptions of another large fossil cat from Java which he named *Felis tigris soloensis*. This subspecies differed from the recent javanese tiger only in the size as far as could be ascertained from the examination of the jaws (Von Koenigswald, 1933, p. 16). The differences from the recent Javanese tiger seem to be only very slight. Judging by the description I agree with Von Koenigswald's identification of the jaws described by him as belonging to *Panthera tigris*, but I do not believe that the subspecific name *soloensis* can be used for it. Whether this fossil tiger is identical with the Javanese subspecies I cannot say, as the remains examined by me are too scanty; it is, however, remarkable that the skull figured by Von Koenigswald (1933, pl. II) shows the narrow occiput that is characteristic for *Panthera tigris sondaica* (Temm.). This is also evident from a photo of the occiput of the same skull which I received for comparison. The

1) 1 inch = 25.4 mm

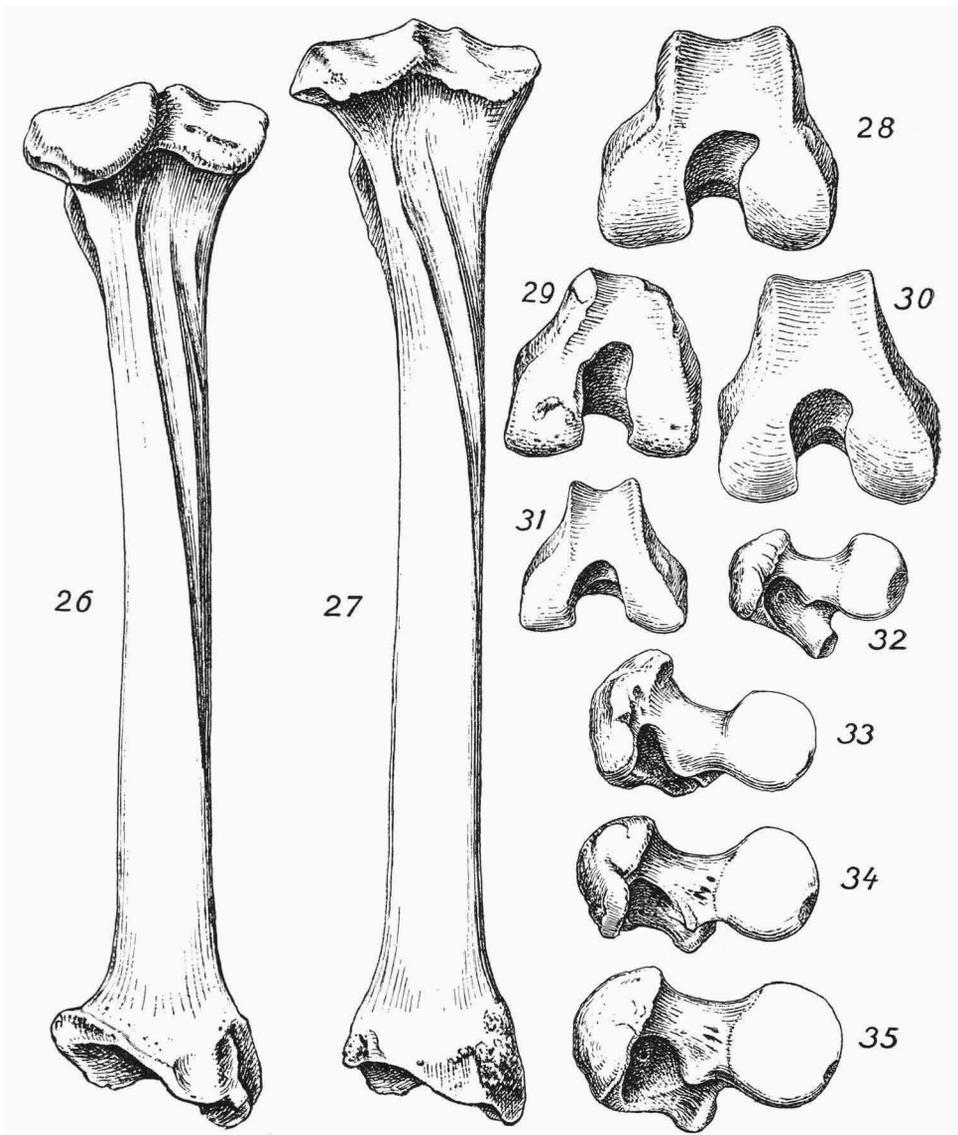


Fig. 26, *Panthera tigris sumatrae* Poc., reg. 991, left tibia, hind view; fig. 27, *Panthera tigris* (L.) sp., Coll. Dubois, no. 8411, left tibia, hind view; fig. 28, distal extremity of left femur of *Panthera tigris sumatrae* Poc., reg. no. 991; fig. 29, id. of *Panthera tigris sondaica* (Temm.), cat. ost.: a; fig. 31, id. of *Panthera pardus melas* (Cuvier), cat. ost.: a; fig. 32, proximal extremity of femur of *Panthera pardus melas* (Cuv.), cat. ost.: a; fig. 33, same of fossil femur, incertae sedis, Coll. Dubois, no. 89; fig. 34, id., *Panthera tigris sondaica* (Temm.), cat. ost.: a; fig. 35, id., *Panthera tigris sumatrae* Poc., reg. no. 991. All figures $\times \frac{1}{2}$.

fossil form seems, however, to reach a much greater size than the recent javanese subspecies, and it is not at all improbable that it will have to be retained as a distinct subspecies, which then should be known as *Panthera tigris groeneveldtii* (Dubois). Probably the larger specimens described as *F. palaeojavanica* were the males, the smaller ones described by Von Koenigswald as *Felis tigris soloensis* females.

To the present species I also refer provisionally the following limb bones: no. 8411. Left tibia. Trinil (textfig. 27, pl. VIII).

This tibia is larger than that of a sumatran tiger used for comparison, it differs from the latter chiefly in two features. 1. The tubercle for the attachment of the ligamentum patellae is longer in the fossil and slopes more downwards than in the tibia of the recent sumatran tiger. 2. The two ridges on the posterior surface of the tibia, between which the musculus flexor longus digitorum takes its origin, have a direction which is slightly different from that in recent tigers. As shown in textfig. 27 these ridges take their origin nearer to the lateral side of the tibia in the fossil than in the recent tibia (textfig. 26), and as in the former they cross the posterior surface of the tibia over a shorter distance, they run more obliquely in the fossil specimen than in the recent tigers examined. From the comparison of three recent left tiger-tibiae it was evident that the position of these oblique ridges and the course they take over the posterior surface of the tibia is subject to individual variations, though none of the recent tibiae shows the obliqueness to such an extent as the fossil. Some comparative measurements are given in the following table:

	greatest length	width (proximally)	width (distally)
cat. ost : a	260	65.9	47.1
reg. no. 991	277	68.3	51.1
Coll. Dubois, no. 8411	295	69.6	47.5

no. 1667. Left third metatarsal, Bangle (pl. IX fig. 3); length: 121.4 mm.

no. 8907. Right fourth metatarsal, loc.?

no. 1871. Left ulna. Trinil (pl. VI figs. 1, 3). This fossil ulna is larger and somewhat more heavily built than in the sumatran and javanese tigers examined for comparison. In the sagittal plane it is rather strongly curved, differing in this character from a recent javanese ulna, but resembling that of a sumatran tiger. That these bones are subject to a rather wide variation was proved by the comparison of the ulnae of a javanese, a sumatran and a manchurian tiger. It was evident that the ulna being straighter or more curved is variable individually.

no. 90. Right ulna, Tegoean (pl. VI figs. 2, 4), resembling in all characters the ulna described above, but smaller. Besides these two complete ulnae I examined two fragments consisting of the proximal part of the ulna, broken off at a short distance below the processus coronoideus. One of the (no. 9548) is larger than no. 1871, the other (no. 5429) is smaller and slightly more slender than no. 90. It is not impossible that no. 5429 belongs to another species, but the remains are too incomplete to arrive at a definite conclusion. Some measurements in mm of the ulnae are given in the following table:

	greatest length	length olecranon	sagittal diameter of olecranon
cat. ost. : a	288	44.7	46.7
reg. no. 991	302	44.8	49.8
cat. ost. : n	353	57.0	52.7
Coll. Dubois, no. 1871	323	57.7	54.3
" " " 90	290	48.9	50.4

no. 6259. Right second metacarpal, loc. ?; length 89.2 mm. Three fossil phalanges are present in the collection. Of these no. 6986 is a second phalanx, probably of the left fourth finger (pl. IX fig. 4); length: 43.3 mm. The other two, basal phalanges (nos. 6256, 6495), could not be ascribed with any certainty to one of the different digits. Four fragments of metacarpals and metatarsals (nos. 5486, 6263, 6987, 9179, locality unknown) lack the proximal part, which is most useful for the identification, and are therefore unidentifiable.

***Panthera tigris sumatrae* Pocock (figs. 1, 23, 26, 28, 35, 37, pl. V fig. 3).**

Panthera tigris sumatrae Pocock, J. Bomb. Nat. Hist. Soc., vol. 33, 1929, p. 535, pl. H, pl. I figs. C, D; Sody, J. Bomb. N. H. Soc., vol. 36, 1932, p. 234; Sody, Natk. Tijdschr. Ned. Ind., vol. 93, 1933, p. 89.

Felis tigris, Kerr, Anim. Kingd., Mamm., 1792, p. 141; Desmarest, Nouv. Dict. Hist. Nat., 2nd ed., vol. 6, 1816, p. 92; F. Cuvier, Dict. Sci. Nat., vol. 8, 1817, p. 211; Desmarest, Mammologie, vol. 1, 1820, p. 219; Temminck, Monogr. Mammal., vol. 1, 1825, p. 88; Lesson, Manuel Mamm., 1827, p. 181; Fischer, Syn. Mamm., vol. 1, 1829, p. 198; Lesson, Hist. Nat. Gén. Mammif., vol. 5, 1836, p. 336; Griffith, Anim. Kingd., vol. 2, 1837, p. 441; Müller, Verh. Nat. Gesch. Overz. Bez., Zool., 1839, p. 29, table; Wagner, Suppl. II Schreber, Säugeth., 1841, p. 469; Schinz, Syst. Verz., vol. 1, 1844, p. 429; Wagner, Abh. math. phys. Kl. bayer. Ak. Wiss., vol. 4, pt. 2, 1845, p. 82; Müller, Arch. Natg., 12, 1846, vol. 1, p. 112; Horsfield, Cat. Mamm. Mus. E. Ind. Cy., 1851, p. 43; Pöppig, Illustr. Naturg., vol. 1, 1851, p. 98; Bruyn Kops, Tijdschr. Taal-Land-Volkenk., vol. 2, 1854, p. 481; Gervais, Hist. Nat. Mammif., 1855, p. 85; Giebel, Säugeth., 1855, p. 867; Brandt, Mémoires. Ac. Imp. Sci. St. Pétersb., ser. 6, sc. math. phys. nat., vol. 8, 1856, p. 145 et seq.; Schlegel, Handl. Dierk., vol. 1, 1857, p. 22;

Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 388; Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 54; Blyth, P.Z.S., 1863, p. 182; Schlegel, Dierentuin, 1872, p. 32; Elliot, Mon. Felidae, pts. 4—5, 1879; Jentink, Aardr. Weekbl., vol. 2, 1881, p. 290; Mivart, The Cat, 1881, p. 393; Mohnicke, Pflanzen- u. Thierl., 1883, p. 407; Jentink, Cat. Ost., 1887, p. 81; Snelleman, Midd. Sumatra, IV, 1, Fauna, 1, 1887, p. 18, 21; Blanford, Fauna Brit. Ind., 1888, p. 55, 58; Hagen, Tijdschr. Kon. Ned. Aardr. Gen., ser. 2, vol. 7, 1890, p. 86; Weber, Zool. Ergebn., vol. 1, 1890, p. 94, 96; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 213, 216; Jentink, Cat. Syst., 1892, p. 96; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 48, 97; Lydekker, Handbook, 1895, p. 48; Flower, P.Z.S., 1900, p. 322; Koningsberger, Med. Plantent., no. 54, 1902, p. 12; Weber, Säuget., 1904, p. 530; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 204, 323; Koningsberger, Java Zool. Biol., pt. 7, 1913, p. 326; Van Balen, Dierenwereld, vol. 1, 1914, p. 346; Dammerman, Treubia, vol. 8, 1926, p. 316; Dammerman, Treubia, vol. 11, 1929, p. 34; Ménégau, Mammif., p. 244.

Felis (Panthera) tigris, Weber, Säuget., vol. 2, 1928, p. 319.

Felis tigris tigris, Kloss, J. Fed. Mal. St. Mus., vol. 10, 1921, p. 237.

Felis tigris subsp., Schwarz, Ann. Mag. N.H., ser. 8, vol. 10, 1912, p. 324; Schwarz, Ber. Senckenb. natf. Ges., vol. 44, pt. 1, 1913, pl. 2 fig. 1 a & b.

Uncia tigris, Trouessart, Bull. Soc. Et. Sci. Angers, suppl. 1884, 1885, p. 97.

Cynailurus tigris, Casto de Elera, Cat. Sist. Fauna Filip., vol. 1, 1895, p. 30.

Felis tigris nigra Lesson, Nouv. Tabl. R. Anim., 1842, p. 1842.

Felis tigris sumatrana Blainville, Ostéographie, 1843, pl. 7.

Felis tigris sondaicus Temminck, Fauna Japonica, Mamm., 1845, p. 43; Temminck, Coup-d'oeil Poss. Néerl., vol. 2, 1847, p. 88.

Felis tigris sondaica, Snelleman, Midd. Sumatra, IV, 1, Fauna, 1, 1887, p. 20; Grevé, Zool. Jahrb. Syst., vol. 6, 1891, p. 62; Grevé, Nova Acta Caes. Leop. Carol., vol. 63, 1895, p. 53, 97; Matschie, SB. Ges. Natf. Fr. Berl., 1895, p. 194; Robinson & Kloss, J. Fed. Mal. St. Mus., vol. 8, pt. 2, 1918, p. 8, 73; Jacobson, J. Fed. Mal. St. Mus., vol. 10, 1921, p. 237; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 53.

Felis (Uncia) tigris sondaica, Trouessart, Cat. Mamm., vol. 1, 1897, p. 352; Trouessart, Cat. Mamm., Suppl., 1904, p. 266.

Uncia tigris sondaica, Matschie, SB. Ges. natf. Fr. Berl., 1895, p. 199; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 56.

Felis tigris var. *sundaica*, Jentink, Cat. Syst., 1892, p. 96.

Tigris sondaicus, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 454.

Felis tigris regalis, Ludeking, Geneesk. Tijdschr. Ned. Ind., vol. 9, 1862, p. 40, 41.

? *Felis tigris ruber* Ludeking, Geneesk. Tijdschr. Ned. Ind., vol. 9, 1862, p. 41.

Specimens examined:

- 1 ex., ♀, Padang, Sumatra, leg. S. Müller, cat. syst.: d, mounted, cat. ost.: i, skull.
- 1 ex., ♀, Atjeh, Sumatra, from the Rotterdam Zoo, 1876, cat. syst.: e, mounted.
- 1 ex., ♂, Soengei Bras, Deli, Sumatra, from Rotterdam Zoo, reg. no. 925, mounted.
- 1 ex., ♀, Deli, Sumatra, don. Werdmüller, from Amsterdam Zoo, Mus. Amst., flat skin and skull.
- 1 ex., Sumatra, 1870, cat. ost.: e, incomplete skull.
- 1 ex., Padang, Sumatra, leg. Henrici, cat. ost.: g, skull.
- 2 ex., Sumatra, don. Dr. J. J. Haver Droeze, 15. XI. 1913, reg. no. 315, skulls.
- 1 ex., Painan, Padang Lowlands, leg. Steinbuch, don. E. Jacobson, reg. no. 872, skull.
- 1 ex., ♂ juv., Tjoebadak, Ophir distr., Sumatra, 6. V. 1915, leg. E. Jacobson, collection no. 5434, reg. no. 991, skin and skeleton.

Schwarz (1912, p. 324) separated the sumatran tiger as a distinct subspecies from the javanese tiger, without, however, giving it a name, and in 1929 Pocock proposed the name *Panthera tigris sumatrae* for it. It is not impossible that this subspecific name will have to be replaced by the name *ruber* given by Ludeking in 1862. This author (Ludeking, 1862, p. 40, 41) mentions that among the carnivores of the district of Agam (W. Sumatra) occur two species of tigers: *Felis tigris regalis* and *Felis tigris ruber*. Of the latter it is said that it resembles the former in all respects, except that it is smaller, and that the skin is reddish above and spotted below. If Ludeking had not written that it resembled his *Felis tigris regalis* I should have concluded that he meant *Profelis temminckii*, but it is not impossible that after all the name was based on a smaller specimen (♀?) with a reddish tinge. For the spots on the belly Ludeking does not use the ordinary Dutch word for spotted, but he wrote "gedaalderd" (derived from "daalder", a rather large round coin), which term he also used for the spots of panther-skins. It is, of course, possible that with these spots he meant the looped stripes on the sides of the belly. For the present I believe it better to retain the name *Panthera tigris sumatrae* Poc. for the sumatran subspecies, regarding *Felis tigris ruber* Ludeking as a doubtful subspecies.

A female from the Padang Highlands collected by S. Müller may be considered to be a cotype of *Felis tigris sondaicus* Temm., as it was in the collection prior to 1845 when this name was first published. This specimen, as well as a fully adult male from Deli, which lived for some time in the Rotterdam Zoo, resemble very much the specimen described by Pocock (1908, p. 890, fig. 174; 1929, p. 535, pl. H). A female from Atjeh, which is also a specimen from the Rotterdam Zoo, is somewhat more heavily striped, especially on the anterior part of the back. Neither does the skin of a cub from the Padang Highlands show any features of particular interest. In the adult specimens mentioned above the anterior surface of the fore-limb is nearly unstriped, but a living male in the Amsterdam Zoo has several stripes on the fore-limb.

***Panthera tigris sondaica* (Temminck) (figs. 25, 30, 34, 38, pl. XI).**

Felis tigris sondaicus Temminck, Fauna Japonica, Mamm., 1845, p. 43; Temminck, Coup-d'oeil Poss. Néerl., vol. 2, 1847, p. 88.

Felis tigris sondaica, Grevé, Zool. Jahrb. Syst., vol. 6, 1891, p. 62; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 53, 97; Matschie, SB. Ges. natf. Fr. Berl., 1895, p. 194; Pocock, P.Z.S., 1908, p. 890; Welch, P.Z.S., 1909, p. 892; Schwarz, Ann. Mag. N.H., ser. 8, vol. 10, 1912, p. 325 (cf. also Schwarz, Ber. Senckenb. natf. Ges., vol. 44, pt. 1, 1913, pl. 2 figs. a & b); Robinson & Kloss, J. Fed. Mal. St. Mus., vol.

8, pt. 2, 1918, p. 8; Jacobson, J. Fed. Mal. St. Mus., vol. 10, 1921, p. 237; Kloss, J. Fed. Mal. St. Mus., vol. 10, 1921, p. 237; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 53; Dammerman, Treubia, vol. 11, 1929, p. 34; Sody, Natk. Tijdschr. Ned. Ind., vol. 89, 1929, p. 164; Lydekker, Wild Life, vol. 2, p. 126.

Felis (Uncia) tigris sondaica, Trouessart, Cat. Mamm., vol. 1, 1897, p. 352; Trouessart, Cat. Mamm., Suppl., 1904, p. 266.

Uncia tigris sondaica, Matschie, SB. Ges. natf. Fr. Berl., 1895, p. 199; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 56.

Panthera tigris sondaica, Pocock, J. Bomb. N. H. Soc., vol. 33, 1929, p. 537, pl. I figs. a & b; Sody, J. Bomb. N. H. Soc., vol. 36, 1932, p. 234; Sody, Natk. Tijdschr. Ned. Ind., vol. 93, 1933, p. 89.

Tigris sondaicus, Fitzinger, SB. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 454.

Felis tigris, Kerr, Anim. Kingd., Mamm., 1792, p. 141; Temminck, Monogr. Mammal., vol. 1, 1825, p. 88; Lesson, Manuel Mamm., 1827, p. 181; Fischer, Syn. Mamm., vol. 1, 1829, p. 198; Temminck, Fauna Japonica, Coup-d'oeil, 1835, p. XXI; Lesson, Hist. Nat. Gén. Mammif., vol. 5, 1836, p. 336; Griffith, Anim. Kingd., vol. 2, 1837, p. 441; Müller, Verh. Nat. Gesch. Overz. Bez., Zool., 1839, p. 29, table; Wagner, Suppl. II Schreber, Säugeth., 1841, p. 469; Schinz, Syst. Verz., vol. 1, 1844, p. 429; Wagner, Abh. math. phys. Kl. bayer. Ak. Wiss., vol. 4, pt. 2, 1845, p. 82; Müller, Arch. Natg., 12, 1846, vol. 1, p. 112; Horsfield, Cat. Mamm. Mus. E. Ind. Cy., 1851, p. 43; Pöpping, Illustr. Naturg., vol. 1, 1851, p. 98; Gervais, Hist. Nat. Mammif., 1855, p. 85; Giebel, Säugeth., 1855, p. 867; Brandt, Mém. Ac. Imp. Sci. St. Pétersb., ser. 6, sc. math. phys. nat., vol. 8, 1856, p. 145 et seq.; Schlegel, Handl. Dierk., vol. 1, 1857, p. 22; Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 388; Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 54; Blyth, P.Z.S., 1863, p. 182; Schlegel, Dierentuin, 1872, p. 32; Elliot, Mon. Felidae, pts. 4—5, 1879; Jentink, Aardr. Weekbl., vol. 2, 1881, p. 290; Mivart, The Cat, 1881, p. 393; Mohnicke, Pflanzen-u. Thierl., 1883, p. 407; Jentink, Cat. Ost., 1887, p. 81; Blanford, Fauna Brit. Ind., 1888, p. 55, 58; Weber, Zool. Ergebn., vol. 1, 1890, p. 94, 97, 108; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 213, 216; Jentink, Cat. Syst., 1892, p. 96; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 48, 97; Kohlbrugge, Natk. Tijdschr. Ned. Ind., vol. 55, 1895, p. 176; Lydekker, Handbook, 1895, p. 48; Kohlbrugge, Natk. Tijdschr. Ned. Ind. vol. 55, 1896, p. 262; Flower, P.Z.S., 1900, p. 322; Koningsberger, Med. Plantent., no. 54, 1902, p. 12; Weber, Säuget., 1904, p. 530; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 204, 323; Koningsberger, Java Zool. Biol., pt. 7, 1913, p. 326, pt. 8/9, 1913, p. 420; Van Balen, Dierenwereld, vol. 1, 1914, p. 346; Dammerman, Treubia, vol. 11, 1929, p. 34; Ménégau, Mammif., p. 244.

Felis (Panthera) tigris, Weber, Säuget., vol. 2, 1928, p. 319.

Uncia tigris, Trouessart, Bull. Soc. Et. Sci. Angers, Suppl. 1884, 1885, p. 97.

Cynailurus tigris, Casto de Elera, Cat. Sist. Fauna Filip., vol. 1, 1895, p. 30.

Tigris regalis, Veth, Java, vol. 1, 1875, p. 254.

Specimens examined:

- 1 ex., ♀, W. Java, leg. Kuhl, Van Hasselt & Van Raalten, cat. syst.: c, mounted, type.
 1 ex., ♂, Java, from Rotterdam Zoo, rec. 13. II. 1931 (imported: 10. VI. 1920), reg. no. 1929, flat skin and skull.
 1 ex., Java, leg. Kuhl and Van Hasselt, cat. ost.: a, skeleton.
 1 ex., Java, 1841, cat. ost.: d, skull.
 2 ex., Java, leg. Reinwardt, cat. ost.: h, j, skulls.
 2 ex., Loc.?, from the Van Lidth de Jeude collection, cat. ost.: nos. 314, 319, skulls.
 1 ex., Java, don. J. Kunst, 1912, cat. ost.: o, skull.

1 ex., ♂, Probolinggo district, Java, don. M. Maxwell, B. M. reg. no. 20. 11. 14. 2, skull.
1 ex., Java, purchased from Mr. Damon, B. M. reg. no. 67. 4. 12. 194, skull.

In literature it is commonly assumed that the subspecific name *sondaica* for the tiger of the Malay Archipelago dates from Fitzinger (1868, p. 454), but this is not the case. Temminck (1835, p. XXI) in his introduction to the Fauna Japonica mentioned that the soendanese tigers differ from north-asiatic (korean) tigers in having a much shorter coat. In his description of the mammals in the Fauna Japonica, Temminck (1845, p. 43) mentions again these differences (on p. 5 also referring to his earlier paper), and names the tiger from the Malay Archipelago *Felis tigris sondaicus*. Though the notes given by Temminck are very short and refer only to the length of the coat, the name is valid. Temminck did not make any difference between the tigers from Java and Sumatra, but for several reasons it is evident that his notes were based chiefly on javanese tigers. In his first notes on the differences existing between the soendanese and north asiatic tigers Temminck (1835, p. XXI) stated that the characters were best developed in those from Java. Moreover it is extremely doubtful whether, at that time, he had any sumatran specimens for examination. In our collection we have only one specimen from Sumatra that was there already in Temminck's time, but it probably was not there, when he wrote his first notes, for Veth (1879, p. 77) writes that the collections made by Sal. Müller in Sumatra (to which this specimen belongs), were sent to Europe towards the end of 1835, while Temminck's paper is dated 1835. To his earlier notes Temminck referred in his paper on the mammals in the Fauna Japonica (1842, p. 5), and therefore Java may be considered to be the type-locality of Temminck's *Felis tigris sondaicus*. Schwarz (1912, p. 325), who was not aware of Temminck's notes, and who believed Fitzinger to be the original author of the name *sondaica* showed that the javanese and sumatran tigers belonged to different races. For the javanese subspecies he retained the name *sondaica*, and happily this is also in accordance with the conclusions that may be drawn from Temminck's papers.

In our collection we have only one specimen from Java, a mounted female collected by Kuhl, Van Hasselt and Van Raalte, which was already present in the Museum when Temminck (1835, p. XXI; 1845, p. 43) published his notes, and therefore this may be considered to be the type. The bars are narrower than in the sumatran specimens examined by me; several of them are indicated only by rows of faint spots. The general colour is reddish brown; on the right side it is much lighter than on the left, probably through exposure to the light. The light markings on the

head are of a light buff colour. The anterior surface of the fore-limb is unstriped, except for a few dark stripes on the shoulder which reach down on to its outer surface. On the anterior part of the body the stripes are restricted to the back and do not reach downwards on to the flanks. Though this specimen is mounted in the style of about a hundred years

TABLE VIII
Cranial measurements of *Panthera tigris* (L.) sp., in mm

	condylobasal length	greatest length	zygomatic width	postorbital constriction	width of braincase	length of nasals	width of nasals	length of P ₄	breadth of P ₄	length of M ₁	length of P ₄	length of mandible	alveolar length P ₃ -M ₁
<i>P.t. sumatrae</i> Poc.													
cat. ost.: g. . .	250.5	285.0	187.0	56.6	89.0	93.0	49.5	33.3	16.7	24.9	21.7	182.7	60.0
" " e. . .	—	—	255.5	62.0	104.5	108.8	58.2	34.2	18.0	—	22.8	216.6	64.3
reg. no.: 315 . .	—	278.5	181.0	55.9	92.0	91.9	—	32.7	16.8	27.0	—	180.0	63.3
" " " . . .	241.5	271.0	179.3	59.5	92.0	88.0	44.1	30.3	15.5	23.2	—	176.0	57.4
" " 872 . . .	244.0	276.1	177.5	56.3	88.5	85.4	47.3	31.0	15.8	23.3	21.8	181.0	57.9
Coll. Dub. no. 1429	259.0	284.0	194.5	60.1	94.3	93.6	50.1	33.9	18.9	24.9	22.4	188.0	60.9
<i>P.t. sondaica</i> (Temm.)													
cat. ost.: a . .	252.5	283.0	183.5	55.0	90.8	89.0	47.1	31.9	16.7	23.0	20.8	187.0	57.5
" " d . . .	284.0	321.0	212.7	59.4	103.0	105.0	55.0	33.9	18.0	25.6	23.0	211.2	65.0
" " h . . .	258.0	289.5	217.1	56.2	92.8	97.0	48.7	31.2	16.8	23.3	21.1	192.8	58.4
" " j . . .	252.5	282.5	186.6	56.9	93.0	93.8	46.8	31.0	16.5	23.1	20.8	180.3	56.8
" " o . . .	272.0	309.0	205.5	52.8	93.0	102.1	49.1	32.8	16.8	23.7	21.2	198.4	59.8
no. 314	250.0	279.0	189.8	51.9	91.6	93.7	46.6	32.3	16.4	23.3	20.9	181.4	59.0
" 319	255.0	282.5	184.9	57.0	94.5	89.6	47.3	32.5	15.8	23.6	21.0	186.4	57.8
<i>P.t. altaica</i> (Temm.)													
cat. ost.: n . .	300.0	333.0	239.5	57.0	94.8	104.6	54.0	30.8	16.6	24.1	22.6	218.2	63.6

ago, and therefore not a very beautiful example, a figure of it is given on pl. XI. Besides this female we have the flat skin of a javanese male which lived for some years in the Rotterdam Zoo. In colour-characters it resembles the female described above. The general colour is a rich reddish brown. The coat is, however, much longer than that of the female, but probably this may be explained by the fact that the male was in its wintercoat. The hair on the neck is much longer than that on the back; the formation of a short mane in a javanese male has also been described

by Welch (1909, p. 892); it will have to be proved whether these characters also occur in javanese tigers captured in the wild, or that they are caused by the living in captivity in a colder climate.

The skulls of nine specimens were examined by me, and all of them show the narrow occipital plane as mentioned by Schwarz (1912, p. 325) and Pocock (1929, p. 538, pl. I fig. b).

Panthera tigris balica (Schwarz).

Felis tigris balica Schwarz, Ann. Mag. N.H., ser. 8, vol. 10, 1912, p. 325; Schwarz, Ber. Senckenb. natf. Ges., vol. 44, pt. 1, 1913, p. 70, pl. 1, pl. 2 fig. 3 a & b; Kloss, J. Fed. Mal. St. Mus., vol. 10, 1921, p. 238.

Panthera tigris balica, Pocock, J. Bomb. Nat. Hist. Soc., vol. 33, 1929, p. 539; Sody, J. Bomb. Nat. Hist. Soc., vol. 36, 1932, p. 234; Sody, Natk. Tijdschr. Ned. Ind., vol. 93, 1933, p. 89.

Felis tigris, Blyth, Cat. Mamm. Mus. As. Soc., 1863, p. 54; Blyth, P.Z.S., 1863, p. 182; Mivart, The Cat, 1881, p. 393; Mohnicke, Pflanz. Thierl., 1883, p. 407; Weber, Säuget., 1904, p. 53; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 204, 323; Koningsberger, Java Zool. Biol., pts. 8—9, 1913, p. 420—421; Van Balen, Dierenwereld, vol. 1, 1914, p. 346; Dammerman, Treubia, vol. 11, 1929, p. 34.

Felis (Panthera) tigris, Weber, Säuget., vol. 2, 1928, p. 319.

Felis tigris sondaica, Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 53.

Of this subspecies I had no specimens for examination. That the Bali-tiger really is distinct from the javanese form was recently shown again by Sody (1932, 1933).

Panthera tigris altaica (Temm.) (pl. XI).

Felis tigris altaicus Temminck, Fauna Japonica, Mamm., 1845, p. 43; Temminck, Coup-d'oeil Poss. Néerl., vol. 2, 1847, p. 88.

Felis tigris, Temminck, Fauna Japonica, Coup-d'oeil, 1835, p. XXI; Temminck, Fauna Japonica, Mamm., 1842, p. 5.

Panthera tigris amurensis Dode, P.Z.S., 1871, p. 480.

Panthera tigris amurensis, Pocock, J. Bomb. Nat. Hist. Soc., vol. 33, 1929, p. 527, pl. F; Goodwin, Amer. Mus. Novit., no. 681, 1933, p. 7.

Felis tigris coreensis Brass, Nutzb. Tiere Ostasiens, 1904, p. 4.

Specimens examined:

1 ex., Korea, purchased by Von Siebold in Japan, cat. syst.: f, mounted, type.

1 ex., ♂, surroundings of Wladiwostok, from Rotterdam Zoo, XI. 1897, cat. syst.: k, mounted; cat. ost.: n, skeleton.

Temminck (1835, p. XXI) separated the korean tiger from those of India and the Malay Archipelago because it had a much longer coat. In a later paper he (Temminck, 1845, p. 43) mentioned again these differences and named the korean tiger *Felis tigris altaicus*. This race was founded by Temminck on a skin which had been bought in Japan by Von Siebold, and

which was stated to have come from Korea. It is a not fully adult specimen, with a very long coat of a yellowish colour, with rather broad stripes on the posterior part of the back; the stripes on the anterior part of the back and the flanks are narrower. Some of the stripes are duplicated; on the middle of the back they are black, on the sides more brownish. The hairs on the neck are longer than those on the back and form a short mane; the tail is very bushy with broad brownish rings. The light patches on the head are whitish. The anterior surface of the fore limbs is unstriped. This specimen, which may be considered the type of Temminck's *Felis tigris altaicus*, was mounted about a hundred years ago and therefore not a very beautiful example; nevertheless I believed it advisable to have it figured on pl. XI. For comparison I examined a mounted fully adult male from Wladiwostok which lived for some time in the Zoological Gardens in Rotterdam. This skin is of a more brownish colour than that of the type, but this does not seem to be a very important difference, for the colour of this race is rather variable (Goodwin, 1933, p. 8). The markings on the hind limbs are less distinct than those on the back; the stripes on the back and flanks are rather narrow, only a few of them are looped or duplicated. On the sides of the belly the white reaches higher upwards than in the indian and malayan specimens examined by me, but this is not a constant character of the manchurian race (Pocock, 1929, p. 528). The tail is very bushy. It seems quite well possible to me that both these specimens belong to the same subspecies, the type being a not fully adult specimen, the other a fully adult male. Temminck's name has priority over that proposed by Dode (1871, p. 480) and therefore must replace the latter. It may be mentioned that Temminck (1847, p. 88) made a rather puzzling statement when discussing the three races of tigers recognised by him, for after mentioning *Felis tigris altaicus* he wrote "c'est le *Felis irbis* des catalogues méthodiques". From his other writings it is clear that this probably was a lapsus and therefore of no importance, for he mentioned *Felis irbis* as having been often confused with the leopard; the specimen referred to in the Fauna Japonica (Temminck, 1845, p. 43) as *Felis irbis* is the type of Schlegel's *Felis pardus orientalis* (Schlegel, 1857, p. 477; pl. II fig. 13).

Panthera tigris virgata (Illiger).

Felis virgata Illiger, Abh. Ak. Wiss. Berl., 1804—1811, 1815, p. 90, 98.

Felis (Tigris) tigris septentrionalis Satunin, Zeitschr. Priroda iochota, vol. 7, 1904, p. 5 (non vidi).

Panthera tigris septentrionalis, Pocock, J. Bomb. Nat. Hist. Soc., vol. 33, 1929, p. 519.

Pocock (1929, p. 519) considers the nomenclatorial status of *Felis virgata* to date from Matschie's use of it in 1897 and in that case it would be preoccupied by *Felis virgata* Nilsson 1829, a name give to the norwegian lynx. As the name *Felis virgata* was first published by Illiger in 1815 for the tiger of Persia and regions bordering the Caspian sea, together with a note on the lesser size, and the more greyish colour (as opposed to *Felis tigris*, the Indian tiger), I believe that the name cannot be considered a nomen nudum. Pocock describes the general colour of tigers of this race as more reddish, but as the colour is rather variable it is possible that Illiger examined an individual variation. As to the size Pocock (1929, p. 522) remarks that this race of tigers possibly is on the average somewhat smaller than the typical indian race, which agrees well with Illiger's note. Therefore I believe that the name proposed by Illiger will have to replace the name *septentrionalis* proposed by Satunin.

***Panthera tigris amoyensis* (Hilzh.).**

Felis tigris var. *amoyensis* Hilzheimer, Zool. Anz., vol. 28, 1905, p. 598, figs. 3, 4, 6 (teeth).

Panthera tigris styani Pocock, J. Bomb. Nat. Hist. Soc., vol. 33, 1929, p. 531, pl. G.

Hilzheimer who examined five skulls of socalled Hankow-tigers, described the differences existing between these and three skulls from India (no exact locality known). As far as can be judged by his description these skulls resemble very much the type-skull of *Panthera tigris styani* Pocock, e.g., the low sagittal crest which both in the skulls examined by Hilzheimer and those examined by Pocock is not elevated over the occiput. Hilzheimer wrote that the chinese tigers did not differ from Indian tigers in skull-characters only, but also the skins were different. He did not examine the skins himself, but quotes from the descriptions given by Brass (1904, p. 1). It is, however, rather strange that he quotes the description given by Brass of the "Amoy-tiger", while Brass (1904, p. 4) also refers to another race, the "Hankow-tiger", to which the skulls examined by Hilzheimer belong. Hilzheimer combines the skull-characters of the Hankow-tigers with the skin-characters of Amoy-tigers, and to this composite he gave the name *Felis tigris* var. *amoyensis*. It is possible of course that Hankow- and Amoy-tigers belong to the same subspecies, but should this not be the case, the name *amoyensis* must be retained for the Hankow-tiger as the skulls examined by Hilzheimer must be considered to be the cotypes of the subspecies, no skin being examined by Hilzheimer. The name *amoyensis* for the Hankow-tiger antedates the name *styani* proposed by Pocock and must replace the latter.

Panthera pardus (L.) sp. (Pl. IX figs. 5, 6).

Felis pardus Linnaeus, *Systema Naturae*, ed. X, vol. 1, 1758, p. 41; Bateson, *Mater. Var.*, 1894, p. 223, 224, 226; Leche, *Zool. Jahrb. Syst.*, vol. 38, 1915, p. 316; Sonntag, *P. Z. S.*, 1923, p. 131, 133, 136, 139, 140, 149, textfig. 18; Chasen, *Singapore Naturalist*, no. 4, 1924, p. 80 and no. 5, 1925, p. 87.

Leopardus pardus, Gray, *P. Z. S.*, 1867, p. 263.

Panthera pardus, Severtzow, *Rev. Mag. Zool.*, vol. 21, 1858, p. 387; Pocock, *Ann. Mag. N. H.*, ser. 8, vol. 18, 1916, p. 314, fig. 4 b; Pocock, *Ann. Mag. N. H.*, ser. 8, vol. 19, 1917, p. 121, 122, 133, 134; Sody, *Natk. Tijdschr. Ned. Ind.*, vol. 93, 1933, p. 90.

Felis pardalis, Mivart, *The Cat*, 1881, fig. 165 (error).

To this species I refer the very incomplete skull mentioned by Jentink (1887, p. 83; 1892, p. 98) as belonging to a mounted specimen of the ounce; to the latter it certainly does not belong, as is distinctly shown by the different shape of the nasals and mandible (cf. p. 75). The skull from Sumatra mentioned under *Felis pardus* by Jentink (1887, p. 82: f) is that of a puma (*Puma concolor* (L.)).

Panthera pardus has been recorded from Sumatra by numerous authors, but no positive evidence exists as yet to this respect. As pointed out by Jacobson (1921, p. 238) most of these records were based on specimens of *Neofelis nebulosa* (Griff.), while others may have been based on melanistic specimens of *Profelis temminckii temminckii* (Vig. et Horsf.) as described by Dammerman (1930, p. 133). The species was recorded from Bali by Jentink (1892, p. 97), but as this record is based on a Zoo specimen, and as no other specimens have been captured in Bali, it is extremely doubtful (Sody, 1933, p. 90). In the Collectie Dubois this species is represented by a single upper carnassial (P⁴) from Djeroek (reg. no. 6221) which agrees in all its characters with that of recent javanese panthers; its greatest length is 23.6 mm, its breadth is 12.0 mm, while in recent javanese panthers these measurements vary from 20.8 to 25.8 mm and 10.6 to 13.2 mm respectively.

Fossil bones from Java that resemble those of *Panthera pardus* (L.), but which could not be identified with absolute certainty, were described by Von Koenigswald (1933, p. 17, pl. VIII figs. 9—11; 1934, p. 193, pl. IV fig. 2). A doubtful record (Lydekker, 1886 a, p. 120; 1886 b, p. 29; Pilgrim, 1932, p. 199) exists for the occurrence of this species in the young pliocene fauna of the Karnul-Caves in British India. In the pliocene of Europe it is known from many different localities.

Panthera pardus melas (Cuv.) (figs. 2, 31, 32).

"Félix mélas" Delamétherie, *Journ. phys. chim. Hist. Nat.*, vol. 13, 1805, p. 41.

Felis melas Cuvier, *Ann. Mus. Hist. Nat.*, vol. 14, 1809, p. 152; Desmarest, *Nouv. Dict. Hist. Nat.*, ed. 2, vol. 6, 1816, p. 164; Cuvier, *Dict. Sci. Nat.*, vol. 8, 1817,

p. 214; Desmarest, Mamm., vol. 1, 1820, p. 223; Cuvier, Rech. Ossem. foss., vol. 4, 1823, p. 427; Desmoulins, Dict. Class. Hist. Nat., vol. 3, 1823, p. 494; Geoffroy-St.-Hilaire & Cuvier, Hist. Nat. Mammif., vol. 3, pt. 49, 1825; Lesson, Man. Mammal., 1827, p. 188; Lesson, Hist. Nat. Gén. Mammif., vol. 5, 1836, p. 337; Temminck, Coup-d'oeil Poss. Néerl., vol. 1, 1846, p. 324; Chenu, Encycl. Hist. Nat., Carnass., pt. 2, 1853, p. 176; Blanford, Fauna Brit. Ind., Mamm., 1888, p. 69; Koningsberger, Java Zool. Biol., pts. 11—12, 1915, p. 503.

Felis pardus melas, Blainville, Ostéogr., pt. 12, 1843, p. 187, pl. 11; Jentink, Cat. Ost., 1887, p. 82; Jentink, Cat. Syst., 1892, p. 96.

Panthera pardus melas, Pocock, J. Bomb. Nat. Hist. Soc., vol. 34, 1930, p. 326.

Felis pardus, Temminck, Mon. Mamm., vol. 1, 1825, p. 99, pl. IX, figs. 3, 4; Lesson, Hist. Nat. Gén. Mammif., vol. 5, 1836, p. 338; Schlegel, Essai Phys. Serp., vol. 1, 1837, p. 235; Müller, Verh. Nat. Gesch. Overz. Bez., Zool., 1839, p. 52, 53, table; Schinz, Syst. Verz., vol. 1, 1844, p. 432; Müller, Arch. Natg., Jahrg. 12, vol. 1, 1846, p. 12; Temminck, Coup-d'oeil Poss. Néerl., vol. 2, 1847, p. 408; Horsfield, Cat. Mamm. Mus. E. Ind. Cy., 1851, p. 46; Chenu, Encycl. Hist. Nat. Carnass., pt. 2, 1853, p. 146, 174, 173, 220; Schlegel, Handl. Dierk., vol. 1, 1857, p. 23; Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 388, 391; Blyth, Cat. Mamm. Mus. Ass. Soc., 1863, p. 55; Blyth, P. Z. S., 1863, p. 183; Schlegel, Dierentuin, 1872, p. 33; Veth, Java, vol. 1, 1875, p. 254; Jentink, Aardr. Weekbl., vol. 2, 1881, p. 290; Mivart, The Cat, 1881, p. 394; Mohnicke, Pflanz. Thierl., 1883, p. 407; Jentink, Cat. Ost., 1887, p. 82; Blanford, Fauna Brit. Ind., Mamm., 1888, p. 58; Weber, Zool. Ergebn., vol. 1, 1890, p. 94, 97, 108; Sclater, Cat. Mamm. Ind. Mus., vol. 2, 1891, p. 213, 218; Jentink, Cat. Syst., 1892, p. 96; Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 66, 97; Lydekker, Handbook, 1895, p. 71; Kohlbrugge, Natk. Tijdschr. Ned. Ind., vol. 55, 1896, p. 262; Flower, P. Z. S., 1900, p. 323; Koningsberger, Med. Plantent., no. 54, 1902, p. 14; Weber, Säuget., 1904, p. 530; Tjeenk Willink, Natk. Tijdschr. Ned. Ind., vol. 65, 1905, p. 205, 323; Thomas & Wroughton, P. Z. S., 1909, p. 384; Koningsberger, Java Zool. Biol., pt. 7, 1913, p. 326, pts. 8—9, 1913, p. 421, and pts. 11—12, 1915, p. 503; Van Balen, Dierenwereld, vol. 1, 1914, p. 361; Sody, Natk. Tijdschr. Ned. Ind., vol. 87, 1927, p. 198; Dammerman, Treubia, vol. 11, 1929, p. 4, 5, 34; Sody, Natk. Tijdschr. Ned. Ind., vol. 89, 1929, p. 164; Appelman, Trop. Nat., vol. 20, 1931, p. 71; Docters van Leeuwen, Verh. K. Ak. Wet. Amst., afd. Natuurk., sect. 2, vol. 31, 1933, p. 72; A., Trop. Nat., vol. 23, 1934, p. 228.

Felis (Panthera) pardus, Weber, Säuget., vol. 2, 1928, p. 319.

Felis leopardus, Temminck, Mon. Mamm., vol. 1, 1825, p. 92, pl. IX figs. 1, 2; Temminck, Bijdr. natuurk. Wet., vol. 3, pt. 1, 1828, p. 69; Fischer, Synops. Mamm., vol. 1, 1829, p. 199, and vol. 2, 1830, p. 366; Ehrenberg, Ann. Sc. Nat., vol. 21, 1830, p. 401; Cantor, J. As. Soc. Beng., vol. 15, 1846, p. 243; Pöppig, Illustr. Naturg., vol. 1, 1851, p. 99; Chenu, Encycl. Hist. Nat., Carnass., pt. 2, 1853, p. 175, 220; Brandt, Mémoires. Ac. Imp. Sci. St. Pétersb., ser. 6, sci. math. phys. nat., vol. 8, 1856, p. 191.

Felis pardus javanicus Blainville, Ostéogr., pt. 12, 1843, p. 189, pl. 14 fig. a.

Felis pardus sumatranus Blainville, Ostéogr., pt. 12, 1843, p. 189, pl. 8; Gray, Ann. Mag. N. H., ser. 4, vol. 14, 1874, p. 386.

Felis variegata Wagner, Suppl. II, Schreber Säugeth., 1841, p. 483; Wagner, Abh. math. physik. Kl. bayer. Ak. Wiss., vol. 4, pt. 2, 1845, p. 82; Fitzinger, Zool. Garten, vol. 5, 1864, p. 200; Grevé, Zool. Jahrb. Syst., vol. 6, 1891, p. 77.

Panthera variegata, Fitzinger, Sitz. Ber. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 473.

Leopardus variegatus, Jentink, Aardr. Weekbl., vol. 2, 1881, p. 290.

Felis pardus variegata, Grevé, Nova Acta Ac. Caes. Leop. Carol., vol. 63, 1895, p. 70, 97.

Leopardus pardus variegata, Matschie, SB. Ges. natf. Fr. Berl., 1895, p. 199; Matschie, Bol. Mus. Nac. Rio de J., vol. 4, pt. 2, 1928, p. 56.

Felis (Leopardus) pardus variegata, Trouessart, Cat. Mamm., vol. 1, 1897, p. 354; Trouessart, Cat. Mamm., Suppl., 1904, p. 268.

Panthera variegata nigra Fitzinger, Sitz. Ber. Ak. Wiss. Wien, math. naturw. Cl., vol. 58, sect. 1, 1868, p. 475.

Leopardus varius, Veth, Java, vol. 1, 1875, p. 254.

Cf. also: Sody, Tectona, vol. 19, 1926, p. 55, 172; Bartels, Trop. Nat., vol. 18, 1929, p. 81.

Specimens examined:

- 1 ex., W. Java, leg. Reinwardt, cat. syst.: a, mounted (black var.).
- 1 ex., W. Java, don. Society of Naturalists, Batavia, cat. syst.: b, mounted (black var.).
- 1 ex., juv., Java, leg. Reinwardt, cat. syst.: c, mounted (black var., taken together with two spotted cubs in the same nest).
- 1 ex., Parang, Java, II. 1827, leg. Boie and Macklot, cat. syst.: g, mounted.
- 1 ex., Java, leg. Reinwardt, cat. syst.: h, mounted.
- 1 ex., ♀, Tapos, Java, VIII. 1827, leg. Müller and Macklot, cat. syst.: j, mounted.
- 1 ex., ♀, Java, leg. Reinwardt, cat. syst.: k, mounted.
- 1 ex., juv., Java, leg. Van Raalten, cat. syst.: l, mounted.
- 1 ex., ♀, Tjinjircean, Java, 10. II. 1910, leg. H. W. v. d. Weele, skin and skull (black var.).
- 1 ex., Java, don. F. H. de Mol van Otterloo, Mus. Amst., mounted.
- 1 ex., Java, don. Van Noord Borski, Mus. Amst., mounted.
- 1 ex., Java, don. Gallois, Mus. Amst., mounted.
- 1 ex., Java, Duymaer van Twist, Mus. Amst., mounted.
- 1 ex., Java, don. Van der Ploeg, Mus. Amst., mounted.
- 2 ex., Java, leg. Reinwardt, cat. ost.: a, b, skeletons.
- 1 ex., juv., Java, leg. Van Raalten, cat. ost.: c, skeleton.
- 1 ex., ♂, Java, cat. ost.: g, skull (black var.).
- 2 ex., Java, leg. Reinwardt, cat. ost.: h, i, skulls (black var.).
- 1 ex., ♀, Willis, Java, leg. Prof. Eug. Dubois, Collectie Dubois, reg. no. 1406, skull.
- 1 ex., ♂, Kedong Broeboes, Java, leg. Prof. Eug. Dubois, Collectie Dubois, reg. no. 1403, skull (black var.).
- 1 ex., Pandan, Madioen, Java, leg. Prof. Eug. Dubois, Collectie Dubois, reg. no. 1408, skull.
- 7 ex., Java, leg. Prof. Eug. Dubois, Collectie Dubois, reg. nos. 1404, 1405, 1407, 1409, 1415, 1423, 1426.
- 1 ex., W. Java, leg. Prof. M. Weber, 1888, Mus. Amst., reg. no. 284, skull.

As was shown recently by Pocock (1930, p. 327) the name *melas*, which was originally proposed by Cuvier for the black variety, must be used for the javanese race (including spotted and black specimens), as it antedates the name *variegata* proposed by Wagner for the spotted specimens. The skins examined by me do not show any special points of interest; they agree well with the notes given by Pocock. In table IX I have given the more important measurements of the seventeen skulls examined by me. Distribution in the Archipelago: Java, Kangean Is.

TABLE IX
Cranial measurements of *Panthera pardus melas* (Cuv.), in mm

	condylobasal length	greatest length	zygomatic width	postorbital constriction	width of braincase	length of nasals	width of nasals	length of P ⁴	length of M ₁	length of P ₄	alveolar length of P ₃ -M ₁
cat. ost.: a . . .	187.8	210.0	129.4	42.2	72.5	60.5	30.1	24.9	17.7	17.1	46.2
" b . . .	182.5	206.5	129.6	43.7	73.0	60.5	32.1	23.6	17.6	16.5	44.8
" g . . .	179.5	±201	132.6	46.4	70.5	59.7	33.5	23.5	16.2	16.2	43.1
" h . . .	195.0	211.5	135.0	41.1	71.7	63.9	33.3	25.4	17.6	17.0	45.2
" i . . .	190.0	209.0	136.4	38.5	70.0	61.8	33.0	23.5	17.7	17.4	45.2
" m . . .	169.8	188.0	—	38.1	71.6	55.3	30.0	22.1	15.8	14.4	39.1
leg. v. d. Weele . .	152.5	169.0	112.0	38.4	65.8	48.7	24.6	20.8	14.6	14.3	36.9
Coll. Dub. no. 1408	188.0	202+	131.6	46.0	72.8	61.3	34.0	25.8	17.6	17.5	46.8
" 1403♂	187.2	228.0	134.4	40.9	73.4	63.1	32.9	23.9	16.4	16.4	45.0
" 1406♀	152.7	169.0	107.3	39.7	67.0	50.5	27.0	21.3	15.3	15.3	40.3
" 1405	185.4	207.5	132.0	43.1	72.9	62.6	31.4	24.3	16.5	15.0	42.0
" 1407	158.7	176.9	112.2	40.6	66.8	51.9	28.8	21.6	15.6	15.6	41.0
" 1409	179.2	203.0	129.5	41.5	72.2	61.9	32.8	22.5	15.8	15.8	41.8
" 1415	183.2	206.5	135.5	42.8	72.5	61.5	33.7	21.8	18.3	17.9	47.3
" 1423	176.4	191.8	126.7	—	70.4	58.0	33.0	23.7	17.1	17.0	44.2
" 1426	166.6	182.7	116.9	40.6	69.4	56.9	28.9	24.3	17.2	16.4	43.3
" 1404	180.6	196.0	123.4	42.9	71.8	57.6	31.0	24.9	18.5	18.3	47.4
Mus. Amst. no. 284	203.0	230.0	150.9	42.8	77.2	67.6	37.2	25.4	18.3	18.3	49.3

Panthera pardus orientalis (Schleg.).

Felis orientalis Schlegel, Handl. Dierk., vol. 1, 1857, p. 23.

Felis leopardus orientalis, Schlegel, Handl. Dierk., vol. 1, 1857, p. 477; atlas, pl. II fig. 13.

Panthera pardus orientalis, Pocock, J. Bomb. Nat. Hist. Soc., vol. 34, 1930, p. 317, pl. IX.

Felis irbis, Temminck, Fauna Japonica, Coup-d'oeil, 1835, p. XXI; Temminck, Fauna Japonica, Mamm., 1842, p. 5 and 1845, p. 43.

Felis uncia, Jentink, Cat. Syst. 1892, p. 98.

Specimen examined:

1 ex., Korea, purchased by Von Siebold at Nagasaki, Japan, cat. syst. (*Felis uncia*) c.

As Pocock correctly supposed the specimen recorded by Temminck as

Felis irbis from Korea belongs to *Panthera pardus orientalis* (Schleg.) and it even is the type of the latter. It agrees very well with the description of the subspecies given by Pocock. Though it is mounted in another position than the specimen figured by Schlegel, it is evident from the form of the spots that it is the same.

Uncia uncia (Schreb.).

Felis uncia Schreber, Säugeth., vol. 3, 1775, pl. C & 1777, p. 586; Jentink, Cat. Syst., 1892, p. 98; Pocock, Ann. Mag. N. H., ser. 8, vol. 18, 1916, p. 226, fig. 1c.

Uncia uncia, Pocock, Ann. Mag. N. H., ser. 8, vol. 18, 1916, p. 315, figs. 1, 2a, 3a, 4c; Pocock, J. Bomb. N. H. Soc., vol. 34, 1930, p. 331, pl. XII figs a-d, pl. XIII.

Specimens examined:

1 ex., "Montagnes de Perse", cat. syst.: b, mounted.

1 ex., ♀, loc.?, Frank, 1875, cat. syst.: a, mounted.

1 ex., ♀, Siberia, don. L. Ruhe, rec. from Amsterdam Zoo, 12. VII. 1931, Mus. Amst., flat skin and skull.

1 ex., ♀, loc.?, Mus. Amst., 29. VIII. 1905, no. 926, skull (skeleton also present).

Two mounted specimens, which agree in all characters with the description of this species given by Pocock (1930), are in the Leiden Museum. One of these is said to have come from the mountains of Persia, but as has been pointed out by Pocock the species does not occur there; in all probability this label was attached to it as in the older literature the species had been mentioned from that region. Similar falsifications occur some times in old collections, but in most cases can not be checked. The other specimen in our collection was sold to the museum by Frank together with the anterior part of a skull and the complete lower jaw. The skin is certainly that of an ounce, but the skull cannot belong to this species. Probably it is a panther-skull; the nasals are rather long and broad (66.7 × 37.2 mm), with their rounded posterior extremities just reaching the level of the frontal processes of the maxillaries; the zygomatic width is about 18 mm larger than that of an adult female ounce, and the symphysis of the lower jaws is not vertical anteriorly as in the ounce. In 1931 the Amsterdam Zoo received a living specimen which died a few days after its arrival, and therefore its skull does not present any abnormalities due to the life in a zoo. This specimen of which the skin and skull were preserved, was a fully adult female, and as shown by the obliterated cranial sutures and the somewhat worn teeth not very young. The skin of this specimen is in fine condition; the colour pattern is indistinct on the sides, and slightly indistinct on the back; in the flesh the head and body measured 103 cm, the tail 91 cm. As locality for this specimen Siberia was

Table X

Skull measurements of *Uncia uncia* (Schreb.) in mm

	♀ Siberia	no. 926
condylobasal length	164.9	157.8
greatest length	180.4	168.2
zygomatic width	130.5	119.1
postorbital constriction	51.4	47.0
width of braincase	73.0	69.4
width of rostrum over canines	54.1	51.8
length of palate	76.0	72.2
length of nasals	46.2	44.4
width of nasals	33.7	30.8
length of bulla	27.8	26.3
width of bulla	17.6	19.3
C, long (enamel)	11.0	11.2
C, high „	—	27.7
P ² , long	5.7	5.3
P ³ , long	14.2	14.7
P ³ , wide	7.7	8.2
P ⁴ , long	24.1	22.8
P ⁴ , wide	12.1	11.4
Length of lower jaw	120.5	115.2
diasteme	9.9	7.7
alveolar length P ₃ -M ₁	43.9	43.1
C, long	11.3	11.3
C, high	24.8	25.4+
P ₃ , long	11.3	12.1
P ₃ , wide	6.0	6.8
P ₄ , long	15.7	15.7
P ₄ , wide	7.3	7.5
M ₁ , long	17.6	16.5
M ₁ , wide	8.0	8.5

given without more exact indications. Besides this skin and skull the Amsterdam Museum possesses the complete skeleton of another specimen acquired in 1905. Complete skulls of adult ounces seem to be rare in Museum collections and therefore some short notes may be given on the two skulls examined by me. In general characters these skulls agree very well with the description given by Pocock (1916, 1930). That acquired in

1931 is somewhat larger than the skull received in 1905; also the posterior part of the palate bordering the mesopterygoid fossa is somewhat swollen, but in the smaller skull the palate is flat. The occipital condyles seem not to be everted to such an extent as in the specimens examined by Pocock. Comparing these skulls with those of *Panthera pardus* (L.) the following differences besides those mentioned by Pocock, are most noteworthy. The part of the maxillary below the malar is much higher than in the panthers; the muscular ridge on the zygomatic arch is nearer to the inferior border; the jugular process of the skull, as well as the angular process of the mandible are more slender, and the mesopterygoid fossa is broader. As measurements of complete skulls seem to be rare, those of the two skulls examined by me are given in table X (p. 76).

Jaguarius Severtzow.

Jaguarius Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 386, 390 (as a subgenus of *Panthera*); Pocock, Ann. Mag. N. H., ser. 8, vol. 18, 1916, p. 315; Allen, Bull. Am. Mus. N. H., vol. 41, 1919, p. 337.

Onca Severtzow, Rev. Mag. Zool., vol. 21, 1858, p. 390.

Pardotigris Kretzoi, Xe Congr. Int. Zool. Budapest (1927), vol. 2, 1929, p. 1325.

Kretzoi proposes a new generic name for the jaguar, overlooking the fact that, should the species be placed in a separate genus, two names were already available for it. Severtzow (1858, p. 386) proposed *Jaguarius* as a subgenus of *Panthera*, its type by monotypy being *Felis onca* L. In the same paper Severtzow wrote that he should have liked better to use *Onca* as a subgeneric name for the jaguar; this name therefore is also available, as it is of no importance that Severtzow did not accept it. As the case stands, however, *Jaguarius* has page-priority over *Onca*, and it should replace the *Pardotigris* proposed by Kretzoi about seventy years later.

Incertae sedis.

Collectie Dubois, reg. no 89, left femur, Kedoeng Broeboes (figs. 29, 33, 36, pl. VIII). I have not ventured to ascribe this femur to any of the species enumerated in this paper. It is not impossible that it belonged to a small tiger or to a large panther, but it shows differences from both. Only a few recent tiger- and panther-femora being available for comparison it was not possible to get an idea of the individual variations of these bones. In the fossil femur the fossa trochanterica is very narrow (fig. 33), the width of this fossa seems to vary individually, but none of the recent tiger-femora had it as narrow as the fossil. The shape of the fossa intercondyloidea in the fossil is different from that in recent tigers, but

judging by the material at hand the shape of this fossa seems to be rather variable, and therefore no great importance can be attached to it. The crest on the lateral side of the bone is placed at about the same distance from the anterior and from the posterior surface in the fossil, while it is placed nearer to the posterior surface in the recent tiger femora; this makes that, when examined in front view, the fossil femur appears to be flatter than the recent thighbones. This difference is distinctly shown by comparing the cross-sections of the fossil femur and two recent tiger-femora shown in figs. 36 to 38. Some other small differences, e.g., in the shape of the condyles, were found, but these do not seem to be very important. In table XI some measurements are given of the fossil femur and of six recent tiger-thighbones. The length of the bone was measured from caput to the

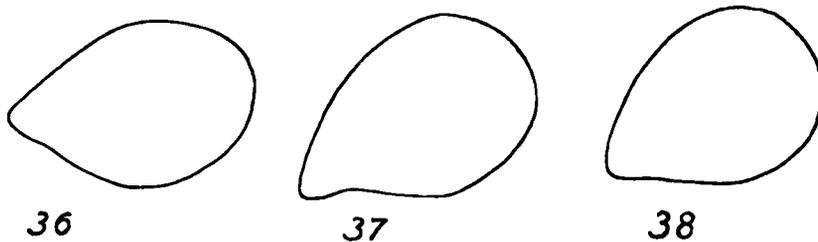


Fig. 36, cross-section of fossil femur, incertae sedis, Coll. Dubois, no. 89; fig. 37, id., *Panthera tigris sumatrae* Poc., reg. no. 991; fig. 38, id., *Panthera tigris sondaica* (Temm.), cat. ost.: a. All figures natural size.

medial condyle; breadth I is the breadth measured over caput and trochanter; breadth II is the width at the middle of the bone, breadth III is the width measured over the condyles (all measurements in mm).

Table XI
Measurements of femora, in mm

	Length	Breadth I	Breadth II	Breadth III
no. 89, fossil	280	64.3	26.4	52.5
a, recent, Java	309	67.3	26.0	63.8
2202, ,, , Sumatra	310	69.1	26.0	62.3
2174, ,, , "	320	73.8	27.8	67.7
2171, ,, , "	322	68.4	25.3	62.2
991, ,, , "	325	73.3	28.5	66.3
n, ,, , Wladiwostock	381	77.5	27.0	71.6

Collectie Dubois, reg. no. 1478, femur, Trinil.

This femur is too much damaged to allow identifications to be made. All that can be said of it is that it probably is that of a *Panthera* species.

LITERATURE

This list contains the titles of the papers to which has been referred in the text, and those of some publications of which the abbreviated titles are given in the synonymies. Titles of papers mentioned in the synonymies only, and which may be easily found by the citations given are not repeated here.

- ALLEN, J. A., 1910. Mammals from Palawan Island, Philippine Islands. *Bull. Am. Mus. Nat. Hist.*, vol. 28, pp. 13—17.
- 1919a. Severtzow's classification of the Felidae. *Bull. Am. Mus. Nat. Hist.*, vol. 41, pp. 335—340.
- 1919b. Notes on the synonymy and the nomenclature of the smaller spotted cats of Tropical America. *Bull. Am. Mus. Nat. Hist.*, vol. 41, pp. 341—421, 31 figs.
- 1920. Note on Gueldenstaedt's names of certain species of Felidae. *Journ. Mamm.*, vol. 1, pp. 90—91.
- 1924. Carnivora collected by the American Museum Congo-Expedition. *Bull. Am. Mus. Nat. Hist.*, vol. 47, pp. 73—281, pls. 6—78, 67 textfigs., map.
- ANDRES, J., 1926. Hat die Hauskatze im Unterkiefer Molaren? *Anat. Anz.*, vol. 61, pp. 244—247.
- ANONYMOUS, 1891a. Palaeontologische onderzoekingen op Java. *Verslag v. h. Mijnwezen over het 3de kwartaal 1890*, pp. 12—15.
- 1891b. Palaeontologische onderzoekingen op Java. *Verslag v. h. Mijnwezen over het 3de kwartaal 1891*, pp. 12—14.
- 1891c. Palaeontologische onderzoekingen op Java. *Verslag v. h. Mijnwezen over het 4de kwartaal 1891*, pp. 12—15.
- 1892. Palaeontologische onderzoekingen op Java. *Verslag v. h. Mijnwezen over het 2de kwartaal 1892*, pp. 14—17.
- 1893a. Palaeontologische onderzoekingen op Java. *Verslag v. h. Mijnwezen over het 4de kwartaal 1892*, pp. 11—12.
- 1893b. Palaeontologische onderzoekingen op Java. *Verslag v. h. Mijnwezen over het 3de kwartaal 1893*, pp. 15—17.
- BALEN, J. H. VAN, 1914. *De dierenwereld van Insulinde in woord en beeld*, vol. 1, zoogdieren. Deventer, 505 pp., 12 pls., textfigs.
- BANKS, E., 1931. A popular account of the Mammals of Borneo. *Journ. Mal. Br. Roy. As. Soc.*, vol. 9, pt. 2, pp. 1—139, pls. 11—19, map.
- BATESON, W., 1894. *Materials for the study of variation, treated with especial regard to discontinuity in the origin of species*. London & New York, XV + 598 pp., 209 figs.
- BEAUFORT, L. F. DE, 1926. *Zoögeographie van den Indischen Archipel*. Haarlem, 202 pp., map.
- BECCARI, O., 1904. *Wanderings in the great forests of Borneo. Travels and researches of a naturalist in Sarawak*. London, XXIV + 424 pp., 61 figs., map.
- BIRULA, A., 1914. Contributions à la synonymie de l'*Otocolobus manul* (Pallas) (Felidae). *Annuaire Mus. Zool. St. Pétersb.*, vol. 18 (1913), pp. LVII—LVIII.
- 1915. Contributions à la classification et à la distribution géographique des mammifères. V. Sur la position d'*Aelurina planiceps* (Vigors et Horsfield) dans le système de la fam. Felidae. *Annuaire Mus. Zool. Petrograd*, vol. 19 (1914), pp. 92—107, 4 figs., 1 pl.

- BIRULA, A., 1917. Contribution à la classification et à la distribution géographique des mammifères. VI. Sur la position de l'*Otocolobus manul* (Pallas) dans le système de la fam. Felidae et sur ses races. *Annuaire Mus. Zool. Petrograd*, vol. 21 (1916), pp. 130—163, pls. 7—9, 4 textfigs.
- BLAINVILLE, H. M. D. DE, 1843. Ostéographie ou description iconographique comparée du squelette et du système dentaire des mammifères récents et fossiles pour servir de base à la zoologie et à la géologie, pt. 12, *Felis*, 100 pp., 19 pls.
- BLANFORD, W. T., 1888. *Mammalia*, in: *The Fauna of British India*, XX + XII + 1—250 pp., figs.
- BOULE, M., 1906. Les grands chats des cavernes. *Ann. Palaeont.*, vol. 1, pt. 2, pp. 1—27, 4 pls.
- BRANDT, F., 1871. Neue Untersuchung über die in den altaischen Höhlen aufgefundenen Säugethierreste, ein Beitrag zur quaternären Fauna des Russischen Reiches. *Bull. Ac. Imp. Sci. St. Pétersb.*, vol. 15, pp. 147—202.
- BRANDT, J. F., 1842. Observations sur le Manoul (*Felis manul* Pallas). *Bull. sc. Ac. Imp. Sc. St. Pétersb.*, vol. 9, pts. 2/3 (194/195), pp. 37—39.
- 1844. Observations sur les différentes espèces de Souseliks de Russie, suivies de remarques sur l'arrangement et la description géographique du genre *Spermophilus*, ainsi que sur la classification de la famille des *Sciurina*. *Bull. cl. physico-mathématique Ac. Imp. Sc. St. Pétersb.*, vol. 2, pts. 23/24 (47/48), pp. 357—382.
- BRASS, E., 1904. *Nutzbare Tiere Ostasiens; Pelz- und Jagdtiere, Haustierte, Seetiere*. Neudamm, VIII + 130 pp.
- BUSK, G., 1870. On a method of graphically representing the dimensions and proportions of the teeth of mammals. *Proc. Roy. Soc. Lond.*, vol. 18, pp. 544—546, pls. 8—9.
- 1874. Note on the cranial and dental characters of the Northern and Southern Tigers and Leopards of China as affording marks of their specific distinction. *Proc. Zool. Soc. Lond.*, pp. 146—150, pls. 24—25.
- CHASEN, F. N., 1924—1925. A preliminary account of the mammals of Singapore Island. *Singapore Naturalist*, pt. 4, 1924, pp. 76—86, and pt. 5, 1925, pp. 74—89.
- CHASEN, F. N. and C. BODEN KLOSS, 1928. *Spolia Mentawiensia. Mammals*, with an introduction by C. Boden Kloss. *Proc. Zool. Soc. Lond.*, (1927) pp. 797—840, pls. 1—5, map.
- 1930. On mammals from the Raheng District, Western Siam. *Journ. Siam Soc. Nat. Hist.*, suppl. vol. 8, pt. 2, pp. 61—78.
- CHENU, & E. DESMAREST, 1853. *Encyclopédie d'histoire naturelle ou Traité complet de cette science. Carnassiers*, pt. 2, Paris, 312 pp., 132 figs.
- COPE, E. D., 1882. On the systematic relations of the Carnivora Fissipedia. *Proc. Am. Phil. Soc.*, vol. 20, pp. 471—475.
- CUVIER, G., 1809. Recherches sur les espèces vivantes de grands chats, pour servir de preuves et d'éclaircissements au chapitre sur les Carnassiers fossiles. *Ann. Mus. Hist. Nat.*, vol. 14, pp. 136—164, pls. 15—16.
- 1823. Recherches sur les ossements fossiles, où l'on rétablit les caractères de plusieurs animaux dont les révolutions du globe ont détruit les espèces. *Nouv. éd.*, vol. 4, contenant les Ruminans et les Carnassiers fossiles. Paris, 514 pp., 39 pls.
- D(ELSMAN), H. C., 1932. De Mangrove-kat op Sumatra. *De Tropische Natuur*, vol. 21, p. 50, fig.
- DAMMERMAN, K. W., 1930. On a black variety of *Felis temmincki* from Sumatra. *Treubia*, vol. 12, pp. 133—134.
- 1932. Donnée provisoire des mammifères dans la grotte de Sampung, in: *Homage du Service Archéologique des Indes Néerlandaises au Premier Congrès des Préhistoriens d'Extrême-Orient à Hanoi 25—31 janvier 1933*, publié par la Société Royale des Arts et des Sciences de Batavia, pp. 30—31.

- 1934 a. Voorhistorische Menschen en Dieren van Java. De Tropische Natuur, vol. 23, pp. 229—235, 2 figs.
- 1934. On prehistoric mammals from the Sampoeng Cave, Central Java. *Treubia*, vol. 14, pp. 477—486, pl. 11.
- DAWKINS, W. BOYD, & W. AYSHFORD SANDFORD, 1866—1872. The British pleistocene Mammalia. I British pleistocene Felidae, pt. 1, *Pal. Soc. Lond.*, vol. 18, 1866, pp. 1—18, pls. 1—4; pt. 2, *ibid.*, vol. 21, 1868, pp. 29—124, pls. 6—19; pt. 3, *ibid.*, vol. 22, 1869, pp. 125—176, pls. 20—23; pt. 4, *ibid.*, vol. 25, 1872, pp. 177—194, pls. 24—25.
- DESMAREST, 1816. Chat, in: *Nouveau Dictionnaire d'Histoire Naturelle*, nouv. éd., vol. 6, pp. 73—123.
- DESMAREST, A. G., 1820. *Mammalogie ou description des espèces de mammifères. Première partie, contenant les ordres des bimanés, des quadrumanes et des carnassiers.* Paris, VIII + 276 pp.
- DESMOULINS, A., 1823. Chat, in: *Dictionnaire classique d'Histoire Naturelle*, vol. 3, pp. 487—501.
- DODE, C., 1871. Exhibition of, and Remarks upon, Animals from the Amoor and Turkestan. *Proc. Zool. Soc. Lond.*, pp. 480—481.
- DOHERTY, W., 1891. The Butterflies of Sumba and Sambawa, with some account of the Island of Sumba. *Journ. Ass. Soc. Beng.*, vol. 60, pp. 140—197, pl. 2.
- DUBOIS, E., 1888. Over de wenschelijkheid van een onderzoek naar de diluviale fauna van Nederlandsch-Indië, in het bijzonder van Sumatra. *Natk. Tijdschr. Ned. Ind.*, vol. 48, pp. 148—165.
- 1891. Voorloopig bericht omtrent het onderzoek naar de pleistocene en tertiaire Vertebraten-Fauna van Sumatra en Java, gedurende het jaar 1890. *Natk. Tijdschr. Ned. Ind.*, vol. 51, pt. 1, pp. 93—100.
- 1907. Eenige van Nederlandschen kant verkregen uitkomsten met betrekking tot de kennis der Këndeng-Fauna (Fauna van Trinil). *Tijdschr. Kon. Ned. Aadr. Gen.*, ser. 2, vol. 24, pp. 449—458.
- 1908. Das Geologische Alter der Këndeng- oder Trinil-Fauna. *Tijdschr. Kon. Ned. Aadr. Gen.*, ser. 2, vol. 25, pp. 1235—1270, pl. 39.
- ELERA, F. CASTO DE, 1895. *Catálogo sistemático de toda la Fauna de Filipinas conocida hasta el presente y á la vez de la colección zoológica de Museo de PP. Dominicanos del Colegio-Universidad de Santo Tomos de Manila*, vol. 1, Vertebrados. Manila, IX + 701 pp.
- ELLENBERGER, W., & H. BAUM, 1915. *Handbuch der Vergleichenden Anatomie der Haustiere*. 14th ed. Berlin, XV + 1047 pp., 1163 figs.
- ELLIOT, D. G., 1871. Remarks on various species of Felidae, with a description of a species from North-Western Siberia. *Proc. Zool. Soc. Lond.*, pp. 758—761, pl. 76.
- 1878—1882. A Monograph of the Felidae or Family of the Cats, pts. 1—3, 1878; pts. 4—5, 1879; pts. 6—7, 1880; pt. 8, 1881; pts. 9—10, 1882.
- ES, VAN, 1930. The prehistoric remains in Sampoeng Cave, Residency of Ponorogo, Java. *Fourth Pacific Science Congress Batavia-Bandoeng (Java) (1929)*, vol. 3, pp. 329—340.
- ES, L. J. C. VAN, 1931. *The Age of Pithecanthropus*. The Hague, 142 pp., pls., maps.
- FISCHER, J. B., 1829. *Synopsis Mammalium*. Stuttgart, XLII + 527 pp.
- 1830. *Addenda, Emendata et Index ad Synopsis Mammalium*. Stuttgart, pp. 329—752, 8 tables.
- FITZINGER, L. J., 1868—1870. Revision der zur natürlichen Familie der Katzen (Feles) gehörigen Formen. *Sitz. Ber. Ak. Wiss. Wien, math. naturw. Cl.*, vol. 58, Abth. 1, 1868, pp. 421—519; vol. 59, Abth. 1, 1869, pp. 211—279, and pp. 629—716; vol. 60, Abth. 1, 1870, pp. 173—262.

- FLOWER, S. S., 1900. On the Mammalia of Siam and the Malay Peninsula. Proc. Zool. Soc. Lond., pp. 306—379.
- FRECHKOP, S., 1934. Notes sur les Mammifères XVI. Les Mammifères rapportés en 1932, de l'Extrême-Orient par S.A.R. le Prince Léopold de Belgique. Bull. Mus. roy. Hist. Nat. Belg., vol. 10, pt. 14, pp. 1—37, 3 figs., 1 pl.
- FRIANT, M., 1933. Contribution à l'Etude de la différenciation des dents jugales chez les mammifères, essai d'une théorie de la dentition. Publications du Mus. Nat. Hist. Nat., no. 1, IX + 132 pp., 71 figs.
- GEOFFROY-SAINTE-HILAIRE & F. CUVIER, 1824—1829. Histoire Naturelle des Mammifères, avec des figures originales, coloriées, dessinées d'après des animaux vivans, vol. 3 (pts. 41—60). Paris.
- GERVAIS, P., 1855. Histoire Naturelle des Mammifères, avec l'indication de leurs mœurs, et de leurs rapports avec les arts, le commerce et l'agriculture, vol. 2, Carnivores etc. Paris, 344 pp., textfigs., pls.
- GIEBEL, C. G., 1855. Die Säugethiere in zoologischer, anatomischer und palaeontologischer Beziehung umfassend dargestellt. Leipzig, XII + 1108 pp.
- GILL, T., 1872. Arrangement of the Families of Mammals, with analytical tables. Smithsonian Miscellaneous Collections, no. 230, 98 pp.
- 1874. On the genera Tremarctos, Gervais (Nearctos, Gray), and Aelurina, Gervais (Ailurogale, Fitz.). Ann. Mag. Nat. Hist., ser. 4, vol. 13, pp. 15—16.
- GOODWIN, G. G., 1933. Mammals collected in the maritime province of Siberia by the Morden-Graves North Asiatic Expedition, with the description of a new hare from the Amur River. Am. Mus. Novit., no. 681, pp. 1—18.
- GRAY, J. E., 1862. Catalogue of the bones of Mammalia in the collection of the British Museum. London. IV + 296 pp.
- 1867. Notes on the skulls of Cats (Felidae). Proc. Zool. Soc. Lond., pp. 258—277, 7 figs.
- 1869. Catalogue of Carnivorous, Pachydermatous and Edentate Mammalia in the British Museum. London, VII + 398 pp., 47 figs.
- 1874 a. On Nearctos and Aelurina. Ann. Mag. Nat. Hist., ser. 4, vol. 14, p. 93.
- 1874 b. List of the species of Feline Animals (Felidae). Ann. Mag. Nat. Hist., ser. 4, vol. 14, pp. 351—356.
- GREVÉ, C., 1895. Die geographische Verbreitung der jetzt lebenden Raubthiere. Nova Acta Ac. Caes. Leop. Carol., vol. 63, pp. 1—280, 21 pls.
- GYLDENSTOLPE, N., 1919. On a collection of Mammals made in Eastern and Central Borneo by Mr. Carl Lumholtz. Kungl. Svenska Vet. Ak. Handl., vol. 60, pt. 6, pp. 1—62, pls. 1—6, 4 textfigs.
- HARTERT, E., 1896. An account of the collections of birds made by Mr. William Doherty in the Eastern Archipelago. Novit. Zool., vol. 3, pp. 537—590.
- 1896 b. List of a collection of birds made in Lombok by Mr. Alfred Everett (with notes on Lombok by A. Everett). Novit. Zool., vol. 3, pp. 537—599.
- HENSEL, R., 1879. Ueber Homologien und Varianten in den Zahnformel einiger Säugethiere. Morph. Jahrb., vol. 5, pp. 528—561.
- HEURN, W. C. VAN, 1932. Vluchtige zoologische waarnemingen, gedaan tijdens een kort verblijf op Timor en Flores, April—Mei 1930. Natk. Tijdschr. Ned. Ind., vol. 92, pp. 64—84.
- HILZHEIMER, M., 1905. Ueber einige Tigerschädel aus der Strassburger zoologischen Sammlung. Zool. Anz., vol. 28, 1905, pp. 594—599, 6 figs.
- 1906. Papio mundamensis, Felis deliensis, Canis reissii und andere neue Säugtiere. Zool. Anz., vol. 30, pp. 109—118, figs.
- HOLLISTER, N., 1912. A List of the Mammals of the Philippine Islands, exclusive of the Cetacea. Philippine Journ. Sc., vol. 7, sect. D, pp. 1—64.

- 1913. A review of the Philippine Land Mammals in the United States National Museum. Proc. U. S. Nat. Mus., vol. 46, pp. 299—341, pls. 27—29.
- 1917. Some effects of environment and habit on captive lions. Proc. U. S. Nat. Mus., vol. 53, pp. 177—193, pls. 22—25.
- 1918. East African Mammals in the United States National Museum. Part I. Insectivora, Chiroptera, and Carnivora. Bull. U. S. Nat. Mus., no. 99, 194 pp., 3 figs., 55 pls.
- HORSFIELD, T., 1821—1824. Zoological researches in Java and the neighbouring Islands. London, pts. 1—2, 1821; pts. 3—5, 1822; pts. 6—7, 1823; pt. 8, 1824. 72 pls. + unpagged text.
- 1851. A catalogue of the Mammalia in the Museum of the Hon. East-India Company. London, VI + 212 pp.
- HOSE, C., 1893. A descriptive account of the Mammals of Borneo. London, 78 pp., map, 3 pls.
- HOWELL, A. B., 1925. Pathologic skulls of captive Lions. Journ. Mamm., vol. 6, pp. 163—168.
- IHERING, H. VON, 1910. Systematik, Verbreitung und Geschichte der südamerikanischen Raubtiere. Arch. Natg., Jahrg. 76, vol. 1, pt. 2, pp. 113—179.
- JACOBSON, E., 1921. Notes on some Mammals from Sumatra. Journ. Fed. Mal. St. Mus., vol. 10, pp. 235—240, pl.
- JENTINK, F. A., 1883. A list of species of Mammals from West Sumatra and North Celebes, with descriptions of undescribed or rare species. Notes Leyd. Mus., vol. 5, pp. 170—181.
- 1887. Catalogue ostéologique des Mammifères. Muséum d'Histoire Naturelle des Pays-Bas, vol. 9, Leiden, 360 pp., 12 pls.
- 1891. On *Lepus netscheri* Schlegel, *Felis megalotis* Müller and *Anoa santeng* Dubois. Notes Leyd. Mus., vol. 13, 1891, pp. 217—222.
- 1892. Catalogue systématique des Mammifères (Singes, Carnivores, Ruminants, Pachydermes, Sirènes et Cétacés). Muséum d'Histoire Naturelle des Pays-Bas vol. 11, Leiden, 219 pp.
- 1901. On *Felis badia* Gray. Notes Leyd. Mus., vol. 23, pp. 91—93.
- JONES, F. WOOD, 1918. Effect of captivity on the cranial form of the Lion. Proc. Zool. Soc. Lond. (1917), p. 333.
- JOYNSON, H. W., 1924. Melanism in the Golden Cat (*Felis temmincki*). Journ. Nat. Hist. Soc. Siam, vol. 6, p. 313.
- KELLER, C., 1905. Naturgeschichte der Haustiere. Berlin, VII + 304 pp., 51 figs.
- KOENIGSWALD, G. H. R. VON, 1933. Beitrag zur Kenntnis der fossilen Wirbeltiere Javas. Wet. Meded. Dienst Mijnb. Ned. Ind., no. 23, 184 pp., 28 pls.
- 1934. Zur Stratigraphie des javanischen Pleistocän. De Ingenieur in Nederlandsch Indië, vol. 1, pt. 11, sect. 4, pp. 185—201, 4 pls.
- KONINGSBERGER, J. C., 1902. De Zoogdieren van Java. Meded. Plantentuin, no. 54, pp. 1—75, 2 pls.
- 1911—1915. Java, zoölogisch en biologisch. Buitenzorg, pt. 1, 1911, pp. 1—50; pts. 2—3, 1912, pp. 51—254; pts. 6—9, 1913, pp. 255—440; pt. 10, 1914, pp. 441—492; pts. 11—12, 1915, pp. 493—663.
- KRETZOL, N., 1929. Materialien zur phylogenetischen Klassifikation der Aeluroideen. Xe Congr. Int. Zool. Budapest (1927), vol. 2, pp. 1293—1355, pls. 43—44.
- LESSON, R. P., 1827. Manuel de mammalogie ou Histoire Naturelle des Mammifères. Paris, XV + 442 pp.
- 1836. Histoire naturelle générale et particulière des Mammifères et des Oiseaux découverts depuis la mort de Buffon. Mammifères, vol. 5. Paris, 512 pp.
- LUDEKING, E. W. A., 1862. Natuur- en geneeskundige Topographische schets der As-

- sistent-Residentie Agam. Geneeskundig Tijdschr. Ned. Ind., vol. 9 (n.s., vol. 4) pp. 1—153.
- LYDEKKER, R., 1878. Aberrant dentition in *Felis tigris*. Journ. As. Soc. Beng., vol. 47, pt. 2, pp. 2—3, pl. 2.
- 1886 a. Preliminary note on the Mammalia of the Karnul Caves. Rec. Geol. Surv. Ind., vol. 19, pp. 120—122.
- 1886 b. The Fauna of the Karnul Caves. Mem. Geol. Surv. Ind., Pal. Ind., ser. 10, vol. 4, pt. 2, pp. 23—58, pls. 7—11.
- 1895. A handbook to the Carnivora, vol. 1, Cats, Civets and Mongoose. London, VIII + 312 pp., 32 pls.
- date?. Wild Life of the world, a descriptive survey of the geographical distribution of Animals, vol. 2. London & New York, XII + 440 pp., 218 figs., 29 pls.
- LYON, M. W., 1908. Mammals collected in Eastern Sumatra by Dr. W. L. Abbott during 1903, 1906, and 1907 with descriptions of new species and subspecies. Proc. U. S. Nat. Mus., vol. 34, pp. 619—679, 4 figs., pls. 52—56.
- 1911. Mammals collected by Dr. W. L. Abbott in Borneo and some of the small adjacent islands. Proc. U. S. Nat. Mus., vol. 40, pp. 53—146, pls. 1—7.
- MAAREL, F. H. VAN DER, 1931. Mammalia, in: De Palaentologie en Stratigraphie van Nederlandsch Oost-Indië. Leidsche Geol. Meded., vol. 5, pp. 471—484.
- 1932. Contributions to the knowledge of the Fossil Mammalian Fauna of Java. Wet. Meded. Dienst Mijnb. Ned. Ind., no. 15, 208 pp., 29 figs., 20 pls., 26 tables.
- MARTIN, K., 1919. Unsere Palaeozoologische Kenntnis von Java. Leiden, XI + 158 pp., 4 pls.
- MATTHEW, W. D., 1910. The Phylogeny of the Felidae. Bull. Am. Mus. Nat. Hist., vol. 28, pp. 289—316, 15 figs.
- MATTHEW, W. D., & W. GRANGER, 1923. New Fossil Mammals from the Pliocene of Sze-chuan, China. Bull. Am. Mus. Nat. Hist., vol. 48, pp. 563—598, 27 figs.
- MÉNÉGAUX, A., date? Les Mammifères, in: La vie des Animaux illustrée. Paris, XXVIII + 544 pp.
- MILNE-EDWARDS, A., 1868—1872. Etudes pour servir à l'histoire de la Faune mammalogique de la Chine, in: Recherches pour servir à l'Histoire Naturelle des Mammifères. Paris, pp. 67—180, 1869; pp. 181—208, 1871; pp. 209—229, 1872; pls. 6—33, 1868—1872.
- MIVART, ST. GEORGE, 1881. The Cat, an introduction to the study of Backboned Animals, especially Mammals. London, XXIV + 557 pp., 208 figs.
- MODIGLIANI, E., 1889. Appunti intorno ai Mammiferi dell'Isola Nias. Ann. Mus. Civ. Gen., ser. 2, vol. 7 (vol. 27), pp. 238—245.
- 1890. Un Viaggio a Nias. Milano, XVI + 724 pp., 195 figs., 26 pls., 4 maps.
- MOHNICKE, O., 1883. Blicke auf das Pflanzen- und Thierleben in den Niederländischen Malaien-ländern. Münster, 694 pp., figs.
- MÜLLER, S., 1839. De Zoogdieren van den Indischen Archipel, in: Verhandelingen over de Natuurlijke Geschiedenis der Nederlandsche Overzeesche Bezittingen door de leden der Natuurkundige Commissie in Indië en andere schrijvers, Zoölogie. Leiden, 57 pp., table.
- OWEN, R., 1834. On the distinguishing peculiarities of the crania of the Lion and Tiger. Proc. Zool. Soc. Lond., pt. 2, pp. 1—2.
- 1840—1845. Odontography or a Treatise on the Comparative Anatomy of the teeth; their physiological relations, mode of development and microscopic structure in the Vertebrate Animals. London, vol. 1, text, XIX + LXXIV + 655 pp. (pt. 1, 1840; pt. 2, 1841; pt. 3, 1845); vol. 2, atlas, 168 pls. (pt. 1, 1840, 50 pls.; pt. 2, 1841, 50 pls.; pt. 3, 1845, 68 pls.).
- PILGRIM, G. E., 1932. The fossil Carnivora of India. Mem. Geol. Surv., Pal. Ind., n.s., vol. 18, III + 322 pp., 10 pls.

- Pocock, R. I., 1907. English Domestic Cats. Proc. Zool. Soc. Lond., pp. 143—168, fig. 60, pls. 8—10.
- 1908. Exhibition of photographs of a Sumatran Tiger, and remarks upon this animal and upon Tigers living in the Society's Gardens. Proc. Zool. Soc. Lond., pp. 890—893, figs. 174—175.
- 1916 a. Some dental and cranial variations in the Scotch Wild Cat (*Felis sylvestris*). Ann. Mag. Nat. Hist., ser. 8, vol. 18, pp. 272—277, figs. A—D.
- 1916 b. On the tooth-change, cranial characters, and classification of the Snow Leopard or Ounce (*Felis uncia*). Ann. Mag. Nat. Hist., ser. 8, vol. 18, pp. 306—316, 4 figs.
- 1916 c. The structure of the auditory bulla in existing species of Felidae. Ann. Mag. Nat. Hist., ser. 8, vol. 18, pp. 326—334, 7 figs.
- 1916 d. On some cranial and external characters of the Hunting Leopard or Cheetah (*Acinonyx jubatus*). Ann. Mag. Nat. Hist., ser. 8, vol. 18, pp. 419—429, 5 figs.
- 1917 a. On the external character of the Felidae. Ann. Mag. Nat. Hist., ser. 8, vol. 19, pp. 113—136, 12 figs.
- 1917 b. The classification of existing Felidae. Ann. Mag. Nat. Hist., ser. 8, vol. 20, pp. 329—350.
- 1929. Tigers. Journ. Bomb. Nat. Hist. Soc., vol. 33, pp. 505—541, pls. 1—4 and A—I.
- 1930. The Panthers and Ounces of Asia. Journ. Bomb. Nat. Hist. Soc., vol. 34, pp. 64—82, pls. I—VI, and pp. 307—336, pls. VII + XIII.
- 1932. The Marbled Cat (*Pardofelis marmorata*) and some other oriental species, with the definition of a new genus of Felidae. Proc. Zool. Soc. Lond., pp. 741—766, 5 figs., 2 pls.
- PÖPPIG, E., 1851. Illustrierte Naturgeschichte des Thierreichs, vol. 1, Naturgeschichte der Säugethiere. Leipzig, VIII + 312 pp., 1100 figs.
- REIGHARD, J., & H. S. JENNINGS, 1928. Anatomy of the Cat, 2nd ed. New York, XX + 498 pp., 173 figs.
- ROBINSON, H. C., & C. BODEN KLOSS, 1918. Results of an expedition to Korinchi Peak, Sumatra. I. Mammals. Journ. Fed. Mal. St. Mus., vol. 8, pt. 2, pp. 1—80, pl.
- ROSENBERG, H. VON, 1878. Der Malayische Archipel. Land und Leute in Schilderungen, gesammelt während eines dreissig-jährigen Aufenthaltes in den Kolonien. Leipzig, VI + XVI + 615 pp., figs., map.
- SANCHEZ, D. SANCHEZ Y, 1898—1901. Los Mamíferos de Filipinas. An. Soc. Esp. Hist. Nat., ser. 2, vol. 7 (vol. 27), 1898, pp. 93—110; ser. 2, vol. 9 (vol. 29), 1900, pp. 177—256, and same volume, 1901, pp. 257—290.
- SATUNIN, K., 1905. Trichaelurus, eine neue Feliden-Gattung und die Arten derselben. Annuaire Mus. Zool. St. Pétersb., vol. 9 (1904), pp. 495—506.
- 1909. Zur Systematik der Familie Felidae. Mitt. Kauk. Mus. Tiflis, vol. 4, pp. 218—237 (Russian), pp. 238—256 (German), 8 figs.
- SCHEIDT, P., 1894. Morphologie und Ontogenie des Gebisses der Hauskatze. Morph. Jahrb., vol. 21, pp. 425—462, pl. 12.
- SCHINZ, H., 1844. Systematisches Verzeichniss aller bis jetzt bekannten Säugethiere oder Synopsis Mammalium nach dem Cuvier'schen System, vol. 1. Solothurn, X + 587 pp.
- SCHLEGEL, H., 1837. Essai sur la Physionomie des Serpens, vol. 1. Leiden, XXVIII + 251 pp.
- 1857. Handleiding tot beoefening der Dierkunde, vol. 1. Breda, LII + 530 pp., and Atlas, pls. 1—7.
- 1866. Communication on Mammals and Birds collected in Madagascar. Proc. Zool. Soc. Lond., pp. 419—426.

- 1872. De Zoogdieren, in: De Dierentuin van het Koninklijk Zoölogisch Genootschap Natura Artis Magistra te Amsterdam. Amsterdam, pp. 1—174 + VII, figs.
- SCHNEIDER, G., 1905. Ergebnisse zoologischer Forschungsreisen in Sumatra. Erster Teil. Säugetiere (Mammalia). Zool. Jahrb., Syst., vol. 23, pp. 1—172, 3 pls., 2 maps.
- SCHWARZ, E., 1912. Notes on the Malay Tigers with description of a new form from Bali. Ann. Mag. Nat. Hist., ser. 8, vol. 10, pp. 324—326.
- 1914. Säugetiere von Timor. Zoologie von Timor, pt. 2, pp. 113—135, pls. 2—9.
- SEVERTZOW, N., 1857—1858. Notice sur la classification multisériale des Carnivores, spécialement des Félidés et les études de zoologie générale qui s'y rattachent. Revue et Magasin Zool., ser. 2, vol. 9 (vol. 20), 1857, pp. 387—391, and pp. 433—439; ser. 2, vol. 10 (vol. 21), 1858, pp. 3—8, pp. 145—150, pp. 193—196, pp. 241—246, and pp. 385—393.
- SHELFORD, R. W. C., 1916. A naturalist in Borneo. London, XXVII + 331 pp., 32 pls.
- SNELLEMAN, J. F., 1887. Systematisch overzicht der Zoogdieren, in: Bijdragen tot de kennis der fauna van Midden Sumatra. Midden Sumatra, reizen en onderzoekingen der Sumatra Expeditie uitgerust door het Aardrijkskundig Genootschap, 1877—1897, vol. 4, Nat. Hist., sect. 1, Fauna, pt. 1, pp. 5—29, pl.
- SODY, H. J. V., 1932. The Balinese Tiger, *Panthera tigris balica* (Schwarz). Journ. Bomb. Nat. Hist. Soc., vol. 36, pp. 233—235.
- 1933. On the Mammals of Bali (with a note on the races of *Callosciurus notatus* of Java). Natuurk. Tijdschr. Ned. Ind., vol. 93, pp. 56—95.
- SONNTAG, C. F., 1923. The comparative anatomy of the tongues of the Mammalia. VIII. Carnivora. Proc. Zool. Soc. Lond., pp. 129—153, figs. 15—24.
- STEHLIN, H. G., 1925. Fossile Säugetiere aus der Gegend von Limbangan (Java). Wet. Meded. Dienst Mijnb. Ned. Ind., no. 3, pp. 1—10, 4 figs., 2 pls.
- STEWART, C. E., 1903. On the original home of the Tiger. Proc. Zool. Soc. Lond., pp. 109—110.
- STREMME, H., 1911 a. Die Säugetierfauna der Pithecanthropus-Schichten. Centralbl. Min. Geol. Pal., pp. 54—60, and pp. 83—89.
- 1911 b. Die Säugetiere mit Ausnahme der Proboscidier, in: Die Pithecanthropus-Schichten auf Java, Geologische und Paläontologische Ergebnisse der Trinil-Expedition (1907 und 1908). Leipzig, pp. 82—150, 10 figs., pls. 16—20.
- TEMMINCK, C. J., 1824—1827. Monographies de Mammalogie ou description de quelques genres de Mammifères dont les espèces ont été observées dans les différents Musées de l'Europe, vol. 1. Paris. pp. 1—72, 1824; pp. 73—204, 1825; pp. 205—244, 1826; pp. 245—268, 1827.
- 1835. Coup-d'oeil sur la faune des Iles de la Sonde et de l'Empire du Japon. Discours préliminaire destiné à servir d'introduction à la Faune du Japon, in: Fauna Japonica. Leiden, XXX pp.
- 1842—1845. Aperçu général et spécifique sur les Mammifères qui habitent le Japon et les Iles qui en dépendent. Fauna Japonica. Leiden. pp. 1—24, 1842; pp. 25—40, and Mammifères marins, pp. 1—26, 1844; pp. 41—60, 1845, 30 pls.
- 1846—1849. Coup-d'oeil général sur les Possessions Néerlandaises dans l'Inde Archipélagique. Leiden, vol. 1, 1846, XXII + 352 pp.; vol. 2, 1847, VIII + 471 pp.; vol. 3, 1849, VIII + 379 pp.
- THOMAS, O., 1896. On Mammals from Celebes, Borneo, and the Philippines recently received at the British Museum. Ann. Mag. Nat. Hist., ser. 6, vol. 18, pp. 241—250.
- 1898. On the Mammals obtained by Mr. John Whitehead during his recent expedition to the Philippines. Trans. Zool. Soc. Lond., vol. 14, pt. 6, pp. 377—412, pls. 30—36.

- TROUËSSART, E. L., 1897. *Catalogus Mammalium tam viventium quam fossilium*, nov. ed. (Prima completa), vol. 1, V + 1—664 pp.
- 1904—1905. *Catalogus Mammalium tam viventium quam fossilium*. *Quinquennale Supplementum*. Berlin, IV pp. + pp. 1—550, 1904; pp. 551—929, 1905.
- TSCHERSKI, J. D., 1892. *Wissenschaftliche Resultate der von der Kaiserlichen Akademie der Wissenschaften zur Erforschung des Jana-landes und der neusibirischen Inseln in den Jahren 1885 und 1886 ausgesandten Expedition*. Abtheilung IV. *Beschreibung der Sammlung posttertiärer Säugetiere*. *Mém. Ac. Imp. Sc. St. Pétersb.*, ser. 7, vol. 10, pp. 1—511, 6 pls.
- VETH, H. J., *Overzicht van hetgeen in het bijzonder door Nederland, gedaan is voor de kennis der Fauna van Nederlandsch Indië*. Diss. Leiden, VIII + 204 pp.
- VETH, P. J., 1875. *Java, Geographisch, Ethnologisch, Historisch*, vol. 1. Haarlem, XII + 672 pp., map.
- VOSMAER, A., 1773. *Description d'un chat sauvage indien, très singulier, qui n'a point encore été décrit, et qui se trouve au Japon*, in: *Regnum Animale, Quadrupèdes*, pl. 13 + 5 pp. Amsterdam.
- WAGNER, J. A., 1841. *Die Raubthiere*, suppl. vol. 2, in: *Die Säugethiere in Abbildungen nach der Natur mit Beschreibungen von Dr. Johann Christian Daniel von Schreber*. Erlangen, VIII + 558 pp.
- WARD, ROWLAND, 1922. *Rowland Ward's Records of Big Game*, 8th ed. London.
- WEBER, M., 1890. *Mammalia*, in: *Zoolog. Ergebnisse einer Reise in Niederländisch Ost-Indien*, vol. 1, pp. 93—114.
- 1904. *Die Säugetiere*. Jena, XI + 866 pp., 567 figs.
- 1927—1928. *Die Säugetiere*. 2nd ed., Jena. vol. 1, 1927, XV + 444 pp., 316 figs.; vol. 2, 1928, XXIV + 898 pp., 573 figs.
- ZOLLINGER, H., 1850. *Verslag van eene reis naar Bima en Soembawa, en naar eenige plaatsen op Celebes, Saleijer en Floris, gedurende de maanden Mei tot December 1847*. *Verh. Bataviaasch Genootsch. v. Kunsten en Wet.*, vol. 23, pp. 1—24, pl.
-

EXPLANATION OF THE PLATES

PLATE I.

Figs. 1—4, *Felis catus* L., ♂, Timor, Mus. Amst.; fig. 1, skull, upper view; fig. 2, skull, lower view; fig. 3, skull, side view; fig. 4, mandible, side view; fig. 5, *Leopardus pardalis* (L.), left mandible, side view. Figs. 1—4, $\times \frac{4}{5}$; fig. 5, $\times 1.1$.

PLATE II.

Figs. 1—2, *Ictailurus planiceps* (Vig. et Horsf.), left upper jaws, side view; fig. 1, Borneo, cat. ost.: c; fig. 2, Deli, Sumatra, cat. ost.: b.
Fig. 3, *Prionailurus bengalensis javanensis* (Desm.), Java, cat. ost.: e, left lower cheek-teeth, side view.
Fig. 4, *Prionailurus bengalensis borneoensis* Brongersma, E. S. E. Borneo, cat. ost.: o, left lower cheekteeth, side view.
Fig. 5, *Prionailurus bengalensis borneoensis* Brongersma, Rantau, S. E. Borneo, leg. F. C. E. Putten, reg. no. 467, right mandible, side view.
Figs. 6—7, *Felis catus* L., Deli, Sumatra, type of *Felis deliensis* Hilzh., Mus. Strasbourg; fig. 6, skull, upper view; fig. 7, skull, lower view.
Figs. 1—2, $\times 1.1$; figs. 3—4, $\times 3\frac{1}{2}$; fig. 5, natural size; figs. 6—7, $\times \frac{4}{5}$.

PLATE III.

Fig. 1, *Prionailurus bengalensis* (Kerr) sp. (*Felis microgale* Dubois), Trinil, Coll. Dubois, no. 1484, left mandible, upper view.
Figs. 2—3, *Panthera tigris* (L.) sp. (*Felis trinilensis* Dubois), Trinil; fig. 2, right upper jaw, Coll. Dubois, no. 1495, lower view; fig. 3, left upper jaw, Coll. Dubois, no. 1494, lower view.
Fig. 4, *Prionailurus bengalensis* (Kerr) sp. (*Felis microgale* Dubois), Trinil, Coll. Dubois, no. 1484, left mandible, side view, nat. size.
Fig. 1, $\times 2\frac{4}{5}$; figs. 2—3, $\times 1\frac{1}{5}$; fig. 4, natural size.

PLATE IV.

Panthera tigris (L.) sp. (*Felis trinilensis* Dubois), Trinil; fig. 1, right upper jaw, Coll. Dubois, no. 1495, side view; fig. 2, left upper jaw, Coll. Dubois, no. 1494, side view. Both figures natural size.

PLATE V.

Fig. 1, *Panthera tigris* (L.) sp., (*Felis trinilensis* Dubois), Trinil, Coll. Dubois, no. 1479, tooth-row of right mandible, upper view.
Fig. 2, *Panthera tigris* (L.) sp., Trinil, Coll. Dubois, no. 1481, left lower milk-carnassial, side view.
Fig. 3, *Panthera tigris sumatrae* Poc., Tjoebadak, Sumatra, reg. no. 991, left lower deciduous cheekteeth (p₃, p₄), side view.

Fig. 4, *Panthera tigris* (L.) sp. (*Felis trinilensis* Dubois), Trinil, Coll. Dubois, no. 1479, right mandible, side view.

Figs. 1—3, natural size; fig. 4, $\times \frac{4}{5}$.

PLATE VI.

Figs. 1—4, *Panthera tigris* (L.) sp.; fig. 1, left ulna, Trinil, Coll. Dubois, no. 1871, outer view; fig. 2, right ulna, Tegoean, Coll. Dubois, no. 90, inner view; fig. 3, left ulna, Trinil, Coll. Dubois, no. 1871, front view; fig. 4, right ulna, Tegoean, Coll. Dubois, no. 90, front view. All figures $\times \frac{1}{2}$.

PLATE VII.

Figs. 1—2, Incertae sedis, Kedoeng Broeboes, left femur, Coll. Dubois, no. 89; fig. 1, posterior view; fig. 2, front view. Both figures $\times \frac{1}{2}$.

PLATE VIII.

Figs. 1—3, *Panthera tigris* (L.) sp., left tibia, Trinil, Coll. Dubois, no. 8411; fig. 1, inner view; fig. 2, front view; fig. 3, posterior view. All figures $\times \frac{3}{5}$.

PLATE IX.

Figs. 1—4, *Panthera tigris* (L.) sp.; fig. 1, right 4th metatarsal, Coll. Dubois, no. 8907, outer view; fig. 2, right 2nd metacarpal, Coll. Dubois, no. 6259, inner view; fig. 3, left 3rd metatarsal, Bangle, Coll. Dubois, no. 1667, inner view; fig. 4, second phalanx, probably of 4th finger, Coll. Dubois, no. 6982, upper view.

Figs. 5—6, *Panthera pardus* (L.) sp., right upper carnassial (P⁴), Djeroek, Coll. Dubois, no. 6221; fig. 5, side view; fig. 6, lower view.

Figs. 1—4, $\times \frac{9}{10}$; figs. 5—6, natural size.

PLATE X.

Figs. 1—4, *Panthera tigris* (L.) sp. (*Felis oxygnatha* Dubois), Kedoeng Broeboes; fig. 1, right mandible, Coll. Dubois, no. 1498, upper view; fig. 2, right mandible, Coll. Dubois, no. 1499, upper view; fig. 3, right mandible, Coll. Dubois, no. 1498, side view; fig. 4, right mandible, Coll. Dubois, no. 1499, side view. All figures natural size.

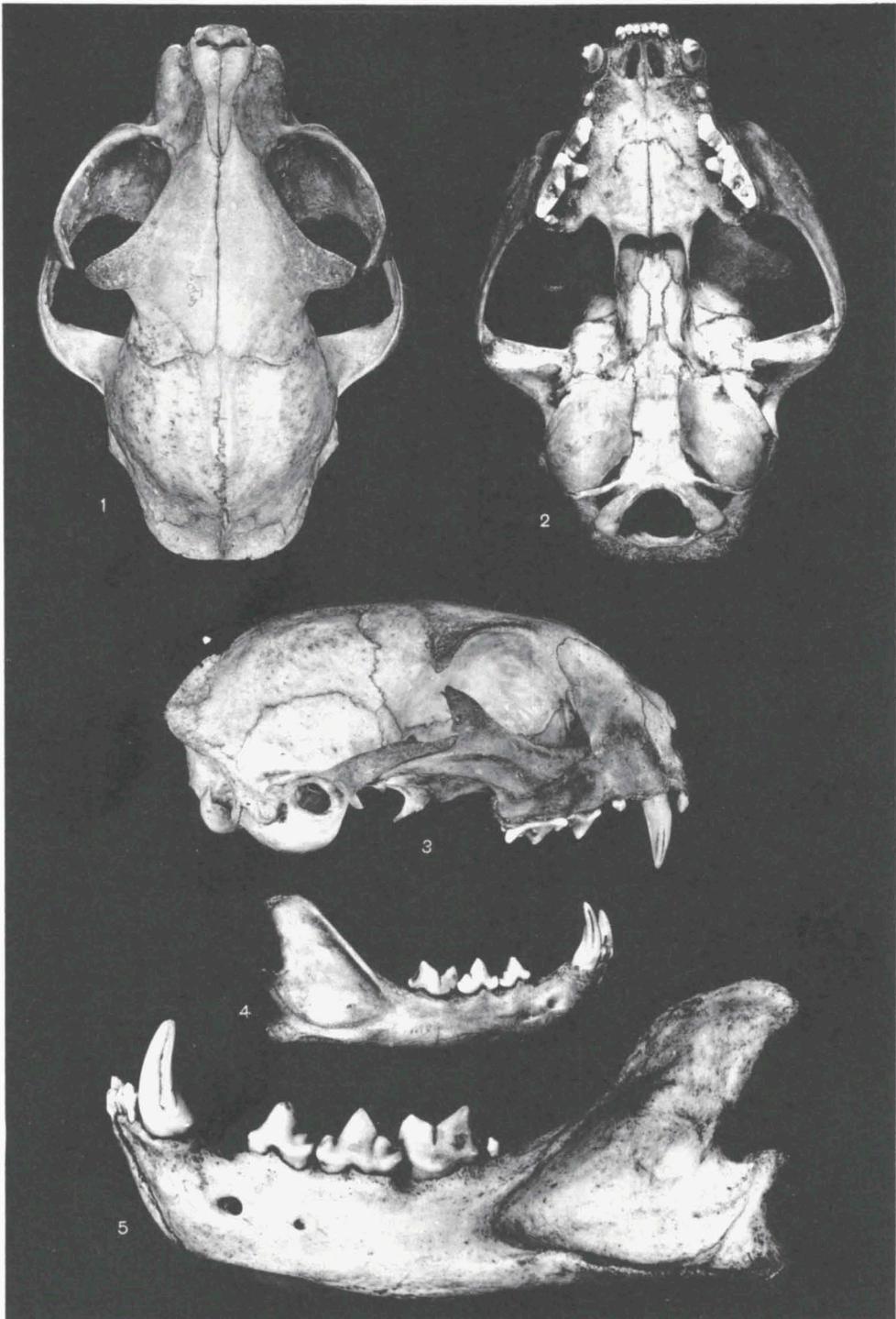
PLATE XI.

Upper figure, *Panthera tigris sondaica* (Temminck), ♀, type, from a specimen mounted about a hundred years ago.

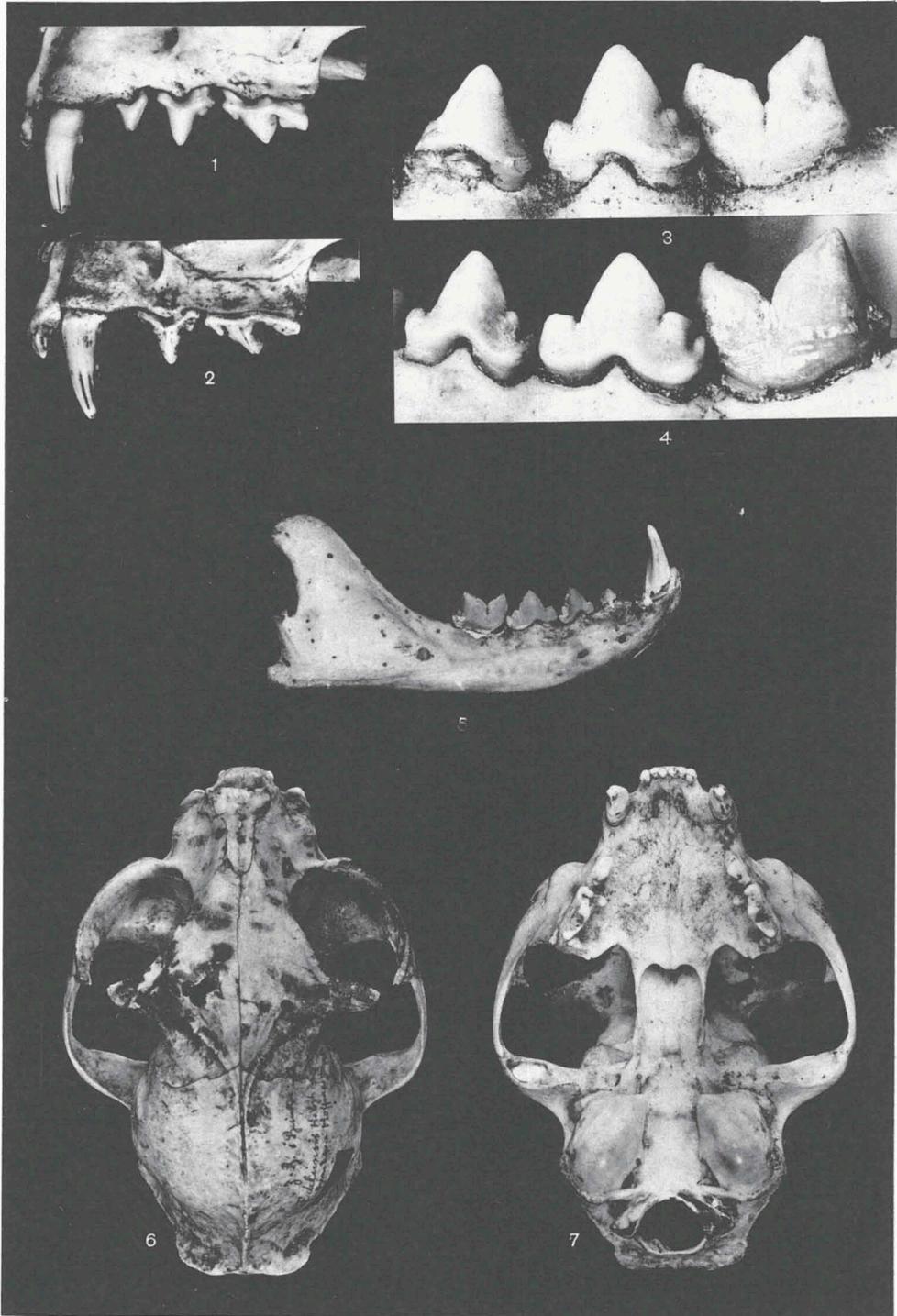
Lower figure, *Panthera tigris altaica* (Temminck), type, from a mounted specimen. Both figures $\times \frac{1}{14}$.

N.B. Indications of scale all approximately.

PLATES I—XI

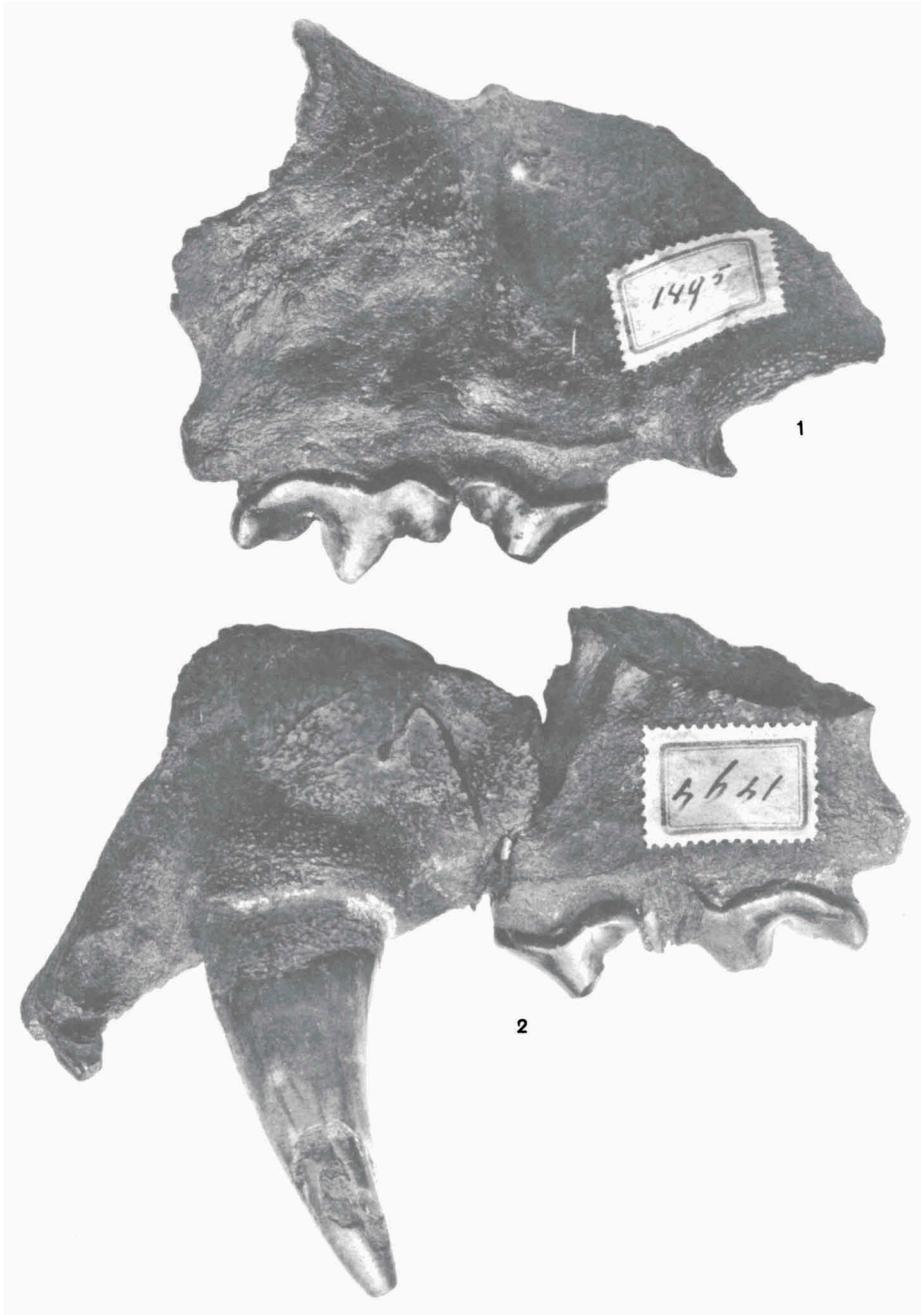


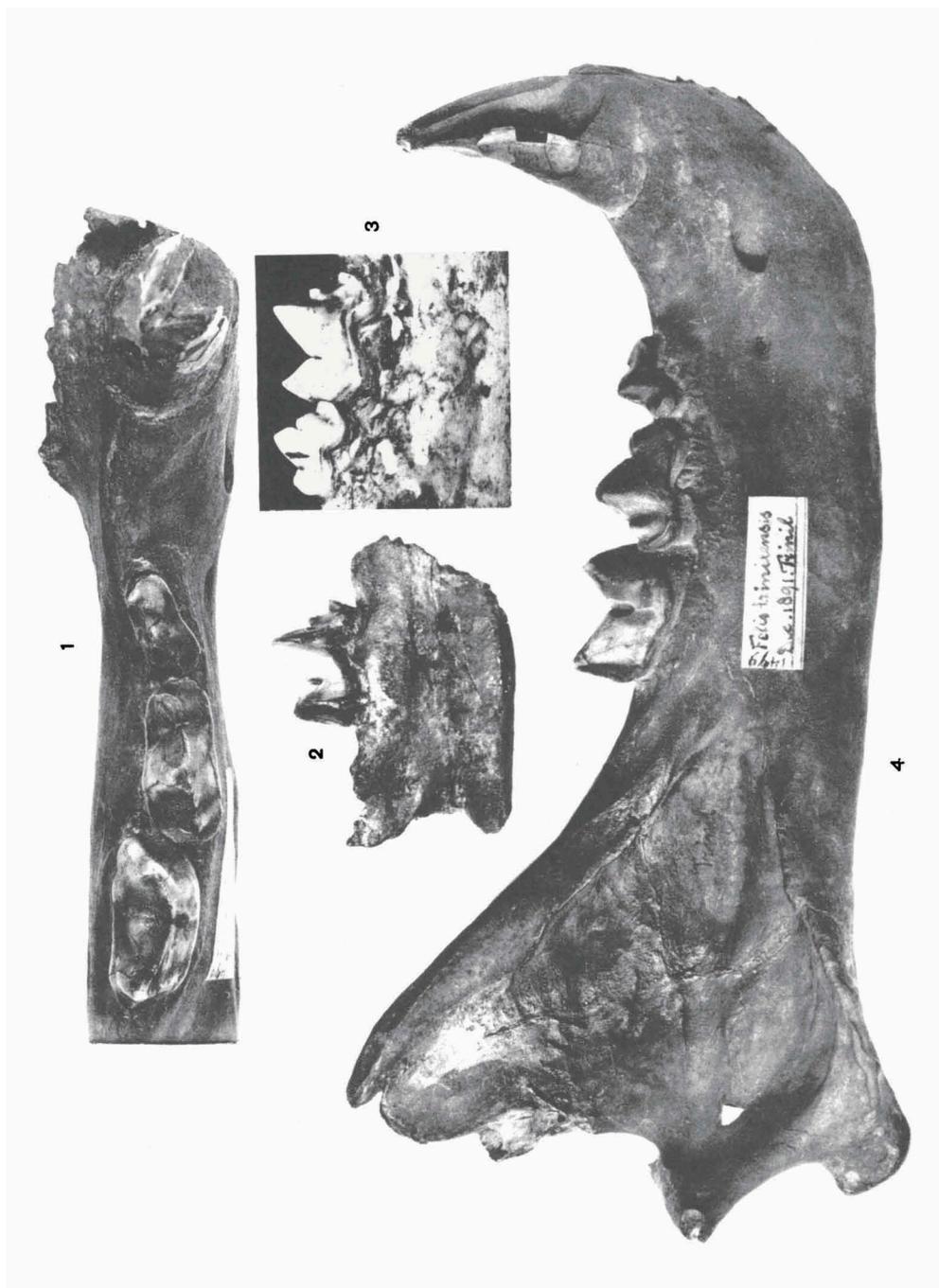
H. CORNET PHOT.

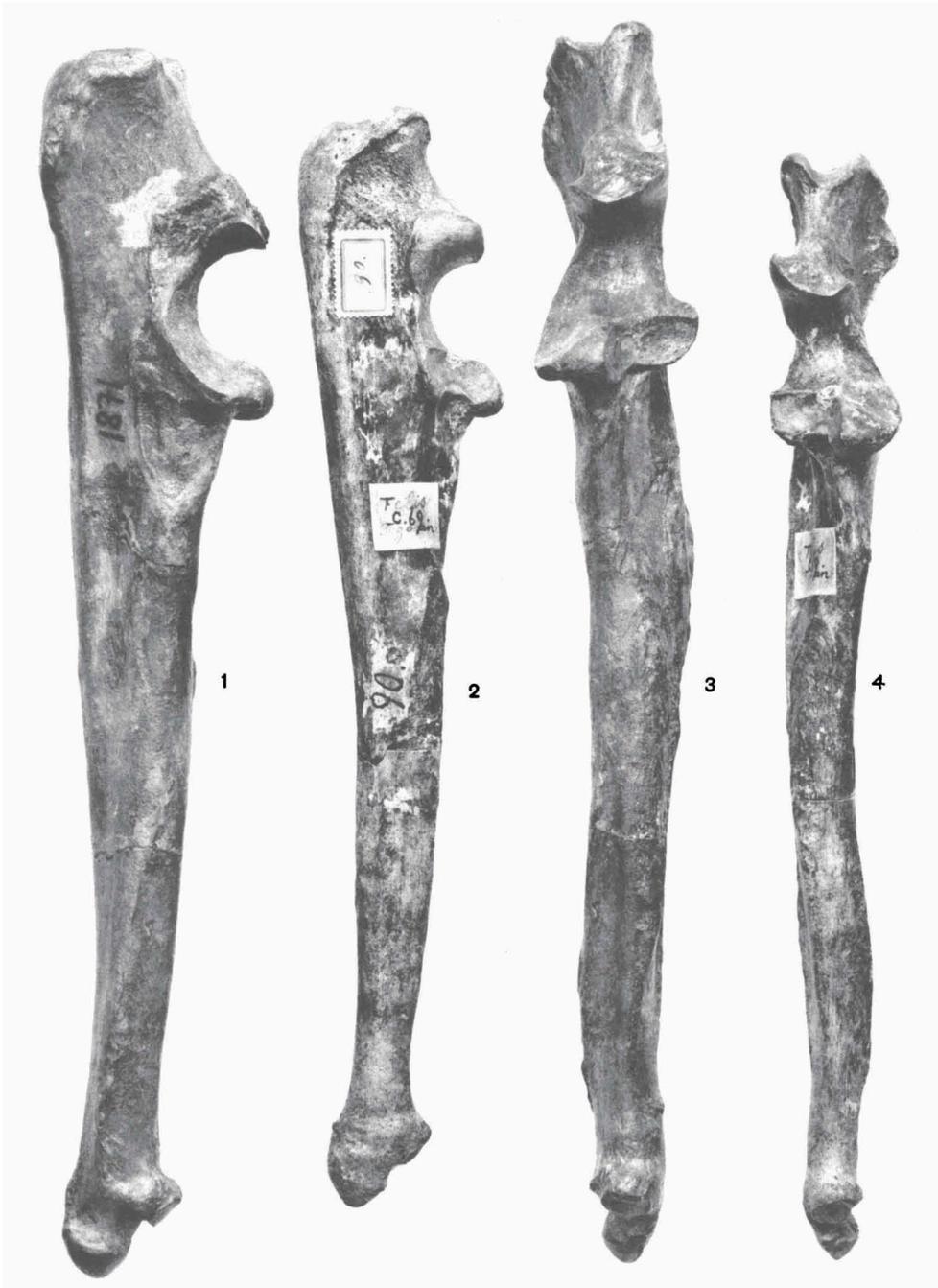


H. CORNET PHOT.







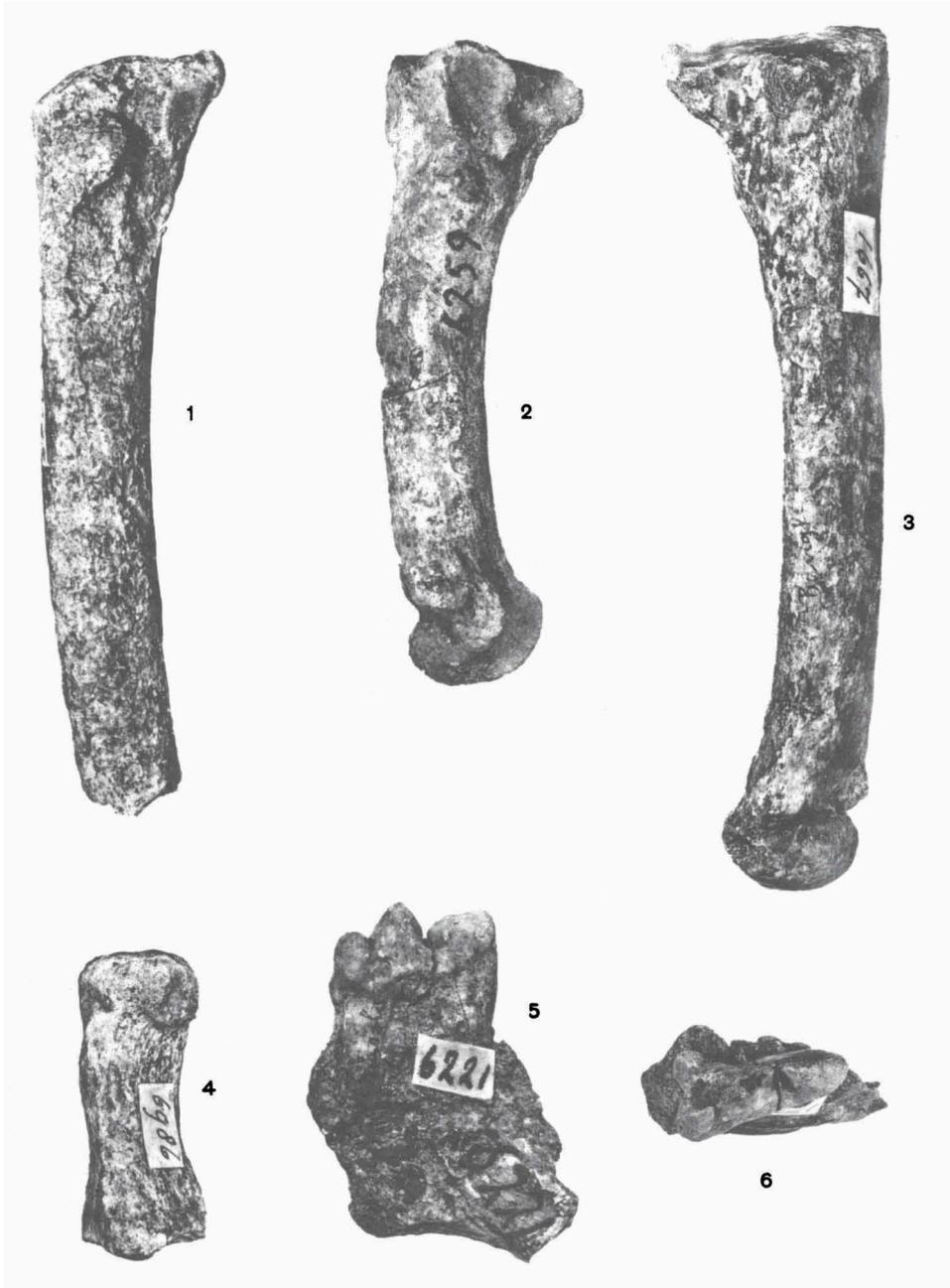


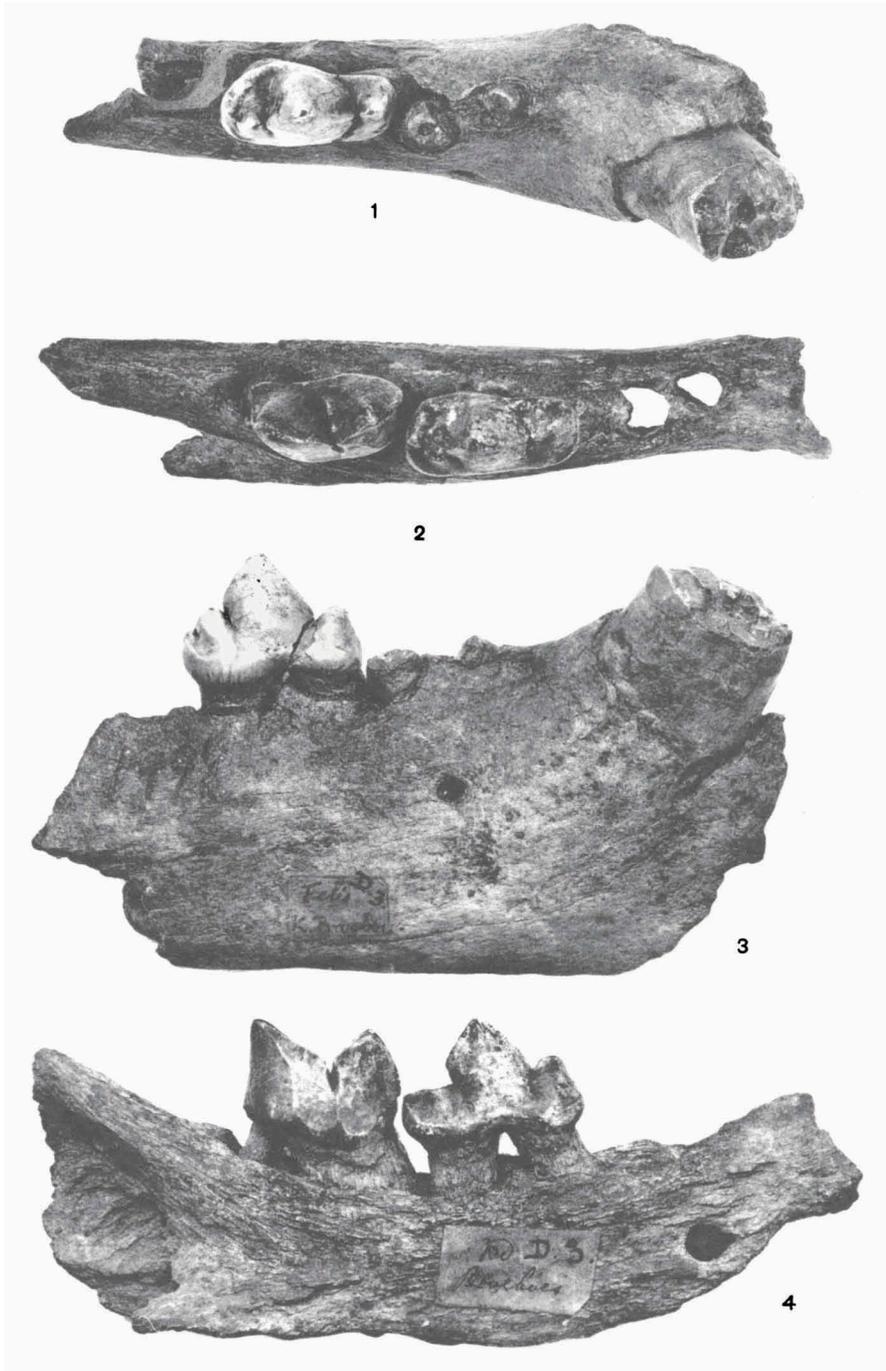
H. CORNET PHOT.

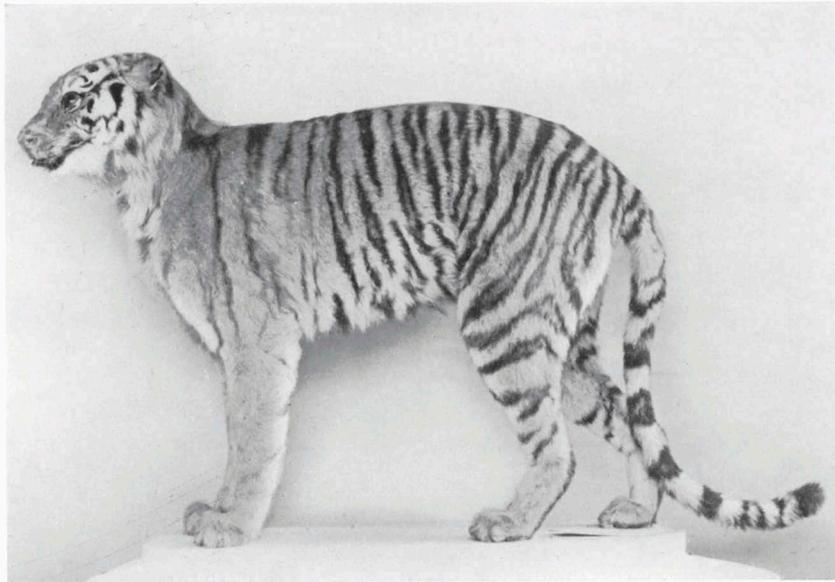




H. CORNET PHOT.







H. CORNET phot.

ERRATUM

In Brongersma, Notes on some recent and fossil cats, chiefly from the Malay Archipelago, on page 60, in the explanation of the figures, one line has dropped out. The explanation of figs. 29 and 30 must read as follows:

fig. 29, id. of fossil femur, incertae sedis, Coll. Dubois no. 89;
fig. 30, id. of *Panthera tigris sondaica* (Temm.), cat. ost.: a;