Contents

Dr Pieter Bleeker, undated photograph from the Holthuis collection, Naturalis.

Introduction

It is now 150 years since Dr Pieter Bleeker published Volume I of his "*Ichthyologiae Archipelagi Indici Prodromus*", literally translated: "A precursor of the Fishes of the Indian Archipelago". In the preface of this work Bleeker wrote that he intended to publish an illustrated review of all ca 2000 species of the Indian. Volumes 1-IX of this work would be published from 1862-1878 as the "Atlas Ichthyologique des Indes Orientales Néêrlandaises". Unfortunately Bleeker's *opus magnus* would remain unfinished because of his death in January 1878.

In 1858 coloured drawings of almost all species were ready and a grant for the printing had been awarded by the Dutch Colonial Government. However, Bleeker decided to postpone the printing of the "Atlas" till he had returned to Europe as local printers in Batavia, his home town, could not meet his high demands.

As a precursor to his Atlas, Bleeker decided to publish a series of reviews of the fish fauna of the Indian archipelago. Each volume would be a compilation of all his earlier papers on one particular taxon and was intended as a kind of primer and exercise for what Bleeker envisaged to be his final work.

Vol. I of this series was a revision of the Order *Siluri*, the catfishes. After a critical description of the systematic work on this order by predecessors and contemporary ichthyologists, Bleeker divided the Siluri in four Families, viz. the Siluroidei, Aspredinoidei, Loricaroidei and Heterobranchoidei. In the Indian archipelago he only obtained representatives of the first and the last family. These were subdivided in Subfamilies, *Phalanges*, and *Cohortes*. Detailed descriptions were presented for 99 species. Many species earlier described by Bleeker were placed in synonymy.

Latin and Dutch

Like many papers that formed the basis of his revisions, the *Prodromus* volume was bilingual. Diagnostic keys and descriptions of genera and species were in Latin, whereas the history of Bleeker's own systematic research, the taxonomic reviews of the families, information on the specimens used for the descriptions, explanations of the scientific names, distinguishing characters, and data on species distribution, stomach contents, fishery and consumption were in Dutch. As a consequence, more than half of the text was unavailable to most ichthyologists.

Probably Bleeker explicitly wanted to reach a Dutch audience. He owned most of his specimens to donations of his countrymen, who were distributed all over the Indian archipelago. By writing in Dutch (and naming species after their collectors) he could make them aware of his gratitude and stimulate them to send him more specimens.

In the Atlas Ichthyologique the species descriptions were still in Latin, but for additional remarks French was used instead of Dutch. However, these French parts in the Atlas are much more condensed than the Dutch parts in the *Prodromus*. The Dutch parts of the *Prodromus* volumes are unique as they contain information on type specimens mentioned neither in the original species descriptions nor in the Atlas. These data are indispensable for designating specimens from the Bleeker collection as types.

Vol. I of the *Prodromus* was published as Vol. IV of the *Acta Societas Scientiarum Indo-Neerlandicae* (Bleeker, 1858a) and separately as a book (Bleeker, 1858b). Although the two versions have same contents, the lay-out differs slightly. In the book version p. ii-xii containing the index and the errata, are placed before he main text, in the journal version at the end of the main text.

In the two versions of *Prodromus* Vol. II, dealing with the Order *Cyprini*, (Bleeker, 1860a,b) the lay-out was similar to the book version of Vol. I. After Bleeker's return to the Netherland in 1861, the *Prodromus* series stopped. Nevertheless, Bleeker continued to publish many smaller revisions of families, subfamilies, and genera as precursors for the Atlas till the end of his life.

Notes on the translation

Our translation of the *Siluri* is made from the book version. In general the lay-out of the book is followed. Latin parts that in the original were set in a smaller font, have been treated the same when translated. The lay-out of the tables in a few places is slightly adjusted to make them more lucid. Page numbers of the original publication are incorporated in the text in a grey square.

In Bleeker's time, it was not yet an official standard to write Latin names in italics. Bleeker uses italics rather haphazardly. In the translation we have followed Bleeker. Similarly no corrections are applied to Bleeker's inconsistencies in abbreviations of names of journals, the application of diereses, etc. Only mistakes in spelling of scientific names are corrected. However, a number of older anatomical names, which are no longer in use, are replaced by up to date synonyms. Thus, "*cirri supramaxillaris*" is translated by maxillary barbels, "*inframaxillare*" by lower jaw, "*intramaxillare*" by premaxilla and "*interparietal*" by supraoccipital.

Notes on Bleeker's measurements

Apparently Bleeker assumed that all readers were familiar with his abbreviations and measuring techniques as defined in his earlier publications. For example, in his species descriptions Bleeker (1858a,b) behind the number of caudal fin rays (e.g. C.1/13/1) used the abbreviation "*et lat. brev.*" without explanation. Earlier (e.g. in Bleeker, 1846) he used "*c. lat brev.*", "*cum later. brev.*" and "*c lat.*' or "c *later.*" Only once (Bleeker, 1846: 150 = 1847: 22), the full text is given as "*cum lateralibus brevioribus.*" Translated literally this means "with the lateral ones shorter". Obviously, "lateral" refers to the fin in the sagital plane and therefore we have translated this as "and shorter ones alongside".

About the measurements Bleeker (1846: 143) stated [translated] "With regard to the clarification of length and width measurements of the head, which occur in the diagnosis of most of the species, it must be pointed out that the length is taken from the tip of the upper jaw to the most posterior extension of the gill cover. Only in species of Clarias that length is taken from the upper jaw to the posterior most part of the interparietal [= supraoccipital] bone. The head width in all species is taken over the gill covers. Wherever the length of the body is discussed it is the total length of the body, including the head and the caudal fin, unless the reverse is said."

In the present paper Bleeker (1858a,b: 12; see p. 19, 20) gives definitions of several taxonomic characters and two other measurements.

In his earliest paper in which the lengths of described specimens are mentioned (Bleeker, 1847) and in his first twelve publications in the Verhandelingen van het Bataafs Genootschap (Vols XXII & XXIII, 1847-1849), lengths of specimens are given in mm. In subsequent papers he always used the notation ''', which gives the impression that he does not use the metric system. However, in his first paper in the "Natuurkundig Tijdschrift voor Nederlandsch Indie" Bleeker (1851: 8) stated [translated]: "Of all species I have added in the diagnosis the length of the specimens used for the description expressed in millimeter measure." This measure is indicated as: '''. A comparison of the size of Bleeker specimens and the measurements given in the descriptions, makes clear that Bleeker always gives the total length in millimeters. Only rarely another length measurement indicated as "absque pinna caudalis" [without caudal fin] is used.

The figures

For identification as well as for determination of the relationships of the species, Bleeker attached much value to head and body shape, and the shape of bony elements, fins and fin spines, teeth and tooth patches. He often must have had problems when trying to express these shapes in words, especially in Latin. Bleeker realized that figures were indispensable for illuminating both morphology and colouration. He believed it was essential to have figures made not only of the *habitus* of the species but also a dorsal view of the head to show the shape of the head bones with fontanels and granulation as well as of the jaw- and palatal dentition.

Bleeker was very critical of the achievements of his artists (all drawings of catfishes were made by Mr L. Speigler) and he even wrote that because of the many corrections he had to have made, the figures should be considered more his own work that that of his artist (Bleeker, 1878; van Oijen, 2005).

As in Bleeker's time facilities for publishing of large coloured plates in the Dutch East Indies were limited, the figures of the species described in *Prodromus* Vol. I were published 4 years later. In our translation these figures are combined with the text. The figures were scanned from the plates of the Naturalis' copy of Volume II of the Atlas Ichthyologigue. In the Atlas, figures are life size unless specimens were larger than page size, in which case they were reduced by the lithographer. The page size of the Zoologische Mededelingen forced us to reduce the size of nearly all *habitus* figures to page width. In the few cases when figures were enlarged, the original size of the figure is indicated. The dorsal view of the head, and the figures of the dentition are included at Atlas size (= life size). In a few cases the size had to be reduced to 75% Atlas size.

Continuous research

The publication of Vol. I of the Prodromus, was a mile stone in Bleeker's research on catfishes, but his research on the catfishes of his collection and the description of new species continued. As a result of new research some descriptions had to be adapted. In a few cases figures of the dentition published in the Atlas (Bleeker, 1862) diverge from the descriptions in Bleeker, 1858. Bleeker never refers to any detail in the figures,

neither in the *Prodromus* volume nor in the Atlas. Therefore it is not clear whether the uncolored drawings of the head and the dentition were made before the publication of his *Prodromus* and adapted for the Atlas, or especially for the Atlas. Only in the case of *Silurichthys hasseltii* Blkr we can be certain that the figures of the head and dentition were made in the Netherlands, as the only specimen of this species was preserved in the Leyden museum.

In the Atlas some species still regarded as valid by Bleeker (1858a, b) were placed in synonymy, while quite a few others species were placed in different genera. Remarks on changed views of Bleeker are placed between square brackets.

Recommendation

As Bleeker in this work gives an overview of all his papers on catfishes, from 1846 through 1858, it gives an insight in his development as an ichthyologist. His changing views on this group of fishes are exemplary of his treatment of other groups. Therefore, many parts of this work are of interest to other ichthyologists dealing with Bleeker species.

I hope this translation may contribute to the appreciation of Dr Pieter Bleeker as an ichthyologist and systematist and that it may stimulate further research on the fishes of the Indonesian Archipelago.

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MvO
November 2008

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ICHTHYOLOGIAE

ARCHIPELAGI INDICI

PRODROMUS,

AUCT.

P. BLEEKER,

Math. Mag., Philos. Nat. et Med. Dr., Summ. Consil. Instruct. Public. in Ind. Neërland. Senat., Ordin. Coron. Querc. Praefect., Ordin. Leon. Neërland. et Ordin. Imperial. Austriac. Coron, Ferr. Eq., Societ. Scient. Ind. Neêrl. Praes., Acad. Reg. Scient. Neërland., Acad. Caesar. Leop. Carol. Nat. Cur., Reg. Botan. Societ. Boic. Ratisb. etc. etc. Soc.

VOLUMEN 1

SILURI

BATAVIA
TYPIS LANGE ET CO.
1858

Translated by
M.J.P. van Oijen (Dutch),
G.M.P. Loots & F.J.G. Limburg (Latin)

Published with financial support of the All Catfish Species Inventory Project of the U.S. National Science Foundation.

THE FISHES OF THE INDIAN ARCHIPELAGO

DESCRIBED AND ELUCIDATED

by

P. BLEEKER,

Doctor in science, mathematics and medicine, Commander of the order of the Oak Crown, Knight in the order of the Netherlands Lion and of the Austrian order of the Iron Crown, president of the Society for Natural History in Dutch East Indies, member of the head-commission for education in Dutch East Indies, member of the Royal Academy of Sciences in Amsterdam, of the Dutch Society of Sciences, of the Imperial Academy of Naturalists, of the Royal Botanical Society, Regenburg, of the Imperial Society of Naturalists, Cherbourg, etc., etc.

Part I.
SILURI.

BATAVIA.
Printed by LANGE & CO.
1858.

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1 Preface

After having investigated the ichthyological fauna of the Indian Archipelago for a period of more than 12 years, I now wish to gather the scattered construction material in order to compose a whole from it.

As my cabinet grew richer in new species and in specimens of the same species, I felt more and more the necessity for making more extensive diagnostic species descriptions than customary in science, and gradually I also came to the conviction, that the generic - and specific value of the characters can differ considerably in different fish families, so that the value of the characters can sometimes only be ascertained after comprehensive observations of their natural history.

This conviction that gradually settled in me is reflected in the many hundreds of descriptions of fishes that I published since the year 1846. When one compares my earlier descriptions with my recent ones, one will perceive, that they differ in many aspects and that the recent ones have gradually increased in extent by the addition of numerous details of the shape of the species, making them more comparable to proper descriptions than to diagnoses.

That increase in detail was necessary.

It will only be possible to designate proper diagnoses of plant and animal species, 2 when it can be assumed that all species of this earth are known and that time is not by far to be determined.

When Linnaeus wrote his diagnoses, he had a simple task. The relatively small number of species, made its distinction in a few words easy.

But those diagnoses usually have lost their value because of the thousands and thousands of species discovered since, and on several of these new species one or other diagnosis of Linnaeus would fit entirely, without stopping them being entirely different species as those for which the reformer of zoology and botany formulated his diagnoses. Even still in the 13th edition of his Systema Naturae, delivered before at the end of last century by Gmelin, only 826 species of fish were summed up, representing the whole ichthyological knowledge of the entire earth and among them one counted about 200 freshwater fishes.

Some 40 years later, in 1833, the number of known species of fish had already tripled and nowadays we may assume that about 8000 and, including the fossil species, about 10.000 species of fish are known.

Since long most investigators of natural history have ceased to use the Linnaean way of characterizing species or at least they have elucidated the too short diagnoses by more detailed descriptions.

And yet the descriptions, at least those of fishes, regarding the going into details have not kept step with the ever faster increase in the number of species, and the insufficiency of those descriptions must especially have been clear to those researchers whom, far removed from the large scientific centres and museums, were limited to their own means.

Another inconvenience for the last mentioned researchers was found in the comparative descriptions, which for instance are very often present in the large Histoire naturelle des Poissons, which presuppose knowledge of already described, sometimes also comparatively described 3 species, which can only rarely be acquired by naturalists

in Europe and never by travelling naturalists who live in other continents. This sometimes makes a correct identification of the species completely impossible.

In the fifteen years during which I did not leave the Indian Archipelago and I started my ichthyological researches in Batavia without any aids and appliances, apart from some zoological handbooks and the Histoire naturelle des Poissons of Lacépède, I had to experience in the fullest measure the inconvenience of this deficiency, and even after I, not without considerable sacrifices, had brought my cabinet to a certain extensiveness and supplied myself with the principal literary aids, I often remained in uncertainty regarding the correct determination of many species, because there were no sufficient descriptions of these or related species.

However, I believed this should not keep me from continuing my research, and I did not hesitate to draft descriptions of the many hundreds of species that came to enrich my cabinet thanks to my own research and the care of benevolent friends, and to publish these in numerous contributions.

Often when doing that I thought of the "nomen praematur in annum"* but just as often I believed I did not have to adhere to this maxim.

It is a fact already shown by detailed statistical analyses, that the term of life of the Europeans in Batavia, notwithstanding the five to six times improved depth-rate since the beginning of this century, on average is not half the medium term of life of Europeans in Europe. For myself the boundary of life seemed to be fixed even more narrow, by the many diseases, which here befell me consecutively. And it might be called and maybe is vain, that one wishes to see the fruits of his research published, but that ambition worked in me, even more so after I became aware of the fate of the scientific writings of more than one deserving member of the former "Natuurkundige Commissie" [4] in the Dutch East Indies, cut down by the climate of the tropics in the prime of the beginning male age.

Already soon after the start of my investigations I devised the plan, if I would survive, to unite the results of my investigations in one large work and thus make it possible to achieve the publication of a work, which would contain all the known fishes of the Indian archipelago and illustrations of all species, observed by me.

The realisation of this plan has always remained my aspiration. I have continued to describe all species, which constantly enriched by cabinet, as soon as possible, and in the later years, in more detail, and since eight years 2 to 3 artists are constantly working under my supervision to make accurate figures of all these species.

I have successively described about 2000 species of fish, and made those descriptions public. But these descriptions are spread in so many contributions that the consultation of these has become difficult, even for me. Moreover, for a large part they were taken from a few specimens, which not always were in a desirable state of preservation. Of very many species I later received multiple specimens of various sizes and gender and gradually I learned to know the changes, which the coloration of the

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* This Latin citation seems to be derived from Horatius' "De arte poetica" (couplet 386): "siquid tamen olim scripseris, in Maeci descendat iudicis auris et patris et nostras nonumque prematur in annum membranis intus positis."[but if you nevertheless would ever have written something, have it reviewed by Maecius, your father or by myself, keep it for representation for eight years.]

fishes from the various families undergo when they are preserved in diluted alcohol, so that I now with a rather large certainty can decide the colours of those specimens, which I could not observe in an entirely fresh condition as they were sent to me from elsewhere.

Thus I have been able for a very large part to improve my older descriptions, by examining again and more in detail all species described by myself in former days.

At the moment the figures of almost all species of the Indian archipelago made under my supervision are ready and if 5 my cabinet had not been enriched again and again by new collections, which made me feel how numerous still, the species had to be, of which science had no knowledge, I would have decided already earlier to gather the total of my observations, and rework it to a whole.

The publishing of the large plate work as yet has to be postponed till a point of time which I hope is not far removed. The government of the Dutch East Indies has allowed a large sum to cover the cost of publication and that publication would already have started, if in the Dutch East Indies the means would be present to let an illustrated work of a large size, answering to the present day scientific demands, see the light with the necessary speed. Therefore I have had to decide to wait with bringing the illustrated work to the press until I shall have returned in Europe.

In the mean time I wish, as a precursor of this work to review as a whole, the fish fauna of the Indian archipelago, as far as it has now become known to me and to treat in this work family after family.

I conceived this plan already a long time ago and it has been followed by me in the first years of my investigations. However, the numerous discoveries, made during and after the printing of my proceedings that contained the species of one family or order, soon made these contributions incomplete, even to such an extent that my cabinet soon possessed twice or more than twice the number of species described in those proceedings.

Now I take up this work again. Though I will not tie myself to the sequence of the systems and will not always treat the families of fishes in a systematic order, I will within the circle of those families keep an eye upon a strict systematic order, in order firstly to shed, wherever possible, more light on the natural classification of the species and genera, and secondly to facilitate the reference to my descriptions as much as possible.

6 I will start with the Silurids, a division of the fishes, whose species from the Indian archipelago gave me occasion to the first contribution that I have published on the ichthyology of these regions. Between the printing of that contribution and the present lie eleven years, and in those 11 years I have gained numerous experiences, which have shed a new light on the ichthyological relationships of the Indian archipelago. Years have passed in investigating of the hundreds and hundreds of fish species, which I gradually received. They have taught me, how much my first contributions to ichthyology leave to be desired, gradually diminishing the objections that naturalists which are removed from the centres of science constantly are faced with when identifying species, and to give later descriptions an extension and a clarity, which makes them usable for every naturalist, independent of where and in which circumstances he finds himself. One will often judge these descriptions too detailed, but I have tried to let the details not harm the utility, as I have done my utmost to facilitate the search and the

identification of the species everywhere by the addition of analytical reviews, which at first glance make the most important characters of the species obvious.

The circumstances under which I started and continued my ichthyological investigations deserve some elucidation, because they were not without influence on its nature and extent.

I arrived in the Dutch East Indies in the year 1842 as a surgeon in the army. Naturally my service in the army had to be in the foreground. The execution of service demanded always a large part of my time, reason why my natural history research continually had to be wrested from the time left over from my employment.

In that respect the circumstances for my investigations were not favourable, the more because of my employment I was tied to certain posts and I was unable to move around freely in the interest of my investigations.

7 Moreover, the time left to me after my daily pursuits was occupied for a large part by activities of another nature to which I soon was called.

The editing of various periodicals[1] was entrusted to me and it was rather impossible to shirk from it. The editing of scientific journals in these regions however, is not restricted to pure editorial work, but included also the correction of the galley proofs and each day several hours had to be set apart in order to make see the light the 30 volumes which were published under my immediate editorship.

Other tasks were directed to me as well and took away another part of the remaining time. On me rested and still rests the Chair of the Natuurkundige Vereeniging in Nederlandsch Indië [Society for Natural History in Netherlands India], the secretariat of the Bataviaasch Genootschap van Kunsten en Wetenschappen [Batavian Association of Arts and Sciences], the subchair of the Vereeniging ter bevordering der Geneeskundige Wetenschappen in Nederlandsch-Indië [Society for the promotion of the Medical Science], the subchair of the Nederlandsch Indische Maatschappij van Nijverheid [Netherlands India Society of Industry] and the membership of the Hoofdcommissie van Onderwijs in Nederlandsch Indië [Chief-Commission of Education in Netherlands India] and of the Direction of the Militair Weduwen- en Wezenfonds in Nederlandsch Indië (Military Widow and Orfan Fund in Netherlands India].

If therefore I could not in the least rejoice in having ample time available for the research of my choice, on the other hand I received the most benevolent cooperation of numerous persons, who, spread over the Indian archipelago, partly because of affection for me, partly because of interest in science, had collections of freshwater- and sea fishes sent to me from the most distinct parts of this Island world.

Certainly very few naturalists in places so far removed from the scientific centres of the civilised world have received such an ample support as fell to my share from many friends and 8 relatives, and I therefore was placed in a situation, more favourable for investigations, than those in which real travelling naturalists as a rule are.

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[1] The Natuur- en Geneeskundig Archief van Nederlansch Indië, the Natuurkundig Tijdschrift voor Nederlansch Indië, the Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen, the Acta Societatis Indo-Neerlandicae, the Tijdschrift voor Nijverheid in Nederlandsch Indië.

The larger part of the honour of the numerous discoveries, mentioned in this work, therefore is due to those disinterested co-operators and therefore it is for me a dire obligation, to mention here with gratitude the names of all, who by their consignments have enabled me to advance science with a not unimportant step. Those names already form a long list and at present I see among them many who have succumbed to the blows of the tropical climate.

This list is presented below.

	Collections from
A.J. Andersen, Colonel of the Infantry, Adjudant of the King in extraordinary service, Ridder der Millitaire Willems-Orde der 3e klasse, at present in the Netherlands	West Borneo.
J.J. Adriaans, Retired Surgeon Major	Palembang.
Dr. J.W.E. Arndt, Surgeon Lieutenant Colonel, at present in Timor-koepang	Timor.
W. Hubers van Assenraad, Surgeon Lieutenant Colonel	South Celebes.
C.A. Beksen, Surgeon Colonel, at present in the Netherlands	West Java.
P.W.A. Beijen, Surgeon Major, at present in Makassar	Java.
A. Bierwirth, Apothecary, at present in Batavia	Palembang.
H.H. Brandes, Gardener in Banda	Banda.
J.G.X. Broekmeijer, Surgeon Colonel, at present in Soerabaja	East Java, Makassar.
Dr. O. Brummer, Surgeon Lieutenant Colonel	East Java.
W.J.A.W. Boers, Major of the Infantry, at present in Gombong	Makassar.
J.F. Den Dekker, Administrator at Biliton	Biliton.
Dr. C.L. Doleschall, Surgeon Lieutenant Colonel, at present in Ambon	South Java.
Dr. J.H. Croockewit, Civil servant in charge of chemical research, at present on a mission to New Guinea	South Borneo.
Dr. J. Einthoven, Second town surgeon in Samarang, Ridder der Militaire Willems-Orde 4e klasse	West Borneo.
T.H. Eijsinger, Surgeon Major, in Anjer	West Java.
S. Van Deventer, Assistant resident in Buitenzorg	Java.
9 H.R.F. Fontanes, *Late* Surgeon Major	Makassar.
A. Feldmann, Surgeon Major, at present in Samarang	East Borneo.
H. Fievez, Private person inTjilatjap	South Java.
W.F. Godin, Assistant-resident on Sumatra's West coast	West Sumatra.
Jkhr C.F. Goldman, Gouvernor of the Moluccans, Ridder in de Orde van den Nederlandschen Leeuw	Ternate, Batjan, Halmaheira, Obi, Ambon, Timor.
J.F. Gijsbers, Surgeon Lieutenant Colonel, at present on Java	Banka.
W.J. Goetzee, Agent der Nederlandsche Handelmaatschappij in Manado	North Celebes.
Corns de Groot, Engeneer 1e class of the mines, at present in Buitenzorg	Biliton.
G.H.G. Harloff, Retired Surgeon-major in Soerakarta	Central Java.
C. Helfrich, Surgeon Lieutenant Colonel, at present on Java	South Borneo.
A. Hendriks, Physician in Tjiroetjoep on Biliton	Biliton.
J.C.J. Helmuth, *Late* Surgeon Lieutenant Colonel	Solor, Flores.
D.S. Hoedt, Secretary of the Governement of the Moluccans, in Ceram,	Ambon, Boero, Ambon, Celebes.
W.F.C. van Helsdingen, Civil servant added to the Gouvernor of the Moluccan islands	Goram-Archipel.
Dr. J. Harzfeld, Surgeon Colonel, at present in Batavia	Ambon, Java.
O.F.U.J. Huguenin, Engeneer of the mines, at present in Buitenzorg	Java, Sumatra.
J.P. Höning, Surgeon Major, at present on Java	Timor.
E.F.M. Helmkampf, Surgeon Lieutenant Colonel	West Sumatra.
P. Jakles, *Late* Surgeon Lieutenant Colonel	West Sumatra.

J.E.H. Juch, *Late* Captain of the Infantry, Ridder der Militaire Willems-Orde	East Sumatra.
Dr. F. Junghuhn, Inspector advisor in charge of Physical Research, Ridder der Orde van den Nederlandschen Leeuw en van den Rooden Adelaar van Pruissen, at present in Lembang	West Java.
C. Helfrich, Surgeon Lieutenant Colonel, at present on Java	South Borneo.
A.J.F. Jansen, Resident of Manado, Ridder der Orde van den Nederlandschen Leeuw	Sangi, Celebes.
E.F.J. van Kappen, Surgeon Lieutenant Colonel, at present on Banka	West Borneo.
C.P. Brest van Kempen, Resident of Djokdjokarta	West Java.
A.H. Kunze, Surgeon Lieutenant Colonel, at present in Samarang	Ternate.
N.M. Klein, Tobacco manufacturer, at present in the Netherlands	Central Java.
N.J.H. Kollmann, Civil servant, at present on leave in the Netherlands	West Java.
C.F. de Bruin Kops, Director of the proah ferry in Batavia	Riouw, Singapore.
C.M.H. Kroesen, Captain of the Infantry, Ridder der Militaire Willems-Orde 4^{e} klasse, at present in Batavia	West Borneo.
10 Dr. O. Kunhardt, Retired Surgeon Major, at present in Segalaherang	West Sumatra.
J.M. van Leer, Directing Surgeon Lieutenant Colonel, at present in Samarang	East Sumatra.
J. J. Lindgreen, Surgeon Colonel, at present in Willem 1.	Banka.
L. Lindman, Surgeon Colonel, Ridder der Militaire Willems-Orde 4^{e} klasse, at present in Batavia	East Sumatra.
S.H. de Lange, *Late* Geographical Engeneer for Netherlands India	North Celebes.
E.W.A. Ludeking, Surgeon Lieutenant Colonel, in Fort de Koek	West Sumatra.
E.F. Meijer, Surgeon Lieutenant Colonel, in Riouw	Bintang.
Don Luis d'Almeida Macedo, Governor of Timor-dehli	East Timor.
Dr. C.W.F. Mogk, Surgeon Lieutenant Colonel, at present in Samarang	North Celebes.
J.G.F. Bernelot Moens, Surgeon Lieutenant Conolel, at present at Anjer	Batjan.
Dr. O.G.J. Mohnike, Surgeon Colonel, Ridder der Orde van den Nederlandschen Leeuw, at present in Ambon	Natoena, Amb.
Dr. E.H.H. Mühlert, Surgeon Lieutenant Colonel, in Manado	North Celebes.
D.C. Noordziek, Assistant-resident of Patjitan	East Java.
J.C. van Oven, Surgeon Major, at present in Samarang	South Celebes.
Dr. A.K.J.L.W. Pflaum, *Late* Surgeon Major	Ceram.
…… Steijn Pauvé, Civil servant	West Java.
D.M. Piller, Oud Dirigerend Surgeon Lieutenant Colonel, at present in Djokdjokarta	Sumbawa.
Ida Pfeiffer	Sumatra, Borneo, Celebes.
O. van Polanen Petel, Assistant-resident of Malang	East Java.
Dr. E. Reiss, *Late* Surgeon Lieutenant Colonel	West Sumatra.
J.W. Roelandt, Apothecary 3rd class, in Sinkawang	West Borneo.
H. Raat, Major of the Infantry, Ridder der Militaire Willems-Orde 4^{e} klasse, at present in Makassar	Bintang.
J.C. Ross, *Late* Owner of the Kokos-eilanden	Cocos-island.
J.G.C. Ross, Owner of the Kokos-eilanden	Cocos-island.
H. von Rosenberg, Millitairy officer, at present in commission to New Guinea	Nias, Batoe, West Sumatra.
T.W. Schrödelt, Kapitein der Infanterie, at present in Soerabaja	Ambon.
J.A.H.B. Sonnemann Rebentisch, Surgeon Colonel in Sinkawang	West Borneo.
M.Th. Reiche, Surgeon Colonel, at present in Batavia	West Sumatra.
Dr. J.F.C.F. Schramm, *Late* Surgeon Lieutenant Colonel	Bali.
Dr. F.C. Schmitt, Surgeon Colonel, at present in Samarang	West Sumatra.
H.W. Schwanefeld, *Late* Surgeon Lieutenant Colonel	West Sumatra.

Dr. J. Schwarz, former Surgeon Major	Madura, Sumatra.
11 H. Schwenk, *Late* Major of the Infantry, Ridder der Orde van den Nederlandschen Leeuw en der Militaire Willems-Orde	Sumatra, Nias.
Jkhr A.L.N. Ridder de Stuers, Entrepreneur in Batavia	West Java.
D. Signal, Surgeon Lieutenant Colonel	West Borneo.
J.F. Schultze, Assistant-resident of Ambal	South Java.
C. Serlé, Civil servant at Sumatra's West coast	West Sumatra.
D.F. Schaap, Governor of Celebes, Ridder der Orde van den Nederlandschen Leeuw, at present in Makassar	Banka.
A. Scharlee, Apothecary 2nd class, in Muntok	Banka.
J.N. Stevens, Surgeon Lieutenant Colonel, at present in Djokdjokarta	West Borneo.
H.E. Thepass, Surgeon Lieutenant Colonel in the Navy	North Celeb.
G.J. van Thienen, Directing Surgeon Lieutenant Colonel, at present in Padang	Ambon.
J.E. Teijsmann, 1st Conservator of the Botanical garden in Buitenzorg	West Java.
R.P. Tolson, Member of the business house Anderson, Tolson & Co	West Java.
Dr. E. Tall, Surgeon Major, at Bandaneira	Banda.
Dr. F.L.W. Vogler, Surgeon Colonel, at Padang	West Sumatra.
Dr. C.W.R. Voigt, Chief of the Medical service, on leave in Europa, Ridder der Militaire Willems-Orde 4e klasse	West Sumatra.
Dr. G. Wassink, Chief of the Medical service in Netherlands India, Ridder der Orde van den Nederlandschen Leeuw en der Militaire Willems-Orde der 4e klasse, Kommandeur der Orde van de Eikenkroon en van den Witten Valk, in Batavia	West Java.
P.L. van Bloemen Waanders, Assistant-resident of Bali-Boleling	Bali, Sumatra.
J.T. van Bloemen Waanders, Captain of the Artillery, at present in Batavia	East Sumatra.
H.L. van Bloemen Waanders, Civil servant at Banka	Banka.
J.H. Walbeehm, Assistent-resident, in Riouw	Bintang.
J. Wolf, Ex-Surgeon Lieutenant Colonel, in Koetei	Borneo.
Jkhr. Mr H.C. van der Wijck, Resident van Soembaja, Ridder der Orde van den Nederlandschen Leeuw	West Java.
H. Zollinger, Naturalist, at present in Banjoewangi	Sumbawa, Celebes, East Java.

From this long list one can measure the extent of the cooperation that I was privileged to share in my research.

Even at this moment new collections from the most different parts of the Indian archipelago are send to me from time to time, and therefore it is to be expected that in the course of the publication of this work many species still will be added to my collection and many facts, both concerning unknown forms 12 as well as the geographical distribution of the fishes in the island-world will have to be added to those already mentioned.

Before proceeding with the observation of the fishes of this Order, which I made the subject of the first part of this work, I have to elucidate certain terms used by me in the description of Silurids in as much they are not clear enough or might be explained in various ways; e.g.

Head shield	the bony surface of the head.
Neck shield	the bony plates consisting of one or more inter spinal bones.

Interparietal crest	the bony plate or crest formed by the interparietal bones of both sides [As the interparietal bones are only found in mammals, the term interparietal crest is not used here and replaced by supraoccipital crest. The supraoccipital is possibly formed by the parietal bones.]
Frontal [= anterior] fontanel	the space between the frontal bones of both sides.
Occipital [= posterior] fontanel	openings in or between the occipital bones; sometimes they are double on both sides.
Axillary mucous pore	the opening of the axillary mucous cavity, named by others porus lateralis.
Eyes superior	eyes placed above the mouth corner.
Eyes posterior	eyes placed behind the mouth corner.
Eyes covered	eyes covered with skin.
Eyes free	eyes not covered with skin.
Head length	the head length, measured from the snout tip till the tip of the gill cover.
Head width	the head width measured over the gill covers.

The citations of the figures placed on top of the descriptions refer to the manuscript of my large Atlas.

13 Order Siluri
Catfishes

Bony fishes, with free gills, soft rayed fins, body elongate, naked or armoured, but without true scales; subopercle missing; premaxillary bones forming the margin of the upper jaw; jaws bearing barbels.

Remark. The Silurids are sharply characterized in the large row of bony fishes by the absence of the subopercle, a skin that is naked or covered by shields, but never with scales, and the presence of inter jaw bones [premaxillae] and barbels. They contain a large part of the recent fishes, as already 500 species have been described in the registers of science.

In geological times Silurids seem to have been very scarce. In the "Uebersicht der fossilen Pflanzen und Thiere nach ihrer geologischen Verbreitung" which shows the knowledge of this subject in 1850, the list of fishes has a nil behind the Silurids and since then, as far as I have been able to ascertain, only two Silurids from the prehistoric world are mentioned, one from tertiary sandstone of Hungary (Pimelodus Sadleri Heck.) and one from the hard lime stone of the Lebanon (Coccodus armatus Pict.).

Possibly however, the remains of many other species are still hidden in the lap of those regions, where they mainly live nowadays. Their habitats are especially found in the old and the new world, between 35° North and South latitude. Outside these borders Silurids are found in the northern hemisphere, but they are few in number. - Europe only nourishes 14 Silurus glanis. - In the area of Northern and central Asia above latitude 35°, one knows only the European species plus those which are depicted by Mr Basilewski under the names Silurus asotus and Silurus calvarius and which belong to the genera Silurichthys? and Bagrus. - Also from North America above latitude 35° one knows only a few species of Pimelodus and Ailurichthys. In the southern hemisphere one finds beneath the aforementioned grade in Australia only one species of Plotosus, more a sea- than a river inhabiting species. From Africa, which southern tip not entirely reaches the 35th degree maybe only one species of Galeichthys that lives on or around the Agulhas bank, could be mentioned, however, in South America several species of fresh water species inhabit the Rio la plata and the rivers of Chile, where the Silurids seem to disappear in the genera Trichomycterus and Nematogenys.

The regions where the species of Silurids are most numerous are the largest part of tropical America, the northern part of Hindustan and the Indian archipelago. It is very remarkable that in New Holland, the large borderland of that archipelago, suddenly all Silurids are lacking in fresh water, as the 6 species, which are recorded from this large continent, belong to the genera Hexanemichthys? and Plotosus, which visit the river-mouths, but really belong to the sea fauna.

Two families of Silurids, the Aspredinoïds and the Loricaroïds are exclusively American. On the contrary. a third family, the Heterobranchoïds, which is less rich in forms, is restricted to the old world. Only the family of the Siluroïds, which contains more than ⅘ of all known species of Silurids, is spread across all continents, but with regard to the subfamilies and groups one finds again important restrictions. The Callich-

thyoïds are purely American, while all Aillichthyoïds and Plosichthyoïds belong to the eastern hemisphere. Moreover, of the Bagrichthyoïds the series of the Anodonts and the group of the Euanemines belong to the New world, and the Pangasines belong to the Old world, and so 15 in the Silurichthyoïds at last the Schilbeïnes are restricted to the old world and the remaining groups entirely to America.

A century ago, in Linnaeus' time, one did not consider splitting up the Silurids in divisions. Although, one knew at the time besides the European species already some forms from Africa, America and the Indian archipelago, that knowledge was related to too few forms and lacked the basis which could have led to the erection of groups or numerous genera.

P. Artedi mentioned only 2 species of Silurids, the European Silurus and Clarias niloticus. The last mentioned species he considered as possibly belonging to Silurus.

L.T. Gronovius, in his Museum ichthyologicum (1754-1763), described the genera Silurus, Aspredo, Plecostomus, Callichthys, Mystus and Clarias. Of these genera, Silurus answers to my Schilbeïnes, Aspredo to the Aspredoïnes, Plecostomus to the Loricaroïds, Callichthys to the Callichthyines, Mystus to the Doradines and Bagrines and Clarias to the Heterobranchoïds. For the time in which they are written, these genera can be considered as natural, but since then they have gotten the significance partly of groups, partly even of proper families. Gronovius knew only 18 species of Silurids.

Linnaeus in his later editions of the Systema Naturae accepted only two genera of Silurids, i.e. Silurus and Loricaria, of which the last answers to the family of the Loricaroïds and the first covers the families of the Siluroïds, Aspredinoïds and Heterobranchoïds.

In 1793 Gmelin, in the 13th edition of the Systema Naturae summed up 29 species, which belong to the most diverse genera and of which at least 2 fall entirely outside the order.

Bloch in his large fish work gave figures and descriptions of 25 Silurids, which he brought under the genera Silurus, Platystachus, Loricaria and Cataphractus. His species of Silurus 16 belong to the most diverging genera of the families of the Siluroïds and Heterobranchoïds, those of Cataphractus belong to Doras and Callichthys, and those of Platystachus to Plotosus and Aspredo, while his species of Loricaria all belong to the family of the Loricarioïds.

In the Systema posthumum, the number of species of Silurids is brought to 48, which are all ranked under the four above-mentioned genera.

With Lacépède the knowledge of the Silurids advanced with a not unimportant step. He brought all species that were known to him, 54 in number, under 13 genera, e.g. Ompok, Silurus, Macropteronotus, Malapterurus, Pimelodus, Doras, Cataphractus, Plotosus, Ageneiosus, Loricaria, Hypostomus, Corydoras, and Tachysurus. Many of these genera are well-defined and accepted in science, unchanged or, like Malapterurus, Doras, Plotosus, Ageneiosus and Hypostomus after modifications made necessary by new discoveries. However, their succession by Lacépède and the insertion of genera, that do not belong to any families of the Silurids, shows that their nature or relationships were not clear to Lacépède, which is also apparent from species, which were placed by him in his genus Silurus, where one finds representatives of the families of the Aspredinoïds and even of the Heterobranchoïds. His genus Pimelodus represent very well the subfamily of the Bagrichthyoïds, under which however Ageneiosus and Tachysurus can be

brought as well. Ompok, apparently a corruption of the Malay word Limpok, in my opinion answers to my genus Phalacronotus. Macropteronotus is no other genus than Clarias of Gronovius. Corydoras falls entirely together with Callichthys as does Cataphractus partly. Trachyurus to me does not seem to differ essentially from my genus Pseudopimelodus.

Such was the state of science regarding this subject, half a century ago. Apparently there were no intentions for either a natural arrangement of the Silurids in the classification or in the arrangement of the genera that belonged to them.

17 Mr Dumèril gave the first test of this in 1806 in his Zoölogie analytique, by combining the Silurids of Lacépède under the name Oplophoren or arms bearing fishes. Unjustly however, the genus Ompok Lac. (my Phalacronotus) was withdrawn from these, and added were the genera Macrorhamphosus and Centradon, which Lacépède had also placed among his Silurid genera.

Georges Cuvier in the first edition of his "Règne animal" brought the genera known to him under one family, which essentially is the same as that of the Oplophores of Mr Duméril, but which he gave the name Siluroïds, which has been generally accepted since. The genera accepted at the time by Cuvier were Ompok, Silurus, Schilbe, Synodontis, Pimelodus, Bagrus, Ageneiosus, Doras, Heterobranchus (with Clarias), Plotosus, Callichthys, Aspredo, Hypostomus and Loricaria, names that were passed on to the second edition of the Règne animal without the addition of new ones.

After Cuvier the knowledge of the Silurids has been extended remarkably.

Mr L. Agassiz split it first into two families, by separating the Loricaroïds under the name Goniodontes.

Numerous new and remarkable forms necessitated the erection of new genera and therefore Mr Valenciennes in the years 1839-1940, the years of publication of the volumes of the large Histoire naturelle des Poissons dealing with the Silurids, had come to accept many of the genera, which had to be inserted in the range of the Silurids under the names Silurus, Schilbe, Cetopsis, Bagrus, Phractocephalus, Platystoma, Galeichthys, Pangasius, Silundia, Arius, Pimelodus, Auchenipterus, Trachelyopterus, Hypophthalmus, Ageneiosus, Synodontus, Doras, Callichthys, Arges, Brontes, Astroblepus, Clarias, Heterobranchus, Saccobranchus, Plotosus, Aspredo, Chaca, Sisor, Loricaria, Rinelepis, Hypostomus, Malapterurus and Ailia, to which later the genera Trichomycterus and Eremophilus were accepted as Siluroïds and 18 to which likewise very well could have been added the genus Vandellia.

Mr Valenciennes considers all those genera to belong to one large family and has not accepted the division of Mr Agassiz.

The arrangement of the genera in the large Histoire naturelle leaves much to be desired and also does not exactly seem to have the purport to denote their natural relationships.

It seems to me that the large differences in the build of the Silurids not only give the right to their being split in the two large families of the Loricaroïds and the Siluroïds that has been adopted by various new ichthyologists, but [also] that, after the separation of the Loricarioïds, the remaining Silurids still are too divergent to make a further split in divisions with the rank of families not justifiable.

Prince Charles Lucien Bonaparte in his Prodromus Systematis Ichthyologiae followed the division of the Silurids in the two families Loricaridae and the Siluridae,

and also indicated a further division of the Siluroïds in three subfamilies, which he characterized by the names Callichtini, Pimelodini and Silurini.

However, the division is very incomplete, and includes only a part of the Silurids.

The Callichthini according to the given definition of the subfamilies would only include the genus Callichthys. According to the description of Bonaparte not only the Bagrichthyoïds, but also the Doradins and the genera Heterobranchus and Saccobranchus would have to be placed in the Pimelodini. To the Silurini on the contrary, maybe would have to be brought the genera Silurus, Schilbe and Trachelioperus of Mr Valenciennes, whereas my genus Siluranodon, so much related to Silurus would be excluded. Moreover, various genera, like Malapterurus, Aspredo, Clarias, Chaca, Plotosus and others would not find a place at all in the subfamilies.

This work therefore cannot be considered as succesful.

William Swainson, whose Natural History of Fishes etc. saw the light in the 19 same year as the 14th volume of the large Histoire naturelle des Poissons, gave a different subdivision of the Silurids, which to me does not seem to be better than that of Bonaparte. He brings the Loricaroïds back to the Silurids, which he considers to be one large family, however splits in five subfamilies, which he named Loricarinae, Pimelodinae, Silurinae, Aspredinae and Sorubinae.

A simple look at the genera placed by Swainson under these subfamilies, reveals that the natural relationships are not sufficiently consulted. Swainson, generally speaking, was not fortunate in the choice of the characters for his numerous new divisions and genera that he wished to introduce in ichthyology, no more than the genera brought under these divisions always answer to the characters given to them; - and therefore it seems that his work on the Silurids in which various new points of view have been pointed out, has found little approval.

The characters of the subfamily of the Loricarinae, given by Swainson, answer rather well to those that are due to the family of the Loricarioïds, but Swainson places two genera in it, Hoplisoma and Cataphractus, both of which can be brought back to Callichthys and therefore do not belong to another division of the Siluroïds. The genus Sturisoma Sw. falls together with Loricaria.

The subfamily Pimelodinae of Swainson might be called more or less natural, when the genus Sisor would be removed from it and the whole subfamily Soribinae as well as several of his Silurinae genera would be united with it. In my opinion those Pimelodinae belong to two subfamilies, to the Bagrichthyoïds and the Callichthyoïds. The genus Mystus Sw. resolves itself in Doras; the genera Felichthys Sw. and Cyclopium Sw. in the genera Ailurichthys Baird Gir., Auchenipterus and Arges, and further the genus Pteronotus Sw. in Pimelodus Val. or my genus Rhamdia.

Regarding Swainson's subfamily Silurinae, it contains various genera, that belong not only to other subfamilies, but even to 20 an entirely different family. Swainson has placed therein the genera Clarias, Heterobranchus, Plotosus and Chaca, and other genera, which according to my view belong to the Bagrichthyoïds. Of the new genera erected by Swainson in his subfamily Silurinae, Silonia is the same as Silundia Valenc., Pachypterus is made up from Eutropius and Pangasius; Clupisoma, though characterized entirely different, answers to my genus Schilbeichthys. Callichrus Sw. moreover contains my genera Wallago and Pseudosilurus, while Pusichthys coincides with Schilbe.

The subfamily Aspredinae of Swainson at last is rather well defined, however, entirely unjustly the genera Asatroblepus and Eremophilus have been included. The genus Cotylephorus Swains. moreover, belongs entirely to Aspredo, whereas the species of Aspredo of Swainson belong to my genus Bunocephalichthys.

In the last work of Mr A.M.C. Dumèril, entitled "Ichthyologie analytique ou Essai d'une classification naturelle des Poissons à l' aide de tableaux synoptiques, Paris 1856", the Silurids are placed and divided in different families.

Mr Dumèril in defining his families has often used only a simple character, which was given more weight than it has and as a consequence in these families the most diverse genera have been combined, whereas sometimes the most related genera have been placed in entirely different families.

Thus, for instance the genera Eremophilus and Astroblepus solely on the basis of the lack of ventral fins were placed by Mr Dumèril in his family Pseudapoda, in which family Anarrichas, Xiphias, Orestias, Pristigaster, Gunnellus, Psettus etc. stand side by side, as it were the purpose to show how little natural a division sometimes is, when it is based on a simple character. Later in the same work Eremophilus occurs again next to Trichomycterus and Vandellia, but these genera that are indeed related, have been placed there in the family of the 21 Pogonophores, neither a natural family, in which the genera Barbus, Cobitis, Anableps and others have been included. Still a third time Eremophilus and Astroblepus are found in this work under the family of the Siluroïds where Mr Dumèril has brought them back to their natural relationships, although Tricomycterus and Vandellia have been omitted there.

Mr Dumèril brings all other Silurids to his tribe Oplophora and then splits this in two families, Siluroïds and Dipteronotes. This division again is completely artificial, since it is entirely based on the presence of only one or two dorsal fins. It also tears the natural relationships of the Silurids out of its context, as on one side one sees for example the genera Clarias, Aspredo, Loricaria and Silurus, which belong to four very different families, united to the family of the simple dorsal finned Oplophores, whereas under the Dipteronotes besides the real Siluroïds the genera Heterobranchus and Hypostomus are also placed, by which the close relationship with Clarias and Loricaria is totally neglected. If one would judge Dumèril's characters for identifying the families as valid, one would have to erect a third family of Oplophores from my genera Micronema, Hemisilurus and Phalacronotus, which however, are closely related to the with a rudimentary dorsal fin endowed genera Kryptopterus and Kryptopterichthys, which themselves are closely related to Silurodes and other genera of Schilbeïnes, in which a normal dorsal fin is present.

According to me, the Silures consist of four families. In agreement with Agassiz, Kner and others I consider the Loricarioïds as a separate family, however after the separation of these the remaining Silures in my opinion have to be divided into three families.

I have named these Siluroïdei, Aspredinoïdei and Heterobranchoïdei.

The family Heterobranchoïdei is sharply delineated by the presence of an additional breathing apparatus, which is present in the shape of racemiform appendages on two of the 22 gill arches, or in the shape of an air sac, which receives a branch of the gill artery and stretches far posterior in the back between the muscular mass. The fishes that belong to this group are very similar in shapes and structure of the skulls and fins, and

even with regard to the build of the dorsal fin there are more similarities between Heterobranchus and Saccobranchus than is apparent from existing figures and descriptions, which will be demonstrated later.

The Aspredinoïds are mainly characterized by the gill cover bones, which have grown together and therefore are immovable.

The Siluroïds have a normal breathing apparatus, gills without accessory organs and the three gill cover bones movable.

Defined in this way, the family Siluroïds however offers such a large number and such a large variety of forms, that it would not surprise me, if one would soon like to divide this family into still more families. I have preferred a division in subfamilies and groups, and while doing that I have tried to keep the natural relationships in mind.

These subfamilies and groups will be treated in more detail below.

The Indian archipelago possesses only species of two of the four families. I know now 91 archipelago species of Siluroïds and 7 of Heterobranchoïds, that is nearly 100 species of the whole order; and certainly it cannot be doubted that the basins of the large Sunda Islands, especially those of Sumatra and Borneo, still nourishes many species, which till now have not been brought under the eyes of the naturalists.

I have been privileged to considerably extend the knowledge of the archipelago Silurids.

Bontius was the first to which science owes any indication of Silurids in these regions, however these indications were superficial and not very good.

23 Nieuhof gave recognizable figures of Pseudosilurus bimaculatus, Bagrus gulio CV. and Clarias Nieuhofii CV. and Clarias melanoderma is also rather well recognizable from his short descriptions.

The works of both writers originate from the 17th century.

The 18th century did not bring the knowledge much further. Valentijn and Renard gave insufficient but recognizable illustrations of Plotosus anguilaris Lac.

In the works of Bloch and Lacépède one searches in vain for more archipelagic Silurids.

The first knowledge that is more worth mentioning one owes to Kuhl and Van Hasselt. These excellent naturalists, both eradicated by the tropical climate at a young age, did not get the time to process for publication the large amount of material they brought together. However, much of what they collected has been described and published by Dutch or French naturalists and this has also happened with the Silurids they collected, which, at least partly have been described in the large Histoire naturelle des Poissons.

Only from the publication of the 14th and 15th volume of this work one may say, that the Silurids of the Indian archipelago have become known in more detail. Mr Valenciennes therein made known 26 species of the Indian archipelago, which however can be brought back to 22. Three of those species belong to the Heterobrachoïds, the remaining ones to the Siluroïds. These species are the ones mentioned below.

Arius argyropleuron CV.
Cephalocassis caelatus Blkr = Arius caelatus CV.
" truncatus Blkr = Arius truncatus CV.
Netuma nasuta Blkr = Arius nasutus CV.

Bagrus macronema Blkr = Bagrus nigriceps CV. = Bagrus cavasius CV. (partly) = Bagrus keletius CV. (partly).
" stenomus CV.
" gulio CV. = Bagrus abbreviatus CV.
" nemurus CV. = Bagrus anisurus CV.
" planiceps CV.
24 Leiocassis poecilopterus Blkr = Bagrus poecilopterus CV.
Hexanematichthys sundaicus Blkr = Bagrus sondaicus CV. = Bagrus javensis CV.
Glyptosternon platypogon Blkr = Pimelodus platypogon K.v.H.
Rhamdia? javanica Blkr = Pimelodus javus K.v.H.
Pseudosilurus bimaculatus Blkr = Silurus bimuculatus CV.
Kryptopterichthys bicirrhis Blkr = Silurus bicirrhis CV.
Plotosus anguillaris Lac. = Plotosus lineatus CV.
" albilabris CV.
" canius Buch. = Plotosus unicolor K.v.H.
" macrocephalus CV.
Clarias batrachus CV. = Clarias punctatus CV.
" fuscus CV.
" Nieuhofii CV.

These species were almost all said to belong to the fauna of Java. Only one species, Clarias fuscus CV. is said to live on Sumatra, and only one species, Plotosus macrocephalus CV., is said to occur near Timor, whereas Plotosus anguillaris Lac. is stated to be living near Celebes and Ambon.

Moreover, in the Catalogue of Zoölogical specimens, found in the work entitled "Memoir of the life and public services of Th. St. Raffles", two forms from Sumatra are mentioned i.e. Plotosus marginatus, which is the same as Plotosus anguillaris Lac., and Bagrus sumatranus, which cannot be determined as genus or species, but presumably belongs to my genus Cephalocassis and cannot be placed in the list of species known from Sumatra.

The knowledge of the archipelago Silurids had proceeded this far when I started my research.

However, I have to remark here that it has become apparent to me by copies of nameless drawings left by Kuhl & van Hasselt, that they knew two species of Javanese Siluroïds of which I have recovered one. One will find these species described below as Silurichthys Hasselti and Akysis variegates. Moreover, I gather from a list of species sent to Leiden by Kuhl and van Hasselt, that they also knew Wallago Russellii from Java, but as far as I know in 25 none of the existing works these species are recorded as occurring on Java. The same holds for some other Silurids, mentioned in the same list, but nowhere described and therefore not further determinable, like Pimelodus labroides Van Hass., Pimelodus microstoma Van Hass., Bagrus punctatus Van Hass., Bagrus breviceps Van Hass., Bagrus tetragonocephalus Van Hass., Silurus paboides Van Hass., Plotosus javanicus Van Hass. and Plotosus Perronii Cuv. Probably these species have been described under other names, either by Mr Valenciennes or by myself, but because of the complete absence of descriptions they cannot be recognized as these.

In a contribution entitled "Siluroideorum bataviensum conspectus diagnosticus" included in the 21st part of the Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen, I have mentioned 66 species of Siluroïds, that I had found in Batavia. That contribution was the first one that I published on the ichthyology of

these provinces, and it bears the characteristic features of the little experience in the determination of the species I had in the year 1845 when I had not yet detached myself from the insufficient species definitions of the famous master then in these matters still my most prominent guide.

Since I have had the experience that the features used to determine the species are often insufficient, I have learned that a large number of the 66 species can be considered as nominal species only. And after reducing these nominal species to their actual types, only the ones mentioned below in my present opinion can be considered as real species.

1 Arius arius CV. = Arius gagoroides Blkr = Arius chondropterygiodes Blkr = Arius angulatus Blkr = Arius Heckelii Blkr = Arius borneënsis Blkr.
2 " pidada Blkr = Arius viviparus Blkr.
3 Ariodes tonggol Blkr = Arius tonggol Blkr = Arius crossocheilos Blkr.
4 " acutus Blkr = Arius acutus Blkr = Arius Hamiltonis Blkr.
5 " macrocephalus Blkr = Arius macrocephalus Blkr.
6 " leiocephalus Blkr = Arius leiotetocephalus Blkr.
26 7 " polystaphylodon Blkr = Arius polystaphylodon Blkr.
8 Netuma nasuta Blkr = Arius nasutus CV. = Bagrus rhodonotus Blkr = Bagrus carchariorhynchos Blkr.
9 Cephalocassis macronotacanthus Blkr = Arius macronotacanthus Blkr.
10 " caelutus Blkr = Arius caelatus CV. = Arius caelatoides Blkr = Arius micro-gastropterygius Blkr = Arius clypeaster Blkr = Arius melanopterygius Blkr.
11 " venosus Blkr = Arius venosus CV.? = Arius laeviceps Blkr = Arius micru-ropterygius Blkr = Arius macruropterygius Blkr = Arius manjong Blkr = Arius micronotacanthus Blkr.
12 " utik Blkr = Arius utik Blkr.
13 Hexanematichthys sundaicus Blkr = Bagrus sundaicus CV. = Arius sundaicus Blkr
14 Batrachocephalus micropogon Blkr = Batrachocephalus ageneiosus Blkr.
15 Osteogeneiosus Valenciennesii Blkr = Osteogeneiosus gracilis Blkr = Osteogeneiosus Blochii Blkr.
16 " macrocephalus Blkr = Osteogeneiosus longiceps Blkr = Osteogeneiosus ingluvies Blkr.
17 Bagrus nemurus CV. = Bagrus Sieboldii Blkr.
18 " planiceps CV. = Bagrus anisurus CV. = Bagrus flavus Blkr.
19 " Hoevenii Blkr.
20 " macronema Blkr = Bagrus singaringan Blkr = Bagrus heterurus Blkr.
21 " micracanthus Blkr.
22 " gulio CV. = Bagrus gulioides Blkr = Bagrus melas Blkr = Bagrus Schlegelii Blkr = Bagrus rhodopterygius Blkr.
23 Pangasius Djambal Blkr.
24 Akysis variegatus Blkr = Pimelodus variegatus Blkr.
25 Wallago Russellii Blkr = Silurus Mülleri Blkr = Wallago Mülleri Blkr.
26 Silurodes hypophthalmus Blkr = Silurus hypophthalmus Blkr.
27 Pseuclosilurus bimaculatus Blkr = Silurus bimaculatus Bl. CV. = Wallago bimaculatus Blkr.
28 Kryptopterichthys bicirrhis Blkr = Silurus bicirrhis CV.
29 Micronema typus Blkr = Silurus micronemus Blkr.
30 Plotosus anguillaris Lac. = Plotosus lineatus CV. = Plotosus castaneoides Blkr, CV.?
31 " canius Buch. = Plotosus unicolor K.v.H. = Plotosus viviparus Blkr = Plotosus multi-radiatus Blkr.
32 " albilabris CV. = Plotosus macrophthalmus Blkr.
33 Clarias melanoderma Blkr = Clarius melanosoma Blkr.
34 " batrachus CV. = Clarias punctatus CV.
35 " Nieuhofii CV. = Clarias pentapterus Blkr.

27 Continued research since 1845 has brought to my knowledge numerous species both from Java and from the other Sunda Islands. Even in the same year in which my first work appeared, I followed up with a paper entitled: Nieuwe Bijdrage tot de kennis der Siluroïden van Java [New contribution to the knowledge of the Siluroïds of Java], which paper was likewise included in the 21st part of the Verhandeling van het Bataviaasch Genootschap van kunsten en wetenschappen. I described therein some other Siluroïds, e.g.

1 Pangasius micronema Blkr.
2 Ketengus typus Blkr.
3 Bagrus Buchanani Blkr = Pimelodus bagarius Buch.
4 Glyptosternon platypogon Blkr = Pimelodus cyanochloros Blkr = Pimelodus platypogon K.v.H.
5 Acrochordonichthys rugosus Blkr = Pimelodus rugosus Blkr.
6 Kryptopterus mononema Blkr = Silurus mononema Blkr.

Since then my knowledge of the Silures of Java, but especially concerning those of Sumatra, Banka, Biliton and Borneo was extended considerably and the privilege befell me to enrich science with some further knowledge of many new or little known species. To these species belong:

1 Arius microcephalus Blkr.
2 Ariodes goniaspis Blkr = Arius goniaspis Blkr.
3 Cephalocassis melanochir Blkr = Arius melanochir Blkr.
4 " leptonotacanthus Blkr = Arius leptonotacanthus Blkr.
5 " truncatus Blkr = Arius truncatus CV.
6 Bagrichthys hypselopterus Blkr = Bagrus hypselopterus Blkr.
7 Bagroides melanopterus Blkr.
8 " macropterus Blkr.
9 " macracanthus Blkr.
10 Leiocassis micropogon Blkr = Bagrus micropogon Blkr.
11 Bagrus Wolffii Blkr.
12 Pangasius polyuranodon Blkr = Pangasius juaro Blkr.
13 " macronema Blkr.
14 " rios Blkr.
28 15 Helicophagus typus Blkr.
16 Laïs hexanema Blkr = Pangasius hexanema Blkr
17 Glyptosternon platypogonides Blkr = Pimelodus platypogonides Blkr
18 Acrochordonichthys melanogaster Blkr = Pimelodus melanogaster Blkr.
19 " pleurostigma Blkr = Pimelodus pleurostigma Blkr.
20 " zonatus Blkr = Pimelodus zonatus Blkr.
21 Hemipimelodus borneënsis Blkr = Pimelodus borneënsis Blkr.
22 Wallago Leerii Blkr.
23 Belodontichthys macrochir Blkr = Wallago dinema. Blkr.
24 Silurichthys phaiosoma Blkr = Silurus phaiosoma Blkr.
25 Silurodes macronema Blkr = Silurus macronema Blkr.
26 Pseudosilurus leiacanthus Blkr = Wallago leiacanthus Blkr.
27 Kryptopterus limpok Blkr = Silurus limpok Blkr.
28 Kryptopterus micropus Blkr = Silurus kryptopterus Blkr.
29 Kryptopterichthys palembangensis Blkr = Silurus palembangensis Blkr.
30 " lais Blkr = Silurus lais Blkr.
31 Hemisilurus heterorhynchos Blkr = Wallago heterorhynchos Blkr.

32 Micronema hexapterus Blkr = Silurus hexapterus Blkr.
33 Phalacronotus leptonema Blkr = Silurus leptonema Blkr.
34 " micruropogon Blkr = Silurus apogon Blkr = Silurus micropogon Blkr.
35 " micruropterus Blkr = Silurus phalaronotus Blkr.
36 Clarius leiacanthus Blkr.
37 " Teysmanni Blkr.
38 Heterobranchus tapeinopterus Blkr.
39 Chaca bankanensis Blkr.

All species mentioned above were published in various contributions which were included either in the Natuurkundig Tijdschrift voor Nederlands Indië, the Acta Societas Scientiarum Indo-Neêrlandicae, or the Verhandelingen van het Bataviaasch Genootschap van kunsten en wetenschappen.

Apart from these species I recently discovered some other species, whose descriptions will be found below, e.g.

1 Leiocassis poecilopterus Blkr = Bagrus poecilopterus CV.
2 Bagrus Wyckii Blkr.
3 Helicophagus Waandersii Blkr.
29 4 Eutropius brachypopterus Blkr.
5 Acrochordonichthys ischnosoma Blkr.
6 " platycephalus Blkr.
7 Hemipimelodus macrocephalus Blkr.
8 Silurichthys Hasseltii Blkr.
9 Kryptopterichthys macrocephalus Blkr.
10 Hemisilurus schilbeides Blkr.

In total I know now 89 species of the Indian archipelago from nature. Silurichthys Hasseltii Blkr, a new species, is the only one of the above-mentioned 90 species, which I only know from a drawing I have in my possession.

The only writers, who, as far as I know, after me or simultaneously with me have treated the Silures of the Indian archipelago, are Misters Th. Cantor and R. Kner.

Mr Cantor has mentioned and illuminated the following species in his useful "Catalogue of Malayan Fishes" published in the years 1849 and 1850.

1 Bagrus gulio CV. = Bagrus abbreviatus CV. Cant.
2 Hexanematichthys sundaicus Blkr = Bagrus sondaicus CV. Cant.
3 Cephalocassis truncatus Blkr = Arius truncatus CV. Cant.
4 Arius arius CV. Cant.
5 Osteogeneiosus militaris Blkr = Arius militaris CV. Cant.
6 Ketengus typus Blkr = Pimelodus pectinidens Cant.
7 Clarias batrachus CV. = Clarias punctatus CV. Cant.
8 Plotosus anguillaris Lac. Cant.
9 " albilabris CV. Cant.

These species, although new for the places for which they were mentioned, were already known for the Indian archipelago, with the exception only of Osteogeneiosus militaris CV., if this species can be regarded as different from Osteogeneiosus Valenciennesii Blkr. Ketengus typus, described by Mr Cantor as a new species under the

name Pimelodus pectinidens, I had already made known [30] in my "Nieuwe bijdrage tot de kennis der Siluroïden van Java" published in 1847.

In his "Ichthyologische Beiträge" placed in the 17th part (1855) of the "Sitzungsberichte der mathematisch-naturwissenschaftliche Classe der kaiserliche Akademie der Wissenschaften", Mr Kner also briefly treats some species of Silurids from the Indian archipelago. These species are:

1 Chaca lophioides CV.
2 Plotosus anguillaris Lac. = Plotosus lineatus CV. Kner.
3. " canius Buch. Kner = Plotosus unicolor K.v.H. Kner.

Mr Kner maintains that Chaca lophioides CV. is found on Borneo and New Guinea, which at least as far as New Guinea is concerned according to me is in need of confirmation.

If the existing knowledge is summed up, we may assume that at present nearly one hundred species are known from there, e.g.

Siluroidei

1 Arius arius CV. = Arius gagoroides Blkr = Arius chondropterygioides Blkr = Arius angulatus Blkr = Arius Heckelii Blkr = Arius borneënsis Blkr.
2 " pipada Blkr = Arius viviparus Blkr.
3 " microcephalus Blkr.
4* " argyropleuron CV.
5 Ariodes tonggol Blkr = Arius tonggol Blkr = Arius crossocheilos Blkr.
6 " macrocephalus Blkr = Arius macrocephalus Blkr.
7 " acutus Blkr = Arius acutus Blkr = Arius Hamiltonis Blkr.
8 " leiocephalus Blkr = Arius leiotetocephalus Blkr.
9 " polystaphylodon Blkr = Arius polystaphylodon Blkr.
10 " goniaspis Blkr = Arius goniaspis Blkr.
11 Netuma nasuta Blkr = Arius nasutus CV. Blkr = Bagrus rhodonotus Blkr = Bagrus carchariorhynchos Blkr.
12 Cephalocassis melanochir Blkr = Arius melanochir Blkr.
13 " leptonotacanthus Blkr = Arius leptonotacanthus Blkr.
14 " macronotacanthus Blkr = Arius macronotacanthus Blkr.
15 " truncatus Blkr = Arius truncatus CV. Blkr.
[31] 16 " caelatus Blkr = Arius caelatus CV. = Arius caelatoides Blkr = Arius microgastropterygius Blkr = Arius clypeaster Blkr = Arius clypeastroides Blkr = Arius chondropterygius Blkr = Arius melanopterygius Blkr.
17 " venosus Blkr = Arius venosus CV. Blkr = Arius laeviceps Blkr = Arius micruropterygius Blkr = Arius macruropterygius Blkr = Arius manjong Blkr = Arius micronotacanthus Blkr.
18 " utik Blkr = Arius utik Blkr.
19 Batrachocephalus micropogon Blkr = Batrachocephalus ageneiosus Blkr.
20* Osteogeneiosus militaris Blkr = Arius militaris CV.
21 " Valenciennesii Blkr = Osteogeneiosus gracilis Blkr = Osteogeneiosus Blochii Blkr.
22 " macrocephalus Blkr = Osteogeneiosus longiceps Blkr = Osteogeneiosus ingluvies Blkr.
23 Hexanematichthys sundaicus Blkr = Bagrus sondaicus CV. = Arius sundaicus Blkr
24 Bagrichthys hypselopterus Blkr = Bagrus hypselopterus Blkr.
25 Bagroides melanopterus Blkr.

26 " macropterus Blkr.
27 " macracanthus Blkr.
28 Leiocassis poecilopterus Blkr = Bagrus poecilopterus K.v.H.
29 " micropogon Blkr = Bagrus micropogon Blkr.
30 Bagrus nemurus CV. = Bagrus Sieboldii Blkr.
31 " Hoevenii Blkr.
32 " planiceps CV. = Bagrus flavus Blkr = Bagrus anisurus CV.
33 " Wyckii Blkr.
34 " macronema Blkr = Bagrus singaringan Blkr = Bagrus heterurus Blkr = Bagrus nigriceps CV.
35 " Wolffii Blkr.
36 " micracanthus Blkr.
37 " gulio CV. = Bagrus abbreviatus CV. = Bagrus gulioides Blkr = Bagrus melas Blkr = Bagrus Schlegelii Blkr = Bagrus rhodopterygius Blkr.
38* " stenomus CV.
39 Eutropius brachypopterus Blkr.
40 Pangasius Djambal Blkr.
41 " macronema Blkr.
42 " micronema Blkr.
43 " rios Blkr.
44 " polyuranodon Blkr = Pangasius juaro Blkr.
32 45 Helicophagus typus Blkr.
46 " Waandersii Blkr.
47 Laïs hexanema Blkr = Pangasius hexanema Blkr.
48 Bagarius Buchanani Blkr = Pimelodus bagarius Buch.
49 Glyptosternon platypogon Blkr = Pimelodus platypogon K.v.H. = Pimelodus cyanochloros Blkr.
50 " platypogonides Blkr = Pimelodus platypogonides Blkr.
51 Acrochordonichthys ischnosoma Blkr.
52 " platycephalus Blkr.
53 " melanogaster Blkr = Pimelodus melanogaster Blkr.
54 " rugosus Blkr = Pimelodus rugosus Blkr.
55 " pleurostigma Blkr = Pimelodus pleurostigma Blkr.
56 " zonatus Blkr = Pimelodus zonatus Blkr.
57 Akysis variegatus Blkr = Pimelodus variegatus Blkr.
58 Hemipimelodus borneënsis Blkr = Pimelodus borneënsis Blkr.
59 " macrocephalus Blkr.
60 Ketengus typus Blkr = Pimelodus pectinidens Cant.
61* Rhamdia? javanica Blkr = Pimelodus javus K.v.H.
62 Wallago Russellii Blkr = Silurus Mülleri Blkr = Wallago Mülleri Blkr = Silurus wallago CV.
63 " Leerii Blkr.
64 Belodontichthys macrochir Blkr = Wallago dinema Blkr.
65 Silurichthys phaiosoma Blkr = Silurus phaiosoma Blkr.
66* " Hasseltii Blkr.
67 Silurodes hypophthalmus Blkr = Silurus hypophthalmus Blkr.
68 " macronema Blkr = Silurus macronema Blkr.
69 Pseudosilurus bimaculatus Blkr = Wallago bimaculatus Blkr = Silurus bimaculatus CV.
70 Pseudosilurus leiacanthus Blkr = Wallago leiacanthus Blkr.
71 Kryptopterus mononema Blkr = Silurus mononema Blkr.
72 Kryptopterus limpok Blkr = Silurus limpok Blkr.
73 " micropus Blkr = Silurus cryptopterus Blkr.
74 Kryptopterichthys bicirrhis Blkr = Silurus bicirrhis CV.
75 " palembangensis Blkr = Silurus palembangensis Blkr.

76 " laïs Blkr = Silurus laïs Blkr.
77 " macrocephalus Blkr.
78 Micronema typus Blkr = Silurus micronemus Blkr.
79 " hexapterus Blkr = Silurus hexapterus Blkr.
80 Phalacronotus micruropterus Blkr = Silurus phalacronotus Blkr.
81 " leptonema Blkr = Silurus leptonema Blkr.
33 82 " micropogon Blkr = Silurus apogon Blkr = Silurus micropogon Blkr.
83* " siluroides Blkr = Ompok siluroides Lac.
84 Hemisilurus heterorhynchos Blkr = Wallago heterorhynchos Blkr.
85 " schilbeides Blkr.
86 Chaca bankanensis Blkr.
87* " lophioides CV.
88 Plotosus anguillaris Lac. = Plotosus lineatus CV. = Plotosus castaneoides CV.
89 " canius Buch. = Plotosus unicolor K.v.H. = Plotosus viviparus Blkr = Plotosus horridus Blkr
90 " albilabris CV. = Plotosus macrophthalmus Blkr.
91* " macrocephalus CV.

Heterobranchoidei

92 Heterobranchus tapeinopterus Blkr.
93 Clarias batruchus CV. = Clarias magur CV. = Clarias punctatus CV.
94 " melanoderma Blkr = Clarias melanosoma Blkr.
95* " fuscus CV.
96 " leiacanthus Blkr.
97 " Teijsmanni Blkr.
98 " Nieuhofii CV. = Clarias pentapterus Blkr.

34 GEOGRAPHIC DISTRIBUTION OF THE SILURI

I. FAMILY SILUROIDEI

Genera	Species							
	Known	Archipelagic	Asiatic	African	European	American	Australasiatic	Locality unknown
Arius Blkr.	15	4	4	·	·	7	·	1
Ariodes Blkr.	10	6	1	·	·	2	·	1
Guiritinga Blkr.	1	·	·	·	·	1	·	
Netuma Blkr.	8	1	4	2	·	4	·	
Cephalocassis Blkr.	23	7	11	1	·	7	·	
Genidens Blkr.	1	·	·	·	·	1	·	
Sciades Blkr.	1	·	·	·	·	·	·	1
Sciadeichthys Blkr.	1	·	·	·	·	1	·	
Hexanematichthys Blkr.	8	1	5	·	·	1	2	
Rita Blkr.	6	·	6	·	·	·	·	
Batrachocephalus Blkr.	2	1	1	·	·	·	·	
Osteogeneiosus Blkr.	4	3	2	·	·	·	·	
Diplomystes Dum.	1	·	·	·	·	I	·	
Ailurichthys Baird Gir.	4	·	·	·	·	4	·	
Selenaspis Blkr.	6	·	·	·	·	6	·	
Platystoma Ag.	13	·	·	·	·	13	·	
Phractocephalus Ag.	1	·	·	·	·	1	·	
Galeichthys Baird.	3	·	·	2	·	·	·	
Melanodactylus Blkr.	2	·	1	1	·	·	·	
Octonematichthys Blkr.	1	·	·	1	·	·	·	
Chrysichthys Blkr.	3	·	·	3	·	·	·	
Pseudobagrus Blkr.	1	·	1 (Jap.)	·	·	·	·	
Bagrus Blkr.	29	9	19	3	·	·	·	
Leiocassis Blkr.	3	2	·	·	·	1	·	
Bagroides Blkr.	3	3	·	·	·	·	·	
Bagrichthys Blkr.	1	1	·	·	·	·	·	
Davalla Blkr.	1	·	·	·	·	1	·	
Silundia CV.	2	·	2	·	·	·	·	
Pangasius CV.	6	5	1	·	·	·	·	
Helicophagus Blkr.	2	2	·	·	·	·	·	
Laïs Blkr.	1	1	·	·	·	·	·	
Eutropius Müll. Trosch.	13	1	9	3	·	·	·	
Pimelodus Blkr.	16	·	2	·	·	13	·	1
35 Gagata Blkr.	11	·	11	·	·	·	·	
Glyptosternon	8	2	7	·	·	·	·	
Olyra McCl.	2	·	2	·	·	·	·	
Erethistes Müll. Trosch.	1	·	1	·	·	·	·	
Pseudopimelodus Blkr.	4	·	·	·	·	4	·	
Zungaro Blkr.	1	·	·	·	·	1	·	
Hemipimelodus Blkr.	11	2	7	·	·	1	·	1
Heptapterus Blkr.	1	·	·	·	·	1	·	
Rhamdia Blkr.	25	1	·	·	·	23	1 (1)	
Pinirampus Blkr.	1	·	·	·	·	1	·	
Auchenaspis Blkr.	2	·	·	2	·	·	·	

(1) Sandwich Isl.

Cont.	Species							
Genera	Known	Archipelagic	Asiatic	African	European	American	Austral-asiatic	Locality unknown
Auchenipterus Blkr.	3	·	·	·	·	3	·	
Trachycorystes Blkr.	5	·	·	·	·	5	·	
Rama Blkr.	1	·	1	·	·	·	·	
Akysis Blkr.	1	1	·	·	·	·	·	
Acrochordonichthys Blkr.	6	6	·	·	·	·	·	
Conorhynchos Blkr.	1	·	·	·	·	1	·	
Ketengus Blkr.	1	1	·	·	·	·	·	
Callophysus Müll. Tr.	2	·	·	·	·	2	·	
Bagarius Blkr.	2	1	2	·	·	·	·	
Synodontis Cuv.	10	·	·	10	·	·	·	
Arges Cuv.	2	·	·	·	·	2	·	
Euanemus Müll. Tr.	4	·	·	·	·	4	·	
Ageneiosus Lac.	3	·	·	·	·	3	·	
Clarotes Heck.	1	·	·	1	·	·	·	
Hypophthalmus CV.	3	·	·	·	·	3	·	
Callichthys L. Gr.	14	·	·	·	·	14	·	
Doras CV. part.	20	·	·	·	·	20	·	
Pseudodoras Blkr.	4	·	·	·	·	4	·	
Hemidoras Blkr.	1	·	·	·	·	1	·	
Ailia Gr.	1	·	1	·	·	·	·	
Malapterurus Lac.	1	·	·	1	·	·	·	
Sisor Buch.	1	·	1	·	·	·	·	
Schilbe Cuv. Blkr.	5	·	·	5	·	·	·	
Schilbeichthys Blkr.	1	·	1	·	·	·	·	
Siluranodon Blkr.	1	·	·	1	·	·	·	
Silurus L. Blkr.	1	·	1	·	1	·	·	
Wallago Blkr.	5	2	4	"	"	"	"	
Belodontichthys Blkr.	1	1	"	"	"	"	"	
Silurichthys Blkr.	4	2	2	"	"	"	"	
36 Silurodes Blkr.	4	2	2	"	"	"	"	
Pseudosilurus Blkr.	11	2	10	"	"	"	"	
Kryptopterus Blkr.	3	3	"	"	"	"	"	
Kryptopterichthys Blkr.	4	4	"	"	"	"	"	
Micronema Blkr.	2	2	"	"	"	"	"	
Phalacronotus Blkr.	4	4	"	"	"	"	"	
Hemisilurus Blkr.	2	2	"	"	"	"	"	
Cetopsis Ag.	2	·	·	·	·	2	·	
Trachelyopterus CV.	1	·	·	·	·	1	·	
Brontes CV.	1	·	·	·	·	1	·	
Astroblepus CV.	1	·	·	·	·	1	·	
Nematogenys Gir.	1	·	·	·	·	1	·	
Schilbeodes Blkr.	1	·	·	·	·	1	·	
Trichomycterus Cuv.	9	·	·	·	·	9	·	
Eremophilus Cuv.	1	·	·	·	·	1	·	
Pareiodon Kner.	1	·	·	·	·	1	·	
Vandellia CV.	1	·	·	·	·	1	·	
Plotosus Lac.	8	4	3	1	·	·	4	
Chaca Cuv.	2	2	1	·	·	·	·	
Total	423	91	126	37	1	176	7	5

II. FAMILY ASPREDINOIDEI

Genera	Species							
	Known	Archipelagic	Asiatic	African	European	American	Austral-asiatic	Locality unknown
Aspredo Art.	4	·	·	·	·	4	·	
Aspredinichthys Blkr.	1	·	·	·	·	1	·	
Bunocephalus Kner.	1	·	·	·	·	1	·	
Bunocephalichthys Blkr.	2	·	·	·	·	2	·	
Total	8	·	·	·	·	8	·	

37 III. FAMILY LORICARIOIDEI

Genera	Species							
	Known	Archipelagic	Asiatic	African	European	American	Austral-asiatic	Locality unknown
Loricaria. L.	15	·	·	·	·	15	·	
Hemiodon.	3	·	·	·	·	3	·	
Acestra Kner.	2	·	·	·	·	2	·	
Rinelepis Cuv.	5	·	·	·	·	5	·	
Hypostomus Kner.	21	·	·	·	·	21	·	
Chaetostoma Kner.	1	·	·	·	·	1	·	
Ancistrus Kner.	13	·	·	·	·	13	·	
Total	60	·	·	·	·	60	·	

IV. FAMILY HETEROBRANCHOIDEI

Genera	Species							
	Known	Archipelagic	Asiatic	African	European	American	Austral-asiatic	Locality unknown
Heterobranchus Geoffr.	5	1	·	4	·	·	·	
Clarias Gron.	15	6	5	5	·	·	·	
Saccobranchus CV.	2	·	2	·	·	·	·	
Total	22	7	7	9	·	·	·	

Recapitulation

	Species							
	Known	Archipelagic	Asiatic	African	European	American	Austral-asiatic	Locality unknown
Siluroidei	423	91	126	37	1	176	7	5
Aspredinoidei	8	·	·	·	·	8	·	
Loricarioidei	60	·	·	·	·	60	·	
Heterobranchoidei	22	7	7	9	·	·	·	
Total	513	98	133	46	1	244	7	5

38 From this review one can see that of the known species of Silurids over 17% occurs in the Indian archipelago, more than 20% in Asia, just over 9% in Africa, not even 1/500 in Europe, over 47% in America or the entire western hemisphere, and about 1.3% in Australia.

If one takes the relations for the families, one can see that the Loricaroïds and Aspredinoïds are completely restricted to the New world, and the Heterobranchoïds are restricted to the Old world, whereas only the Siluroïds, with about 423 species, occur in all continents.

Of those Siluroïds more than 21.5% occur on the Sunda Islands, over 30% in Asia, more than 8.5% in Africa, 1/423 in Europe, more than 41.5% in America and over 1.5% in Australia.

39 SUNDA-MOLLUCAN SILURIDS

GEOGRAPHICAL DISTRIBUTION

	Names Fam. Siluroidei Subfam. *Bagrichthyoidei.*	Java	Madura	Bali	Sumatra	Nias	Batu	Pinang	Singap.	Bintang	Banka	Biliton	Borneo	Celebes	Sangi	Batjan	Buro	Ambon	Ceram	Timor	outside the Archipelago
1	Arius arius CV.	1	·	·	1	·	·	1	1	·	·	·	1	·	·	·	·	·	·	·	1
2	" pidada Blkr.	1	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
3	" microcephalus Blkr.	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
4	" argyropleuron CV.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
5	Ariodes tonggol Blkr.	1	·	·	1	·	·	·	·	1	1	·	·	·	·	·	·	·	·	·	·
6	" macrocephalus Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
7	" acutus Blkr.	1	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
8	" leiocephalus Blkr.	1	·	·	·	·	·	·	1	·	·	·	·	1	·	·	·	·	·	·	·
9	" polystaphylodon Blkr.	1	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
10	" goniaspis Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
11	Netuma nasuta Blkr.	1	·	·	1	1	·	·	·	1	·	·	·	1	·	·	·	·	·	·	1
12	Cephalocassis melanochir Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
13	" leptonotacanthus Blkr.	1	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
14	" macronotacanthus Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
15	" truncatus Blkr.	1	·	·	1	·	·	1	·	·	·	·	1	·	·	·	·	·	·	·	1
16	" coelatus Blkr.	1	1	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	1
17	" venosus Blkr.	1	1	·	·	·	·	·	1	1	1	·	·	·	·	·	·	·	·	·	1
18	" utik Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
19	Batrachocephalus micropogon Blkr.	1	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	?
20	Osteogeneiosus militaris Blkr.	·	·	·	·	·	·	1	1	·	·	·	·	·	·	·	·	·	·	·	1
21	" Valenciennesii Blkr.	1	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·
22	" macrocephalus Blkr.	1	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
23	Hexanematichthys sundaicus Blkr.	1	1	·	1	·	·	1	·	·	1	·	1	·	·	·	·	·	·	·	1
24	Bagrichthys hypselopterus Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
25	Bagroides melanopterus Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
26	" macropterus Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
27	" macracanthus Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
28	Leiocassis poecilopterus Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
29	" micropogon Blkr.	·	·	·	1	·	·	·	·	·	1	1	1	·	·	·	·	·	·	·	·

Names cont.

		Java	Madura	Bali	Sumatra	Nias	Batu	Pinang	Singap.	Bintang	Banka	Biliton	Borneo	Celebes	Sangi	Batjan	Buro	Ambon	Ceram	Timor	outside the Archipelago
30	Bagrus nemurus Blkr.	1	·	·	1	·	·	·	·	·	1	·	1	·	·	·	·	·	·	·	·
31	Bagrus Hoevenii Blkr.	1	·	·	1	·	·	·	·	·	1	·	1	·	·	·	·	·	·	·	·
32	" planiceps CV.	1	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
33	" Wyckii Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
34	" macronema Blkr.	1	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
40 35	" Wolffii Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
36	" micracanthus Blkr.	1	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
37	" gulio CV.	1	·	·	1	·	·	1	·	·	·	·	1	·	·	·	·	·	·	·	1
38	" stenomus CV.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
39	Eutropius brachypopterus Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
40	Lais hexanema Blkr.	1	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
41	Helicophagus typus Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
42	" Waandersii Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
43	Pangasius Djambal Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
44	" macronema Blkr.	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
45	" micronema Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
46	" rios Blkr.	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
47	" polyuranodon Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
48	Bagarius Buchanani Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1
49	Glyptosternon platypogon Blkr.	1	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1
50	" platypogonides Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
51	Acrochordonichthys ischnosoma Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
52	" platycephalus Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
53	" melanogaster Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
54	" rugosus Blkr.	1	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
55	" pleurostigma Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
56	" zonatus Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
57	Akysis variegatus Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
58	Hemipimelodus borneënsis Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
59	" macrocephalus Blkr.	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
60	Ketengus typus Blkr.	1	1	·	·	·	·	1	·	·	·	·	1	·	·	·	·	·	·	·	·
61	Rhamdia? javanica Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·

Subfam. *Silurichthyoidei.*

62	Wallago Russelii Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1
63	" Leerii Blkr.	·	·	·	1	·	·	·	·	·	1	·	1	·	·	·	·	·	·	·	·
64	Belodontichthys macrochir Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
65	Silurichthys phaiosoma Blkr.	·	·	·	·	·	·	·	·	·	1	1	1	·	·	·	·	·	·	·	·
66	" Hasseltii Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
67	" hypophthalmus Blkr.	1	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
68	" macronema Blkr.	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
69	Pseudosilurus bimaculatus Blkr.	1	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	1
70	" leiacanthus Blkr.	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·	·	·
71	Kryptopterus mononema Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
72	" limpok Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
73	" micropus Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·

Names cont.

		Java	Madura	Bali	Sumatra	Nias	Batu	Pinang	Singap.	Bintang	Banka	Biliton	Borneo	Celebes	Sangi	Batjan	Buro	Ambon	Ceram	Timor	outside the Archipelago
74	" bicirrhis Blkr.	1	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
41 75	" palembangensis Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
76	" lais Blkr.	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
77	Kryptopterichthys macrocephalus	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
78	Micronema typus Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
79	" hexapterus Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
80	Phalacronotus micruropterus Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
81	" leptonema Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
82	" micropogon Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
83	" siluroides Blkr.	?	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
84	Hemisilurus schilbeides Blkr.	·	·	·	1	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	·
85	" heterorhynchos Blkr.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
	Subfam. *Plotosichthyoidei*.																				
86	Chaca bankanensis Blkr.	·	·	·	·	·	·	·	·	·	1	·	1	·	·	·	·	·	·	·	·
87	" lophioides CV.	·	·	·	·	·	·	·	·	·	·	·	1	·	·	·	·	·	·	·	1
88	Plotosus anguillaris Lac.	1	·	·	1	1	1	1	1	1	1	·	·	1	1	1	1	1	1	·	1
89	" canius Buch.	1	1	·	1	·	·	·	1	·	1	·	1	1	·	·	·	·	·	·	1
90	" albilabris CV.	1	·	·	·	·	·	1	1	1	·	1	·	1	·	·	·	·	·	·	1
91	" macrocephalus CV.	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	1	·
	Total	50	7	0	52	2	1	8	7	5	13	3	37	5	1	1	1	1	1	1	16
	Fam. HETEROBRANCHOIDEI.																				
92	Heterobranchus tapeinopterus Blkr.	·	·	·	·	·	·	·	·	·	1	·	1	·	·	·	·	·	·	·	·
93	Clarias batrachus CV.	1	·	1	1	·	·	1	·	·	1	1	1	·	·	·	·	·	·	·	1
94	" melanoderma Blkr.	1	·	·	1	·	·	·	·	·	1	·	1	·	·	·	·	·	·	·	·
95	" fuscus CV.	·	·	·	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	?
96	" leiacanthus Blkr.	·	·	·	·	1	·	·	·	·	1	·	1	·	·	·	·	·	·	·	·
97	" Teysmanni Blkr.	1	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·
98	" Nieuhofii CV.	1	·	·	·	1	·	·	·	·	1	1	1	·	·	·	·	·	·	·	·
	Total	4	0	1	3	2	0	1	0	0	5	2	5	0	0	0	0	0	0	0	1
	Total Siluroidei	50	7	0	52	2	1	8	7	5	13	3	37	5	1	1	1	1	1	1	16
	Total Heterobranchoidei	4	0	1	3	2	0	1	0	0	5	2	5	0	0	0	0	0	0	0	1
	Total	54	7	1	55	4	1	9	7	5	18	5	42	5	1	1	1	1	1	1	17

It is remarkable that from Sumatra, an island that is much less investigated than Java, at present already more Silurids are known than from 42 Java. Certainly Sumatra is considerably richer in Silurids than Java and I expect the same with regard to Borneo. This large richness however, mainly concerns the real freshwater Siluroïds, because one may presume that the species that live in coastal waters and thus are not restricted to the drainage basins, like the species of Arius, Ariodes, Netuma, Cephalocassis, Batrachocephalus, Osteogeiosus, Hexanemathicthys, Ketengus, and Plotosus,

can move at will between the so close together lying Sunda islands, so that most Javanese species, which till now are most known, will also dwell in the as yet very little researched coastal waters of Borneo, just like it has been shown for Sumatra.

However, concerning the real freshwater Siluroïds, one sees various Sumatran species are lacking in Java, as well as various Javanese species lacking in Sumatra. This also holds true for Borneo.

According to the present day knowledge the following real freshwater species occur on the various Sunda Islands.

Java. Leiocassis poecilopterus Blkr, Bagrus Wyckii Blkr, Bagrus stenomus CV., Pangasius Djambal Blkr, Pangasius micronema Blkr, Acrochordonichthys ischnosoma Blkr, Acrochordonichthys pleurostigma Blkr, Acrochordonichthys zonatus Blkr, Akysis variegatus Blkr, Rhamdia? javanica Blkr, Silurichthys Hasseltii Blkr, Kryptopterus mononema Blkr, Micronema typus Blkr en Clarias Teysmanni Blkr; all together 14 species.

Sumatra. Bagroides macropterus Blkr, Bagroides macracanthus Blkr, Eutropius brachypopterus Blkr, Helicophagus typus Blkr, Helicophagus Waandersii Blkr, Glyptosternon platypogonides Blkr, Acrochordonichthys platycephalus Blkr, Acrochordonichthys melanogaster Blkr, Kryptopterichthys palembangensis Blkr, Kryptopterichthys macrocephalus Blkr, Phalacronotus leptonema Blkr and Hemisilurus heterorhynchos Blkr (also Clarias fuscus CV?); altogether 12 or 13 species.

Borneo. Pangasius macronema Blkr, Pangasius rios Blkr, Hemi-43 pimelodus macrocephalus Blkr, Silurodes macronema Blkr and Kryptopterichthys lais Blkr.

Banka. Pseudosilurus leiacanthus Blkr.

All remaining species have two or more of the Sunda Islands in common, and there is no doubt that continuing investigations will show, that of the above mentioned 32 or 33 species several similarly will be found on one of more islands than the one they are known from till now. One may especially expect that the species that till now were only found in Sumatra for the greater part will also be found on Borneo and vice versa those from Borneo on Sumatra, as the large relationship of the freshwater fauna of both large islands is already clearly known from the existing knowledge, not only with regard to the Silurids but also concerning the freshwater fishes of other families.

44 FAMILY SILUROÏDEI
CATFISH-LIKE FISHES

Siluriform fishes with gills without appendages, opercular bones movable and mobile, skin naked or covered with one or two rows of bony plates.

Remark. The family Siluroïdei in my opinion comprises only those species of the order, in which the branchial apparatus has no additional organs, the gill covers are freely articulating and movable, and the skin is naked or covered with a simple or double longitudinal row of bony plates.

By this definition are excluded not only the Loricarioïds, which had been elevated to a proper family under the names Goniodontes and Loricata or armoured catfishes, but also the Aspredines with their immovable gill cover, the genera Clarias, Heterobranchus and Saccobranchus, and moreover the little known genus Sisor Buch.

The Siluroïds make out about ⅘ of the now known Silures and is the only family of the order, which has its representatives in all continents. The families of the Loricarioïds and Aspredinoïds are restricted to the new world. The only species of the Sisoroïds known till now belongs to the mid-southern part of Asia and the Heterobranchoïds inhabit only Africa, Asia and the Indian archipelago.

The Siluroïds on the contrary inhabit Europe, Mid- and South Asia, and the Indian archipelago, North and Central-Africa, North and 45 South America and a few marine species visit or inhabit even the coasts of New-Holland and the islands of the Pacific Ocean.

The Indian archipelago especially is rich in species of Siluroïds. More than one fifth of the total known species lives in the fresh or salt waters of the Sunda Islands. The species that live in the sea or inhabit the coastal waters near river mouths are found in the eastern part of the Indian archipelago upwards from Celebes, e.g. Ariodes leiocephalus and Netuma nasuta. The Plotosines go even more eastwards and seem to be the link between the Siluroïds of Asia, Australia and America. Thus Plotosus anguillaris traverses almost the entire warmer part of the Pacific Ocean while the coastal waters of Celebes, Timor and New Holland nourishes various other Plotosines.

There are only a few truly marine Siluroïds. Most species that inhabit coastal waters also enter river mouths and thus, if you like, might be considered to be freshwater Siluroïds as well. One might call these species brackish water Siluroïds and indeed they rarely move higher upstream than the tide enters the river.

To these brackish water Siluroïds belong with regard to the Indian archipelago the species of Arius, Ariodus, Cephalocassis, Batrachocephalus, Osteiogeiosus, Hexanemichthys, Ketengus and Bagrus gulio CV.

To the real fresh water Siluroïds of the Sunda Islands belong most species of Bagrus, those of Leiocassis, Bagroides, Bagrichthys and Chaca, and moreover all Pagasines, Pimelodines and Silurichthyoïds. All those species, as far as they not also help populate the rivers of South Asia, are entirely restricted to the Sunda Islands, in which Borneo and Java seem to be their borders set by nature.

This restriction of the fresh water Siluroïds is very remarkable. Java and Borneo are as rich in fresh water Siluroïds as any other region of the world and already on the island of Celebes, only separated by 46 a relative narrow strait, one misses all of a sudden

everything that resembles Siluroïds, a fact that also holds for the Cyprinoïds, which similarly are very numerous on Java and Borneo and seem to lack completely on Celebes. The only exception, which would exist on this rule, would be that one would have encountered Chaca lophoides CV. on New Guinea, as indicated by Mr Kner. On the one hand that account in my opinion needs to be confirmed in every respect before science can definitively accept it, on the other hand it would be possible that Chaca, just like Plotosus, to which it is related and with which genus it forms a proper subfamily, has its borders more easterly than the remaining subfamilies or large groups of Siluroïds.

I believed it was necessary to split up the Silures in various families, but even after setting apart the family under consideration, the remaining species and forms were so numerous and diverse that it seemed to me desirable to group these numerous materials further and arrange the species and genera according to their natural relationships.

Of this arrangement I give here an example, but indeed only an example, as I have only been able to examine from nature amply a hundred archipelagic and Asiatic species and with regard to the remaining species I was restricted to existing descriptions and illustrations thereof, which usually were not made to reveal the knowledge one requires in systematic investigations.

I know no family richer in species than the Siluroïds, even in the restricted sense in which I have conceived it. Many of its genera at a first glance differ more than some families of soft finned and spiny-finned fishes. For example, whoever of the Siluroïds only knew the genera Phalacronotus, Vandellia, Eremophilus, Malapterus, Plotosus, Chaca, Callichthys, Trachelyopterus and Arius, without the numerous connecting members, apparently with equal right [47] could erect from these more families than one has done with regard to other series of fishes. However, if one consults nature in more detail, then one soon comes to the conclusion that those genera through intermediate forms approach each other so much, that their natural and close relationships cannot be doubted. And if already at the borders of the merging of those forms one would encounter characters of absolute value to separate the genera or groups, one will feel that their relationship is too large and too close to separate them on the basis of these characters as proper families. Thus it would be difficult to denote a certain character, unique or isolated enough in any genus, to raise it on that basis to a proper family.

The dentition, although of high value for the determination of groups, genera and species, does not offer such a character. The genera Siluranodon, Hypophthalmus and Hemidoras are without teeth in the jaws and palate, but each belongs to a separate group from which they could not be separated in a natural way. Where the jaws or the palatal or vomerine bones are armed with teeth, one sees the most diverging differences in the dentition in closely related genera and vice versa large similarities in genera, which in a natural arrangement would not be placed closely together.

Concerning the fin shape the differences are not less large than those concerning the dentition. However, these differences are not in agreement with others that could justify an elevation to a higher rank. Thus the pelvic fins are lacking in Eremophilus and Astroblepus whereas they are well developed in related genera Trichomycterus and Brontes. Thus the genera Silurus and Pseudosilurus possess a rayed dorsal fin, whereas this is entirely lacking in the related genera Hemisilurus and Phalacronotus.

Thus Schilbe and Schilbeichthys have only a rayed dorsal fin without adipose fin, whereas that fin is lacking in Ailia and is substituted by a small adipose fin, and both 48 fins occur in united form in Eutropius. However, the natural relationship of these genera are undeniable.

Regarding the skin system, although true scales are lacking in the entire order, some genera have a remarkable covering with bony scutes, but this is also not a sufficient basis for splitting the Siluroïds in families. Thus for instance Callichthys cannot be separated from Doras and both these genera not from the group of the Bagrichthyoïds to which type they are build and among which also genera occur, like Hexanematichthys, in which bony plates along the lateral line show a beginning of shield formation, which in Doras and Callichthys reaches such a large development.

One of the most rarely occurring characters in the Siluroïds is the armament of the gill cover bones with spines. But even to this one cannot attach more than a generic value, as that armament exists for example in Trichomycterus and is lacking in the related genus Nematogenys.

And in this way numerous examples could be brought forward about the intertwining and crossing of characters that have high value in other families, but in Siluroïds do not possess such a high value, and at most and not even in general, can serve in forming natural groups in the large family.

I admit in the family of the Siluroïds the following subfamilies and groups.

Subfamily I. SISORICHTYOIDEI. Two dorsal fins, the anterior one rayed, the posterior one adipose, with a spine. Body with bony plates or sparse bony tubercles. No teeth in lower jaw. Many barbels.

Subfamily II. CALLICHTHYOIDEI. Two dorsal fins, the anterior one rayed, the posterior one adipose, with a spine. Body with spine-bearing shields on the flanks or harnessed with one or two rows of bony plates.

Phalanx A. *Callichthyini.* Bony plates in two rows. Adipose fin with a spine.

B. *Doradini*. Spiny shield one-rowed. Adipose fin spineless. 49

Subfamily III. BAGRICHTHYOIDEI. Two dorsal fins, the anterior one rayed, the posterior one adipose, spineless. Body naked or covered with some bony grains along the lateral line.

Phalanx A. *Ariodontes*. Premaxillary, lower jaw and vomerine-palatine teeth.

Cohort a. *Bagrini*. Anal fin medium-sized, adipose dorsal fin well developed.

b. *Pangasini*. Anal fin elongate, dorsal fin rudimentary.

B. *Pimelodontes*. Premaxillary and lower jaw teeth; no vomerine or palatine teeth.

Cohort a. *Pimelodini*. Anal fin medium-sized, adipose dorsal fin well developed.

b. *Euanemini*. Anal fin elongate, adipose dorsal fin rudimentary.

C. *Anodontes*. No teeth in jaw or palate.

Subfamily IV. AILICHTHYOIDEI. Simple dorsal fin adipose. Body naked.

Phalanx A. *Malapterurini*. No vomerine teeth.

B. *Ailianini*. Vomerine teeth present.

Subfamily V. SILURICHTHYOIDEI. One rayed dorsal fin or no dorsal fin. Body naked.

Phalanx A. *Cetopsini*. Dorsal fin anterior. Jaw teeth and vomerine teeth. Mucous pore in axilla.

B. *Trachelyopterini*. Shield much developed, anal fin elongate. No vomerine teeth.

C. *Trichomycterini*. Anal fin short, dorsal fin central or posterior. Head without shield. No swim bladder.

D. *Schilbeini*. Dorsal fin anterior or missing. Premaxillary and vomerine-palatine teeth. Anal fin elongate. No opening of axillary mucous cavity.

Subfamily VI. PLOTOSICHTYOIDEI. Two rayed dorsal fins, posterior dorsal fin and elongate anal fin confluent with caudal fin. Skin naked.

50 Phalanx I *Chacini*. Two anal fins. No vomerine teeth.

Phalanx II *Plotosini*. One anal fin. Vomerine teeth present.

These five subfamilies defined in this way are sharply characterized and to be considered as natural subdivisions and if one puts the Callichthyoïds on top, than the Bagrichthyoïds, Ailichthyoïds and Silurichthyoïds follow each other in a rather natural way, but it is impossible to form from this a simple line regarding the subdivisions. The Callichthyoïds and Sisorichthyoïds, being descended to the Bagrichthyoïds, split themselves there in two lines, which through the Bagrini and Pimelodini descend to the Malapturini and further to the Cetopsini, Trachelyopterini and Trichomycterini, and on the other side through the Pangasini and Euanemini descend to the Ailianini and Schilbeïni. The Plotosichthyoïds on the contrary form a separate line, which through the Chacini links up with the Pimelodini and through the Plotosini forms a transition to the family of the Heterobanchoïds.

Subfamily I.
Sisorichthyoidei.

Two dorsal fins, the anterior one rayed, the posterior one adipose and with a spine. Body with sparse bony lamina or tubercles. No teeth in lower jaw. Many barbels.

Remark. I cannot agree with the opinion of Mr Kner, according to which Sisor would belong to the Hypostomids and consequently to the family of the Loricaroïds. Surely it is not to be doubted that there are various points of similarity between the Hypostomids and Sisor, but it seems to me not less doubtful that in general shape, and natural relationship Sisor shows more similarity with the Siluroïds and in that family occupies a place in between the groups of Callichthyoïds and Bagrichthyoïds. As however, the only described species, seems only to be known in science from a description of Buchanan in the illustrations of Indian zoology, the natural 51 relationship of Sisor cannot be determined with certainty.

The basis on which my vision regarding the true placement of Sisor are founded upon generally come down to the following:

a. The figure in general gives the impression of a fish of the group of the Pimelodini; and to this also answer the characters expressed in the figure, which lay in the structure of the head shield, the nape shield and the gill covers.
b. The "slit under the chin" mentioned by Buchanan in his description, an expression he often uses in his descriptions of Siluroïds, apparently points at the transverse and sometimes very deep chin groove, which is generally present in Bagrichthyoïds.

Against the reasons put forward to bring Sisor closer to the Hypostomids apart from those given above, can be brought forward:
1. The inferior mouth opening can be found in many Siluroïds and it self is not characteristic for the Loricarioïds. One can find a good example of this in Netuma nasuta (Arius nanasutus CV.) and moreover, also in Bagarius, Glyposternon and other genera.
2. The strong vertical curved headline or the high snout in Sisor for a Siluroid has nothing strange anymore after one has seen this character in a much more pronounced way in Clarotes Heuglini Kner.
3. Although it is said there are 14 barbels, the barbels of the upper jaw at the base seem to be broadly membranous, which reminds of the Pimelodini of the genera Bagarius and Glyptosternon.
4. The spine of the adipose fin is not only present in the Hypostominds, but also in the Callichthyines and in Clarotes.
5. The much elongated upper caudal fin ray is not a character of great weight. It is not common in Loricarioïds and not rare in Siluroïds (which often also have the first rays of other fins thread-like elongated, Bagarius, Bagrus, Arius etc.)
6. The bony shields or knobs on the dorsal keel and sides, leave the larger part of the body naked and indicates a condition 52 which is intermediate between the skin covering of the Callichthyoïds and that of Hexanematichthys.

The only species, Sisor rabdophorus Buch. of Bengal, is said to reach a length of 8 feet. In the old world it seems to be the substitute of the Callichthyoïds.

Subfamily II.
Callichthyoidei.

Two dorsal fins, the anterior one rayed, the posterior one adipose. Body with spine-bearing flanks or armoured with one or two rows of bony lamina.

Remark. The Callichthyoïds form a subfamily of the Siluroïds most related to the Bagrichthyoïds, but constantly differing from it either by a row of spiny shields, or a row of bony plates between head and caudal fin. The Indian archipelago does not have representatives of this subfamily, notwithstanding a species of Callichthys depicted by Valentyn, Ruysch and Renard in their works on the Moluccans. Very certainly all species are restricted to the New world. I will only briefly review them here.

The Callichthyoïds can be divided in two natural groups, which might be called Callichthyini and Doradini. The Callichthyini are characterized by the double row of bony plates of the body and the spine in the adipose fin. It is known from some fifteen species, although maybe later it will appear that some forms that have been described as proper species can be brought back to other species. All these species belong to a simple genus, which can be characterized as follows.

Callichthys L. Gron. Upper jaw with 4 barbels. Adipose dorsal fin with a spine. Teeth only in lower jaw, multiple-rowed. No swim bladder. B. 3 or 4.

The Doradini are not less sharply characterized than the Callichthyini by the singular row of spiny shields on the lateral line, the absence of an adipose fin spine, the presence of 6 barbels, of a swim bladder, etc. According to the ideas of Mr Valenciennes [53] and Mr Kner all known species, about 25 in number, should be brought to a single genus, but it seems to me that they just as well could be brought at least under two genera that one could base on the dentition. One could leave the species that have teeth in both jaws in the genus Doras. Under the generic name Pseudodoras one can comprise all species in which only the lower jaw has teeth, whereas one could bring the species in which both jaws are without teeth or in which only the inter jaw bones [premaxillae] possess teeth, under the generic name Hemidoras.

Doras CV. (partly) Premaxillary and lower jaw teeth. 6 to 8.
Pseudodoras Blkr. Lower jaw teeth only.
Hemidoras Blkr. No teeth in either jaw or only premaxillary teeth.

The now known species of the Callichthyoïds are, for as far I can trace, the following.

Callichthys asper CV. = Sillurus callichthys L. = Cataphractus callichthys Bl.	Hab. Brasil. Guiana.
" caelatus CV.	" Brasil.
" laeviceps CV.	" Brasil.
" thoracatus CV.	" Surin. Mart.
" subulatus CV.	" Guiana. Buen. Ayres
" laevigatus CV.	" Buen. Ayres. Trinidad
" albidus CV.	" Guiana.
" longifilis CV. = Callichthys personatus Ranz.?	" Guiana.
" punctatus CV. = Cataphractus punctatus Bl. = Corydoras Geoffroy Lac	" Surinam, Monte video.
" barbatus QG. CV.	" Brasil.
" exaratus Müll. Trosch.	" Guiana.
" pictus Müll. Trosch.	" Guiana.
" paleatus Jenyns	" S. Am.
" sulcatus Kner.	" Brasil.
Doras costatus Lac. = Silurus costatus L. = Cataphractus costatus Bl.	" S. Am.
" armatultus CV.	" S. Am.
[54] " cataphractus CV. = Silurus cataphractus L. = Doras brunnescens Fish. Guian.	" S. Am.
" Blochii CV. = Cataphractus americanus Bl. Schn.	" S. Am..
" Hancockii CV. = Doras costatus Hanck.	" Amer. (Arow.)
" maculatus CV. = Doras granulosus Val.	" Brasil. Buen. ayres
" dorsalis CV. = Doras carinatus Val. ap. Humb.	" Guiana.
" crocodili V. Humb.	" Nova Grenada.
" dentatus Kner (maybe Doras costatus Lac.??)	" Surinam.
" affinis Kner.	" S. Am.
" asterifrons Heck.	" S. Am.
" Heckelii Kner.	" S. Am.
" murica Natt.	" S. Am.
" lithogaster Heck.	" S. Am.

"	fimbriatus Kner.	" S. Am.
"	punctatus Heck.	" S. Am.
"	carinatus CV. = Silurus carinatus L. = Doras oxyrhynchus Humb.	" Guiana.
"	papilionatus Filipp.	" Amazon. riv.
"	d' Orbigny Kroyer.	" Rio Plata.
"	? castaneoventris Schomb.	" Guiana.
Pseudodoras	niger Blkr = Doras niger CV. = Doras Humboldtii Ag.	" Brasil.
"	brevis Blkr = Doras brevis Kner.	" S. Am.
"	humeralis Blkr = Doras humeralis Kner.	" S. Am.
"	lipophthalmus Blkr = Doras lipophthalmus Kner.	" S. Am.
Hemidoras	stenopeltis Blkr = Doras stenopeltis Kner.	" S. Am.

Subfamily III.

BAGRICHTHYOIDEI.

Two dorsal fins, the anterior one rayed, the posterior one adipose and spineless. Body naked or on the lateral line covered with some bony grains.

Remark. This subfamily or large division of the Siluroïds comprises the genera Bagrus, Batrachocephalus, Platystoma, Galeichthys, Pangasias, Silunda, Arius, Pimelodus, Auchenipterus, Hypophthalmus, Ageneiosus, Synodontus and Arges of the large Histoire naturelle des Poissons. These genera all have in common the presence of an adipose fin. One finds this adipose fin sometimes also in the subfamily of the Callichthyoïds, but in 55 these the body along its entire length is covered with spiny shields or scuted plates, so that they can not be mistaken for Bagrichthyoïds. In the Ailichthyoïds an adipose fin is also sometimes present, but they lack the rayed dorsal fin.

The Bagrichthyoïds, which include the largest number of known species not only of the family but of the entire order of the Silures, are so rich in forms and in the details of the ornamentation, that more natural genera can be formed, than the above mentioned ones erected in the large Histoire naturelle des Poissons.

Several ichthyologists who after the publication of this work have written about the Siluroïds, have reviewed and partly reformed the genera of Cuvier-Valenciennes, whereas also the knowledge of species discovered since then has shown the necessity of the formation of a few new genera, not derived from the ones already known to Mr Valenciennes.

The opinion of the ichthyologists with regard to the genera of the Bagrichthyoïds however diverges remarkably, and surely the characters used by some of them, sometimes are of doubtful generic value.

Thus Mr J. Müller wishes to place almost all Bagrichthyoïds that possess teeth on the palate and have the dorsal and pectoral fin spines indented, in the genus Bagrus, which he then divides into two divisions, to which he gives only the value of subdivisions. However, on the other hand, the same creditable naturalist erected some genera, which belong to the Bagrichthyoïds without palatal teeth, and deservedly his genera Euanemus, Callophysus and maybe Eristhes too, can be considered as natural genera.

Mr Baird, who restricted the genus Galeichthys of Mr Valenciennes, which by Mr J. Müller was considered only as a subgenus of Bagrus, to Galeichthys feliceps CV. Baird

placed the remaining known species of Galeichthys in a new genus which he named Ailurichthys.

56 Mr J. MacClelland, observing the Siluroïds of Kabul, found among them remarkable species, which induced him to the formation of his genera Glyptosternon and Olyra.

Mr C. Duméril moreover on Arius papilosus based his genus Diplomystus, on Pimelodus conirostris CV. his genus Conostomus, and on Bagrus Lamarii CV. his genus Macronus.

While I gradually got to know Siluroïds of the Sunda archipelago and of Bengal, I perceived that under these South Asiatic forms several also will have to be brought to genera of their own. Thus I described already in 1847 the genera Batrachocephalus, Osteogeneiosus, and Ketengus, and later also the genera Bagrichthys, Bagroïdes, Bagarius and Rita.

By these various researches the number of genera of the Bagrichthyoïds was more than doubled.

But in my opinion it is without any doubt that a further detailed study of this division will have to lead, already in view of the now known species and with the already described natural genera, to fix another series of genera from the species, at the moment still comprised under the generic names Bagrus and Pimelodus.

The data to fix the new genera are not complete, and far from generally to be found in existing descriptions and illustrations of Bagrids and Pimelodids and for many species it is even at this moment impossible to say whether they belong to the Bagrids or the Pimelodids because one has failed to make reference to whether the palate has teeth or not.

The dentition of the Siluroïds can be give a higher systematic value than generally has been done by ichthyologists.

In the Siluroïds, as well as in many other families of fishes, the dentition has more than just a subordinate value for the determination of genera and thus I did not hesitate, after a closer study of this family, to derive from the dentition several characters, which, added to those of a still higher or lower value, to me seemed to form the basis of 57 a further splitting of the genera Bagrus and Pimelodus, like has been done with regard to most above mentioned genera erected by me.

However, restricted to the species of my cabinet and the existing descriptions, it is not possible for me to investigate from nature about 250 species belonging to the Bagrichthyoïds, and if I give a review of the splitting of the genera, which to me indeed seem to possess generic value, I wish it to be seen more as an indication than a description that is complete or nearing completion.

I will split the *Bagrichthyoïds* in three groups, based on the general relationships of the dentition.

In the first group the premaxilla bones, the lower jaw bones and the palate are armed with teeth. I name this group *Ariodontes*.

In the second group only the premaxilla and the lower jaw bones have teeth and on the palatal teeth are lacking. For this group I propose the name *Pimelodontes*.

In the third group finally, one perceives teeth neither in the palate nor in the jaws. I name it *Anodontes*.

Phalanx I.
Ariodontes.

Premaxillary, lower jaw and vomero-palatine teeth.

To this group belong the genera Bagrus, Phractocephalus, Platystoma, Galeichthys, Pangasius, Silundia and Arius of Mr Valenciennes, the genus Ailurichthys of Mr Baird, the genera Macrones and Diplomystes of Mr Duméril and my genera Bagrichthys, Bagroides, Rita, Batrachocephalus and Osteogeneiosus.

They all have in common that both jaws are armed with teeth and there are also teeth on one or several bones of the palate, but they differ in the arrangement of those teeth and other characters 58 in such a way from each other that from this a whole series of genera can be erected, more numerous even than the one given above.

The Ariodonts can be split in two subgroups.

One of those subgroups is characterized by a very small adipose fin and an extremely developed long anal fin. One might give it the name *Pangasini.*

To this first group belong the genera Pangasius, Helicophagus Blkr, Silundia CV., Eutropius J. Müll., Davalla Blkr and Lais Blkr. They are easy recognisable by the number of their barbels, however they also possess special features in the dentition, which enforce the value of the numbers of barbels in these genera, e.g.

Eutropius J. Müll. 6 Barbels. Vomero-palatine teeth arranged in a simple or divided transverse band.

Lais Blkr. 6 Barbels. Vomerine teeth arranged in 2 groups. Eyes placed behind the mouth corner.

Helicophagus Blkr. 4 Barbels. Vomerine teeth arranged in 2 groups. Eyes placed above the mouth corner.

Pangasius CV. 4 Barbels. Vomero-palatine teeth arranged in 3 or 4 groups, vomerine groups sometimes fused. [Eyes placed behind the mouth corner[1]]

Silunda CV. 2 Barbels. Jaw teeth placed in two rows.

Davalla Blkr. 2 Barbels. Jaw teeth placed in one row.

I base Davalla on the peculiar species, described and figured under the name Hypophthalmus davalla in the first part of Schomburgk's Natural History of Guiana. It has, like Silundia 2 upper jaw barbels but according to the description the teeth seem to be placed close together in a simple row ("teeth, a series thickly set in each jaw, with two like processes on the palate" l.c. p. 192). The anal fin is said to have 38 rays, reason why, also because of the small adipose fin, the genus seems to have a natural place amongst the Pangasini. However, it would be the only representative of this genus in the new world.

The second subgroup can be formed based on the genera with a moderately developed anal fin. The adipose fin sometimes reaches a 59 great length, however, it equally often remains shorter than the anal though it never becomes rudimentary as in the other group.

[1] Handwritten addition by Bleeker in RMNH copy.

In this subgroup very numerous differences are found in the organisation, which give the right to the formation of many genera, among which are many the naturalness of which cannot be doubted. One might name this subgroup the *Bagrini*.

This subgroup can be split in genera with 8, 6, 4 and 2 barbels.

The genera with 8 barbels, all as far as known to Mr Valenciennes included in his genus Bagrus, belong to two natural divisions.

One of those divisions contains some genera, which are characterized by the shape of the eyes, which, not free and movable as in the other Ariodonts, are entirely covered with head skin, which over the eyes is very thin and transparent. To this division belong my genera Bagrichthys, Bagroïdes and Leiocassis, which moreover can be separated from each other by sharp characters, e.g.

Bagrichthys Blkr. Lower jaw teeth in inner rows very small, in outer rows placed in the tooth gums or labially, subulate and elongate. Barbels with appendages.

Bagroides Blkr. No gingival or labial teeth, vomerine teeth arranged in a round or crescent-shaped group. Teeth on dorsal spine facing upwards.

Leiocassis Blkr. No teeth in the gums or labial teeth, vomero-palatine teeth arranged in an undivided transverse band. Teeth on dorsal spine facing downwards. Interbranchial membrane with a deep incision.

In the second division of the genera with eight barbels of this subgroup the eyes are free, that is, the skin of the head after having formed a narrow or broad eye membrane, bends inwards to form a kind of connective membrane.

To this group belong my genera Bagrus, Pseudobagrus, Chrysichthys, Octonematichthys and Melanodactylus, which can be separated in the following way.

60 *Bagrus* Blkr. Band of vomero-palatine teeth simple and undivided. Caudal fin with two lobes. Head armed with a shield.

Pseudobagrus Blkr. Band of vomero-palatine teeth simple and undivided. Caudal fin entire. Head smooth.

Chrysichthys Blkr. Vomero-palatine teeth arranged in two transverse, oblong, separate bands.

Octonematichthys Blkr. Vomero-palatine teeth arranged in a transverse, quadripartite band.

Melanodactylus Blkr. Palatine teeth placed in two longitudinal, separate groups in the middle of the palate.

The genera of the Bagrini with only 6 barbels are mostly comprised in the genera Arius, Platystoma, Phractocephalus and Galeichthys of the large Histoire naturelle des Poissons, however therein are also contained species in the aforementioned work described as species of Bagrus, while some species placed there under Galeichthys and Arius will have to be removed from this series. Although the dentition of many of the very numerous species belonging to this series are not known, I believe the existing knowledge is sufficient to lay the basis of a new division of this series in genera just like I earlier have proposed the genus Rita on this basis.

The genus Rita is remarkable by its two kinds of lower jaw teeth, which are sharp and brush shaped medially in the jaw but granular towards the corner of the mouth. Moreover, Rita is related to the genera with eight barbels of the series. The nasal barbels are present whereas a pair of lower jaw barbels are lacking. However, its general build and also its granular palatal teeth which are placed in two separate groups, place it closer to the remaining six barbelled genera. Therefore Rita in the system can be briefly characterized as follows.

Rita Blkr. Lower jaw teeth medially sharp and brush-like, laterally granular. 6 Barbels; 2 nasal barbels, 2 maxillary barbels, 2 lower jaw barbels.

In the remaining six barbelled genera of the Bagrini the nasal barbels are lacking, 61 however there are 2 pairs of lower jaw barbels. They can moreover be grouped according to the general arrangement of the teeth on the palate. In one genus, Galeichthys, the arrangement reminds one of that in Bagrus, in another, Phractocephalus, to that of Bagroïdes; in others like Hexanematichthys Blkr, Platystoma Ag. and Selenaspis Blkr that of Octonematichthys and Pangasius. Cephalocassis Blkr reminds one more or less of the dentition of Chrysichthys Blkr and Arius Blkr that of Melanodactylus, though in other genera new groups of teeth are added to the ones already existing in other genera and these groups themselves are placed in different ways. These peculiarities can be observed in the genera Ariodes, Sciades, Sciadeichthys Blkr, Netuma Blkr and Guiritinga Blkr.

Finally one genus, Genidens, has the peculiarity that the palatal teeth are grouped more laterally in the cheeks.

It seems that nature, which has made so many genera of the large subfamily of the Bagrichthyoïds resemble each other, has laid down the characters that can be helpful in distinguishing these genera in the dentition, and in general when one has based the genera on the dentition and the barbels, one will also observe a large similarity in habitus in those species brought to those genera. At least in the genera that I have observed myself.

The genera mentioned above can be characterized as follows:

Galeichthys Val. Baird. Vomero-palatine teeth arranged in a continuous, transverse band.

Hexanematichthys Blkr. Vomero-palatine teeth arranged in a transverse quadripartite band. B. 7.

Phractocephalus Ag. Vomerine teeth placed in a triangular group in the anterior part of the palate.

Platystoma Ag. Vomerine teeth placed in an oblong, transverse, simple or bipartite 62 group, the palatine teeth placed on both sides in a group touching the corner of the vomerine group or close to it. B. 10 to 16. Snout much depressed.

Selenaspis Blkr. Teeth arranged as in the genus Platystoma, but grain-shaped. B. 6.

Sciades Müll. Trosch. Vomerine teeth arranged in a continuous, transverse band, palatine teeth arranged on both sides in an oblong group behind the vomerine band. B. 9.

Cephalocassis Blkr. Vomero-palatine teeth acute, arranged on both sides in an oblong or triangular group in the anterior part of the palate. B. 6.

Netuma Blkr. Vomero-palatine teeth acute, placed on both sides in a triangular, tripartite group in the anterior part of the palate. B. 5.

Guiritinga Blkr. Vomero-palatine teeth arranged in a broad, transverse band, several small groups of teeth fixed onto the posterior margin of the group. B. 6.

Sciadeichthys Blkr. Vomero-palatine teeth arranged in a tripartite, transverse band, an accessory group of palatine teeth placed on both sides separate from vomerine band. B. 6.

Ariodes J. Müll. Trosch. Vomerine teeth placed on both sides in a small group anteriorly, palatine teeth placed on both sides in an oblong group in the middle or the posterior part of the palate. B. 6.

Arius CV. in partly. No vomerine teeth, palatine teeth placed on both sides in an undivided group in the middle or in the posterior part of the palate. B. 5 to 6.

Genidens Blkr. Palatine teeth inserted in the cheeks.

Only a simple genus belongs to the Bagrini with 4 barbels, i.e.

Ailurichthys Baird and Girard, 4 barbels, which was formed at the cost of the genus Galeichthys CV. The vomero-palatine teeth are placed in a transverse, undivided band.

At last, to the Bagrini with 2 barbels belong the genera Osteogeneichthys Blkr, Diplomystes C. Dum. and Batrachocephalus Blkr. They are very different in habitus and build of the head, as well as in the build and arrangement of barbels and teeth. They can briefly be characterized as follows.

63 *Osteogeneiosus* Blkr. Maxillary barbels bony. Palatine teeth placed in two oblong-arcuate groups, jaw teeth multiple-rowed, acute and small. B. 5. Eyes nearly placed behind the mouth corner.

Diplomystes C. Dum. Maxillary barbels fleshy. Palatine teeth placed in 2 oblong, oblique groups, jaw teeth multiple-rowed. B. 8. Eyes placed above the mouth corner.

Batrachocephalus Blkr. Lower jaw barbels rudimentary. Palatine teeth arranged in 2 small, oblong groups, at a large distance from each other. Jaw teeth conico-cylindrical, multiple-rowed, the rows divided into 2 bands, the intermediate space edentate. B. 5. Eyes placed above the mouth corner.

I will now insert here a list of the species already known before and discovered by myself, in as far as I was able to bring them to the genera erected above with certainty or a high probability.

Pangasini

Eutropius	schilbeides J. Müll. = Bagrus schilbeides CV. = Hypophthalmus niloticus Rüpp.	Hab.	Nile.
"	Adansonii = Bagrus Adansonii CV.	"	Senegal.
"	vacha = Bagrus vacha CV. = Pimelodus vacha Buch.	"	Ganges.
"	murius = Bagrus murius CV. = Pirnelodus murius Buch.	"	Bengal.
"	angius = Bagrus angius CV. = Pimelodus angius Buch.	"	Bengal.
"	exodon = Bagrus exodon CV.	"	Bengal.
"	urua = Bagrus urua CV.	"	Bengal.
"	atherinoides = Bagrus atherinoides CV. = Silurus atherinoides Bl.	"	Tranquebar.

"	goongwaree Blkr = Hypophthalmus goongwaree Syk.	" Dekkan.
"	taakree Blkr = Hypophthalmus taakree Syk.	" Dekkan.
"	brachypopterus Blkr.	" Sumatra.
"	Buchanani = Bagrus Buchanani Valenc.	" Hindost.
"	depressirostris Peters.	" Mozamb.
Lais hexanema Blkr = Pangasius hexanema Blkr.		" Java, Sum., Born.
Helicophagus Waandersii Blkr.		" Sumatra.
"	typus Blkr	" Sumatra.
Pangasius Buchanani CV. = Pimelodus pangasius Buch.		" Bengal.
"	Djambal Blkr.	" Java.
64 "	macronema Blkr.	" Borneo.
"	micronema Blkr.	" Java.
"	rios Blkr.	" Borneo.
"	polyuranodon Blkr = Pangasius juaro Blkr.	" Sumatra, Born.
Silundia gangetica CV. = Ageneiosus Childreni Syk. = Pimelodus silundia Buch.		" Beng., Hindost.
"	chandramara CV. = Pimelodus chandramara Buch.	" Atreyi riv.
Davalla Schomburgkii Blkr = Hypophthalmus davalla Schomb.		" Guyana.

Bagrini

Bagrichthys hypselopterus Blkr = Bagrus hypselopterus Blkr.		" Sumatra, Born.
Bagroides melanopterus Blkr.		" Sum., Born.
"	macropterus Blkr.	" Sumatra.
"	macracanthus Blkr.	" Sumatra.
Leiocassis poecilopterus Blkr = Bagrus poecilopterus K.v.H. CV.		" Java.
Leiocassis micropogon Blkr = Bagrus micropogon Blkr.		" Sum., Banka, Bilit., Borneo.
Leiocassis amentosus Blkr = Bagrus (Bagrus) ramentosus Müll. Trosch.		" America??
Bagrus nemurus CV.		" Jav.,Sum.,Bank.,Born.
"	Hoevenii Blkr.	" Jav.,Sum.,Bank.,Born.
"	planiceps CV. = Bagrus anisurus CV.	" Jav., Sum.
"	Wyckii Blkr.	" Java.
"	stenomus CV.	" Java.
"	aor CV. = Platystoma seenghala Syk. = Pimelodus aor Buch.	" Bengal.
"	aorinus Valenc.	" Hindost.
"	Lamarrii CV.	" Bengal.
"	corsula CV. = Mugil corsula Buch. = Bagrus corsula Buch.	" Bengal.
"	halepensis CV.	" Alepo.
"	oculatus CV.	" Malabar.
"	cavasius CV. = Pimelodus cavasius Buch. = Pimelodus seengtee Syk.	" Bengal.
"	keletius CV.	" Bengal.
"	macronema Blkr = Bagrus singaringan Blkr = Bagrus heterurus Blkr = Bagrus nigriceps CV. ?	" Jav., Sum., Born.
"	micracanthus Blkr.	" Jav., Sum., Born.
"	Wolffii Blkr.	" Sum., Borneo.
"	tengara CV. = Pimelodus tengara Buch.	" Bengal.
65 "	bayad CV. = Silurus bayad Forsk. = Porcus bayad E. Géoffr. St. Hil.	" Nile.
"	docmac CV. = Silurus docmac Forsk. = Porcus docmae E. Géoffr. St. Hil.	" Nile, Senegal.
"	vittatus CV. = Silurus vittatus Bl.	" Tranquebar.
"	itchkeea Blkr = Phractocephalus itchkeea Sykes.	" Deccan.
"	batario CV.	" Bengal.

" gulio CV. = Bagrus albilabris CV. = Bagrus fuscens CV. = Bagrus abbreviatus CV. = Bagrus gulioides Blkr, etc.	" Hind., Beng., " Java, Sumatra.
" birmannus CV.	" Irrawaddi.
" trachacanthus CV.	" Bengal.
" ? laticeps Rüpp. = Pimelodus laticeps Rüpp.	" Nile.
" tengana CV. = Pimelodus tengana Buch.	" Bengal.
" calvarius = Silurus calvarius Basilewski.	" China.
Pseudobagrus aurantiacus Blkr = Bagrus aurantiacus T. Schl.	" Japan.
Chrysichthys auratus Blkr = Bagrus auratus CV. = Pimelodus auratus E. Géoffr. St. Hil.	" Aegypt.
" capito Blkr = Bagrus capito CV. (the same as the preceeding one?)	" Nile.
" maurus Blkr = Bagrus maurus CV.	" Senegal.
Octonematichthys nigrita Blkr = Bagrus nigrita CV.	" Senegal.
Melanodactylus acutivelis Blkr = Arius acutivelis CV. = Pimelode doigt de nègre Lac.	" Seneg. Gorea.
" cous Blkr = Pimelodus cous CV. = Arius cous Heck. = Silurus cous L.	" Aleppo.
Rita Buchanani Blkr = Arius rita CV. = Pimelodus rita Buch.	" Bengal.
" ritoides Blkr = Arius ritoides CV.	" Bengal.
" manillensis Blkr = Arius manillensis CV.	" Manilla.
" pavimentata Blkr = Arius pavimentatus CV.	" Hindost.
" hastata Blkr = Arius hastatus CV. = Arius pumilus Valenc.	" Hindost.
" kuturnee Blkr = Phractocephalus kuturnee Sykes.	" Deccan.
Galeichthys feliceps CV. = Bagrus (Bagrus) feliceps Müll. Trosch.	" Cape of Good Hope
" ? stanneus Richds.	" Canton.
Hexanematichthys sondaicus Blkr = Bagrus sondaicus CV. = Bagrus javensis CV.	" Java, Pin. Mal.
" chinta Blkr = nagrus chinta CV. = Chinta-jellah Russ.	" Vizagap.
" sagor Blkr = Bagrus sagor CV. = Pimelodus sagor Buch.	" Mouth of Ganges.
" doroides Blkr = Bagrus doroides CV.	" Beng. Hindost.
" ? coelestinus Blkr = Bagrus (Bagrus) coelestinus Müll. Trosch.	" Guyana.
" ? crinalis Blkr = Bagrus crinalis Richds.	" China.
" venaticus Blkr = Bagras venaticus Richds.	" north N. Holl.
" vertagus Blkr = Bagrus vertagus Richds.	" north N. Holl.
66 Phractocephalus hemiliopterus Ag. = Silurus hemiliopterus Bl. Schn.	" Columbia.
Platystoma lima Ag. = Sorubim infraocularis Spix = Silurus lima Bl. Schn.	" Brasil.
" tigrinum CV.	" Bras? Guyan.
" Orbignyanum Val.	" Buen. Ayr.
" fasciatum CV. = Silurus fasciatus Bl.	" Surinam.
" pardale Val.	" Buen. Ayr.
" coruscans Agass. = Sorubim caparari Spix.	" Brasil.
" spatula Agass. = Sorubim jandia Spix.	" Brasil
" planiceps Agass. = Sorubim piravaca Spix.	" Brasil.
" truncatum Agass. (maybe the same as the preceeding one?).	" Brasil.
" Vaillantii CV.	" Guyan., Colum.
" affine CV.	" Brasil.
" emarginatum CV.	" Brasil.
" platyrhynchos CV.	" ?
Selenaspis Herzbergii Blkr = Bagrus Herzbergii CV. = Silurus Herzbergii Bl.	" Guyan., Surin.
" ? pemecus Blkr = Bagrus pemecus CV.	" Cayenne.
" ? mesops Blkr = Bagrus mesops CV.	" S. Am.

"	flavescens Blkr = Bagrus flavescens CV.	" Cayenne
"	Temminckianus Blkr = Bagrus Temminckianus CV.	" Cayenne
"	luniscutis Blkr = Arius luniscutis CV.	" Brasil.
Sciades pictus Müll. Trosch. = Bagrus (Sciades) pictus Müll. Trosch.		" ?
Sciadeichthys emphysetus Blkr = Bagrus (Sciades) emphysetus Müll. Trosch.		" Guyan., Surin.
Cephalocassis arioides Blkr = Bagrus arioides CV.		" Bengal.
"	gagorides Blkr = Bagrus gagorides CV.	" Bengal.
"	trachipomus Blkr = Bagrus trachipomus CV. (the same as the preceeding one?)	" Bengal.
"	grandicassis Blkr = Arius grandicassis CV.	" Guyana.
"	parmocassis Blkr = Arius parmocassis CV.	" Bahia.
"	stricticassis Blkr = Arius stricticassis CV.	" Cayenne.
"	subrostratus Blkr = Arius subrostratis CV.	" Malab.
"	rostratus Blkr = Arius rostratus CV.	" Alipey.
"	truncatus Blkr = Arius truncatus CV.	" Java, Born. Sum., Mal. Pin.
"	caelatus Blkr = Ar. caelatus CV. = Ar. aequibarbis CV. = Ar. granosus CV. etc.	" Hind., Java. " Sum., Born.
"	venosus Blkr = Arius venosus CV. = Arius laeviceps Blkr etc.	" Birm., Manill., Jav., Bint., Mad., Singap. Bank.
"	Belangerii Blkr = Arius BeIangerii CV.	" Bombay.
67 "	? sinensis Blkr = Arius sinensis CV.	" Touraine.
"	Heudelotii Blkr = Arius Heudelotii CV.	" Seneg.
"	Milberti Blkr = Arius Milberti CV.	" Charl. N. York.
"	Spixii Blkr = Arius Spixii CV. = Pimelodus Spixii Ag. = P. albidus Spix.	" Brasil.
"	rugispinis Blkr = Arius rugispinis CV.	" Cayenna.
"	phrygiatus Blkr = Arius phrygiatus CV.	" Cayenna.
"	falcarius Blkr = Arius falcarius Richds.	" Canton.
"	melanochir Blkr = Arius melanochir Blkr.	" Sumatra.
"	leptonotacanthus Blkr = Arius leptonotacanthus Blkr.	" Java, Madura.
"	macronotacanthus Blkr = Arius macronotacanthus Blkr.	" Java.
"	utik Blkr = Arius utik Blkr.	" Java.
Netuma nasuta Blkr = Arius nasutus CV. = Bagrus thalassinus Rüpp. etc		" Red Sea, Jav., Bint., Nias., Celeb. Sum.
"	bilineata Blkr = Bagrus bilineatus CV. = Deddi-jellah Russ. (or Net. nas?)	" Hind. Birma.
"	netuma Blkr = Bagrus netuma CV. (or Netuma nasuta?)	" Pondich.
"	laevigata Blkr = Bagrus laevigatus CV. (or Netuma nasuta?)	" Red Sea.
"	proöps Blkr = Bagrus proöps CV.	" Antill. Guyan.
"	passany Blkr = Bagrus passany CV.	" Cayenna.
"	couma Blkr = Bagrus couma CV.	" Cayenna.
"	? albicans Blkr = Bagrus albicans CV.	" Cayenna.
Guiritinga Commersonii Blkr = Bagrus Commersonii CV. = Pimelodus Commersonii Lac.		" Brasil etc.
Ariodes clarias Müll. Trosch. = Arius albicans CV. = Pimelodus Blochii CV. = Silurus clarias Bl.		" Bras. Buen. ayr
"	? nigricans Blkr = Arius nigricans Valenc.	" Amer. merid.
"	Dussumierii Blkr = Arius Dussumieri CV.	" Malabar
"	Meyenii Müll. Trosch.	" ?
"	macrocephalus Blkr = Arius macrocephalus Blkr.	" Java.
"	tonggol Blkr = Arius tonggol Blkr = Arius crossocheilos Blkr.	" Java, Sum., Bintang, Banka.

" acutus Blkr = Ariodes arenarius Müll. Trosch? = Arius acutus Blkr etc.	" Jav., Sumatra.
" leiocephalus Blkr = Arius leiotetocephalus Blkr.	" Jav., Sing., Cel.
" polystaphylodon Blkr = Arius polystaphylodon Blkr.	" Jav., Sumatra.
" goniaspis Blkr = Arius goniaspis Blkr.	" Sumatra.
Arius gagora CV. = Pimelodus gagora CV.	" Bengal.
" arius CV. = Pimelodus arius Buch. = Arius gagorides Blkr etc.	" Hind., Mal., Java, Sumatr., Sing. Born.
" ocellatus CV. = Silurus ocellatus Bl. Schn. = Silurus maculatus Thunb. (same as preceeding?).	" Japan.
68 " argyropleuron CV.	" Java.
" arenatus CV.	" Cayenn.
" fissus CV.	" Cayenn.
" variolosus CV.	" Cayenn.
" ? molliceps CV.	" ?
" puncticulatus CV.	" Buen. Ayr.
" quadriscutis CV.	" Guyana.
" ?Parkeri Blkr = Silurus Parkeri Trail.	" Guyana.
" (??) equestris Baird Gir.	" Texas,Indian
" microcephalus Blkr.	" Borneo.
" pidada Blkr = Arius viviparus Blkr.	" Java.
" nenga Blkr = Pimelodus nenga Buch. = Pimelodus sana Buch.	" Bengal.
Genidens Valenciennesii Blkr = Bagrus genidens CV.	" Brasil.
Ailurichthys marinus Baird Gir. = Galeichthys Parrae CV. = Silurus marinus Mitch. etc.	" U.S.A.
" Gronovii Baird, Gir. = Galeichthys Gronovii CV. = Silurus bagre L	" Guyan. Bahia
" Eydouxii Baird, Gir. = Galeichthys Eydouxii CV.	" Guyajaquil r.
" Blochii Baird, Gir. = Galeichthys Blochii CV.	" Surin. Bahia
Diplomystes papillosus C. Dum. = Arius papillosus CV.	" Chili r.
Osteogeneiosus militaris Blkr = Arius militaris CV.	" Birm. Hind., Pin. Sing. Mal.
" Cantoris Blkr.	" Beng.
" Valenciennesii Blkr = Osteogeneiosus gracilis Blkr = Osteogeneiosus Blochii Blkr.	" Java, Banka
" macrocephalus Blkr = Osteogeneiosus ingluvies Blkr = Osteiogeneiosus longiceps Blkr.	" Java, Madura
Batrachocephalus micropogon Blkr = Batrachocephalus ageneiosus Blkr	" Java, Sumat.
" mino Blkr = Ageneiosus mina Bloch. (the same as the preceeding one?)	" Bengal.

The species summed up above are all those that have become known till now as far as I have been able to trace. However, probably we will see in the future that several of them are mentioned twice or more, which I cannot tell without examining them in nature.

69 ARIUS CV. Blkr. Müll. Trosch.

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth multiple-rowed, acute and small. Palatine teeth placed on both sides in an undivided group in the middle or the posterior part of the palate, middle line of the palate edentate. Six

fleshy barbels. Branchiostegal membrane with 5 or 6 rays. Interbranchial membrane hardly or not emarginate. Nostrils not tubular, the posterior ones provided with valves.

Remark. The most essential character of the genus Arius, which separates it from Cephalocassis and Ariodes and from other genera originating from the splitting of the genus Arius of Mr Valenciennes, lies in the groups of grain-shaped teeth, which are placed more backwards on each side of the palate and which have nothing in common with the vomer.

The species of Arius, at least the ones that are in my possession, are so similar in habitus and numerous peculiarities of the build, that their distinction is not easy.

All my species, 4 in number, have in common an almost the same habitus and graining of the head shield, supraoccupital crest and fin spines etc. and the specific differences must primarily be sought in the relative lengths of head and eyes, differences which for specimens of one species are subject to change with the age of the specimens and which only become apparent when specimens of different species of a comparable size are compared. The length of the tooth bands in the jaws and the elongation of the dorsal spine can also be useful for the determination of the species.

To the genus belong Arius gagora CV., Arius arius CV. from Bengalen and Hindostan, Arius ocellatus CV. from Japan, Arius argyropleuron CV. and Arius arenatus CV., Arius fissus CV., Arius variolatus CV. and Arius puncticulatus CV. from South America, Arius molliceps CV. and maybe also Arius quadriscutis CV. from Cayenne, species, which were also considered by Misters J. Müller and Trosschel to belong to the sub-department of their 70 genus Bagrus, for which they have kept the name Arius.

The two first named species are found in my collection. I received Arius gagora CV. from Calcutta and Arius arius CV. is not uncommon in the river mouths of the large Sunda Islands.

Arius ocellarus CV. or Thunberg's Silurus maculates, which would live in the waters of Japan, but in this century has not been found there by any naturalist, judging from the figure, would not possess shield grains, which however should be further investigated.

Arius argyropleuron CV. would be remarkable by the five-pointed posterior edge of the head shield, caused by bony processes between the parietal crest and the supracleithral process.

The American species almost all have small eyes and medium sized spines whereas moreover in Arius puncticulatus CV. and Arius arenatus CV. tooth plates on the palate would touch each other rostrally and in Arius molliceps CV. the body depth would only fit 4⅔ times in its length. All these species would also possess 6 branchiostegal rays.

Arius quadriscutis CV. at last, if this species indeed (according to my definition) belongs to Arius, would stand alone in this genus by its broad nape shield (2nd interspinal bone) and the tooth plates on the palate that touch each other along their entire length.

Among the numerous species described by Buchanan under the generic name Pimelodus, there is one, not recorded in the large Histoire naturelle des Poissons, which belongs to the genus Arius Blkr. I mean Pimelodus nenga Buch., which accord-

ing to me does not seem to differ from his Pimelodus sona. The determination of this species however, is not not well possible as the description of Buchanan is not sufficiently detailed.

Apart from the two already mentioned above, I possess still two other species of Arius of the Indian Archipel, which no one described prior to me, i.e. Arius pidada and Arius microcephala. Thus, in 71 total 4 species of Arius have become known from these regions namely Arius arius CV., Arius argyropleuron CV., Arius pidada Blkr and Arius microcephalus Blkr. They can be separated by their main characters according to the following scheme.

I. Dorsal shield (along interspinal bone) thin, shorter than anterior-posterior eye diameter.
  a. Branchiostegal membrane with 5 rays. Adipose fin with black spot.
    † Head shield with 5 processes posteriorly.

Arius argyropleuron CV.

† Head shield posteriorly only with supraoccipital and suprascapular processes.
  * Eye diameter contained 4 to slightly more than 5 times in length of head.
    ** Band of premaxillary teeth about six times as long as broad.
      § Head contained 3⅖ to 3¼ times in length of body without the caudal fin; profile of snout and forehead convex.

Arius arius CV.

§ Head contained 4 to 3⅔ times in length of body without caudal fin; profile of forehead and crown more or less straight.

Arius pidada Blkr.

** Band of premaxillary teeth three times as long as broad, with truncate angles.
§ Head contained 4 1/5 to 4 in length of body without caudal fin; head profile convex.

Arius microcephalus Blkr.

72 *Arius arius* CV.
Poiss. XV p. 76, Cant. Catal. Mal. Fish. p. 259. Atl. Silur. tab. I
Common Arius

An Arius with an elongate body, anterior part about as broad as deep, posterior part compressed, depth of body contained 4⅖ to nearly 5 times in its length without, and 5½ to 6¼ times in its length with caudal fin. Head slightly depressed, convex and acute, contained 3⅖ tot 3¼ times in length of body without, and slightly more than 4 to 4⅖ times in length of body with caudal fin; depth of head contained 1⅔ to 1⅖ times in its length, width 1½ tot 1⅓ times; rostro-dorsal profile with a convex snout and forehead; eyes free placed above mouth corner, placed nearly totally in the anterior half of the head, eye diameter contained 4 to slightly more than 5 times in length of head, distance between the eyes 1½ or 2½ times their diameter: head shield with a median longitudinal groove reaching or nearly reaching the base of the supraoccipital crest, dividing the entire head shield, the shield is grainy upwards from the eyes; a rather large number of medium-sized grains is generally arranged ray-like; supraoccipital crest nearly triangular, hardly or not longer than the base, about twice as long as top width, granulated, its top obtuse and emarginate, reaching the short and granulated second interspinal bone; snout convex, longer than the

Fig. 1. *Arius arius* CV. [In Atlas as *Pseudarius arius* Blkr]

eye, hardly protruding beyond mouth opening, rostral profile obtusely rounded. Jaw teeth multiple-rowed, acute and small, the upper jaw teeth placed in a slightly curved thin band, much longer than the eye, six times or more than six times as long as broad with rounded angles, the lower jaw teeth placed in a crescent-shaped band, longer but thinner than the premaxillary band, with acute angles; palatine teeth grain-like, placed in two semi-oval, more or less straight groups, which are generally longer than the eye, not touching each other, placed in the middle of the palate. Mouth subinferior, its width contained nearly 3 times in length of head; maxillary barbels reaching or nearly reaching the humeral bone; outer lower jaw barbels, longer than inner ones, reaching or nearly reaching the gill opening; anterior and posterior nostrils nearly touching each other, nearer to the tip of the snout than to the eye; anterior ones are round, the posterior ones are oblong and can be closed by a small broad valve that nearly totally surrounds the opening and is elevated anteriorly. Gill cover glabrous and veined: humeral bone medium-sized, acute,

reticulatedly rough or granulated; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin; one or two conspicious axillary slime pores; dorso-lateral pores are less conspicuous and placed in about 15 simple, transverse parallel lines. Rayed dorsal fin acute, higher than body depth, without filament more than twice as high as length of fin base, the spine thick, contained slightly more than once to 1⅔ times in length of head, spine laterally striped or striped and granular, its anterior side granular basally, upper part feebly serrated, posterior side armed with medium-sized teeth, the long filiform part seldom or not longer than the spine itself; adipose dorsal fin placed at a distance of nearly 3 to more than 3 times its length from the rayed dorsal, slightly shorter than rayed dorsal, less than twice as long as high and obliquely convex; pectoral fins acute, contained 1⅔ or hardly more than once in length of head, with a thick spine equal or nearly equal to the dorsal spine and armed in the same way; ventral fins acute or obtuse and rounded, contained 2 to 1¾ times in length of head, posterior ray sometimes very tumid and cartilaginous; anal fin acute or obtuse, emarginate, fin depth smaller than body depth, not or hardly longer than high and about twice as long as adipose fin; caudal fin with a deep incision and acute lobes, the upper one longer than the lower one and contained 5¾ to 5 times in length of body. Colour of upper part of body bluish-green, lower part pearly or silvery, adipose fin slightly olive-coloured with a large black spot; fins yellowish or faintly rose-coloured, more or less with dark speckles, iris yellow.

73 B. 5. D. 1/7. P. 1/10. V. 1/5. A. 7/13 to 7/16. C. 1/13/1 and shorter ones alongside.

Syn. *Pimelodus arius* Buch., Gang. Fish. p. 170, 376.
Arius gagoroides Blkr, Verh. Bat. Gen. XXI, I Silur. batav. consp. p. 42.
Arius chondropterygioides Blkr, ibid. p. 44.
Arius angulatus Blkr, ibid. p. 44.
Arius Heckelii Blkr, ibid.
Arius borneënsis Blkr, Derde Bijdr. ichth. Borneo, Nat. Tijdschr. Ned. Ind. II p. 67.
Ari gagora Bengalese.
Ikan Saludu or *Surdudu*, Mal. Strait of Malacc.
Ikan Manjong pidada Mal. Batav.

Hab. Java (Batavia, Bantam, Surabaja, Pasuruan), in sea and river mouths.
Sumatra (Padang, Palembang), in sea and rivers. Borneo (Banjermasin, Prabukarta), in rivers.

Length of the 27 specimens 140''' to 390'''.

Remark. I bring the species described here to Arius arius CV. although the descriptions of both Buchanan and Mr Valenciennes do not show sufficient detail to identify the species in question with enough certainty, since they do not mention the realative measurements of the head, by which it differs from the species described hereafter. With more certainty it can be determined, that the species described by Mr Cantor under the name Arius arius, is the same as the one described here, as Mr Cantor states that the head length is one fourth of the body length.

Arius arius CV. by the relatively large size of the head is very easy to distinguish from Arius gagora CV. of which I possess two Bengal specimens with a length of 190 and 204 mm, in which the head fits about 3⅘ times in the body length without the caudal fin, while moreover the profile is much more convex and the eyes are remarkably smaller.

All my specimens from Borneo are smaller than those from Java and have the dorsal fin spine only very little elongated. Previously I regarded them unjustly to belong to a separate species. The elongation of the dorsal spine appendage in this species seems to increase with increasing age, which is not the case in Arius pidada 74 Blkr where in my smallest specimens the dorsal spine thread is relatively as long as in older specimens.

Arius ocellatus CV., the Silurus ocellatus of Schneider or Thunberg's Silurus maculates, depicted in the Acta of the Swedish Academy of Sciences of the year 1792, a work I cannot consult, in the opinion of Mr Valenciennes seems to differ from Arius arius only by the absence of the dorsal spine thread. Because however it is stated that the mentioned figure does not show shield granules it would be hazardous to place Arius ocellatus CV. in the synonymy of Arius arius.

Apart from river mouths and coastal waters of the three major Sunda Islands, Arius arius CV. also lives near Pinang, Singapore and Malakka and even near Ponderichy and in the mouth of the Ganges. Although they become larger than the largest specimens of my collection, I have never seen specimens larger than half a meter.

The females retain the eggs for a long period, and as these eggs reach the size of pigeon eggs, the belly sometimes swells up considerably. When the eggs leave the body the juveniles are already very well developed and many times I have cut from the body of the mother live fishes which long afterwards lively moved on the large yolk sac. I even tried to keep these fishes alive but did not succeed. I have observed the same in Arius pidada.

Arius pidada Blkr.
Verh. Bat. Gen. XXI, I, Silur. Bat. consp. p. 43. Atl. Silur. tab. II.
Livebearing Arius

An Arius with an elongate body, anterior part as broad or nearly as broad as deep, posterior part compressed, depth of body contained 4¾ to 4⅕ times in its length without, and 6¼ to slightly more than 5 times in its length with caudal fin: head depressed, slightly convex and acute, contained 4 to 3⅔ times in length of body without, and 5⅓ to 4⅔ times in length of body with caudal fin; depth of head contained 1⅓ tot 1½ times in its length, width 1⅓ tot 1⅖ times; rostro-dorsal profile at forehead and crown sloping in a nearly straight line; eyes 75 free, placed above the mouth corner, totally or nearly totally in the anterior half of the head, eye diameter contained about 4 to about 5 times in length of head, distance between the eyes 1⅗ tot 2½ times their diameter: head shield with a median longitudinal groove reaching or nearly reaching the base of supraoccipital crest, dividing the entire head shield, which is grainy upwards from the eyes, a large number of medium-sized granules arranged ray-like; supraoccipital crest nearly triangular, hardly or not longer than basal width, granulated, its obtuse and emarginate top reaching the short and granular second interspinal bone. Snout convex, longer than the eye, however hardly protruding beyond the mouth opening, rostral profile obtusely rounded. Jaw teeth multiple-rowed, acute and small, the upper jaw teeth placed in a slightly curved thin band, much longer than the eye, about six times as long as broad, with rounded angles; palatine teeth grain-like, placed in two semi-oval, straight groups, which are generally longer than the eye, not touching each other, placed in middle of palate. Mouth subinferior, its width contained 2½ tot 2⅓ times in length of head; maxillary barbels reaching or nearly reaching the humeral bone; outer lower jaw barbels, longer than inner ones, reaching or nearly reaching gill opening; anterior and posterior nostrils nearly touching each other, nearer to tip of snout than to the eye, anterior ones are round, the posterior ones oblong and can be closed with a small broad valve that nearly totally surrounds the opening and is elevated anteriorly; gill cover glabrous and veined: humeral bone medium-sized, acute and reticulatedly rough; lateral line branched, anterior part sloping downwards, posterior part straight and forked at caudal fin base; axillary slime pore conspicuous; dorso-lateral pores less conspicuous and placed in about 15 simple transverse, parallel lines. Rayed dorsal fin acute, higher than body depth, without filament more than twice as high as length of fin base, spine thick, contained 1 tot 1⅖ times in length of head, laterally striped or striped-granular, its anterior side grainy basally, upper part feebly serrated, posterior side armed with medium-sized teeth, the long filiform part sometimes longer than the spine; adipose dorsal fin placed at a distance of more or less three times its length from the rayed dorsal,

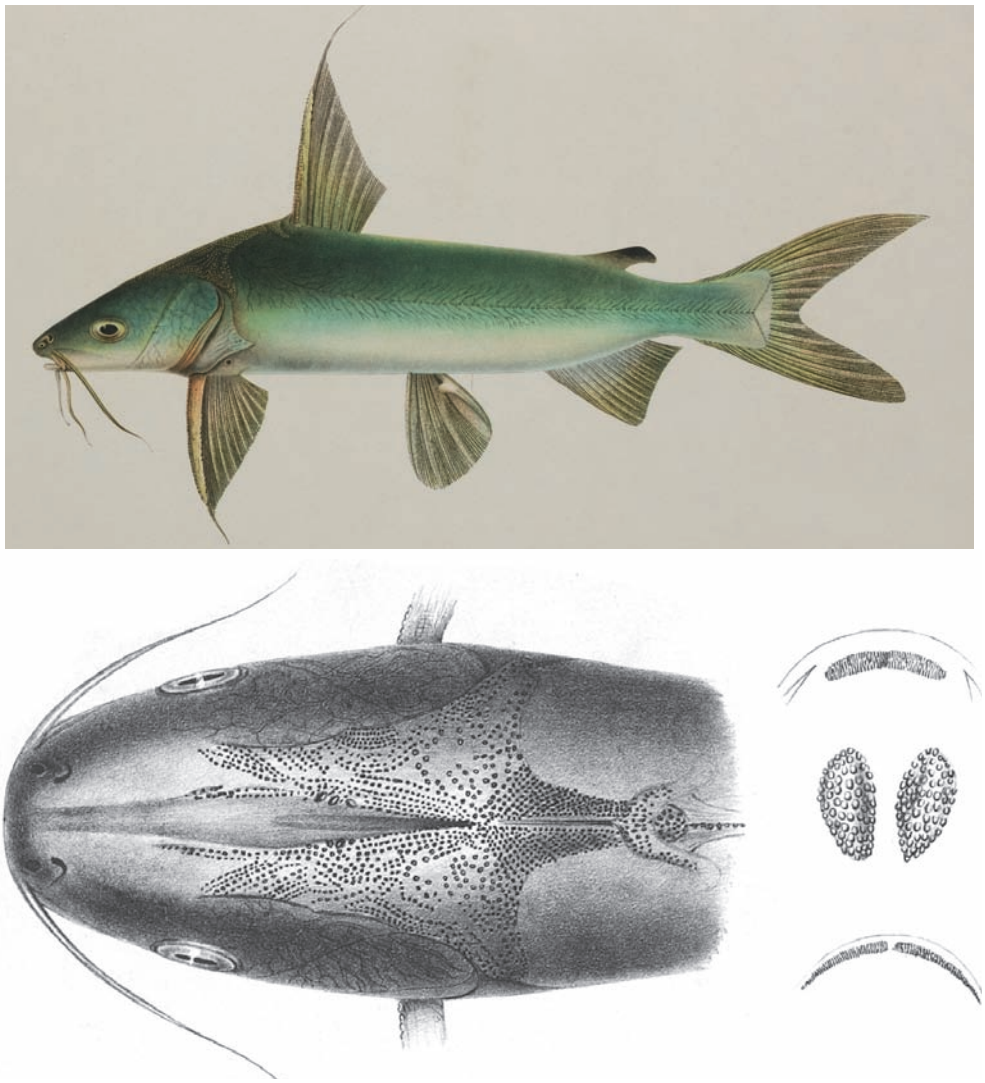

Fig. 2. *Arius pidada* Blkr. [In Atlas as *Pseudarius pidada* Blkr.]

not or slightly shorter than rayed dorsal, less than twice as long as high and obliquely convex; pectoral fins acute, not or slightly shorter than head, with a thick spine equal or nearly equal to dorsal spine and armed in the same way; ventral fins acute or obtuse and rounded, contained 1½ to 1¾ times in length of head, its posterior ray sometimes very tumid and cartilaginous; anal fin acute or obtuse, emarginate, fin depth less than body depth, not or hardly longer than high and about twice as long as adipose fin; caudal fin with a deep incision and acute lobes, upper one longer than lower one and contained slightly more than 4 to 4¾ times in length of body. Colour of upper part of body bluish-green, lower part pearly or silvery, adipose fin slightly olive-coloured with a large, black spot; fins yellowish or faintly rose-coloured, more or less with dark speckles, iris yellow.

B. 5. D. 1/7. P. 1/10 or 1/11. V. 1/5. A. 7/15 or 7/16. C. 1/13/1 and shorter ones alongside.

Syn. *Arius viviparus* Blkr, Verh. Bat. Gen. XXI, I Silur. bat. consp. p. 45.
Ikan Manjong pidada Mal. Batav.
Hab. Java (Batavia, Surabaja), in sea and river mouths.
Sumatra (Palembang), in mouth of the Mussi river.
Length of the 20 specimens 150‴ to 380‴.

Remark. After I had seen a large number of specimens of Arius arius CV. and of the species in question and had come to the 76 conclusion that the species erected by me in 1846 and 1847 could be referred to these, I still hesitated to consider the species in question as a proper species. Nevertheless I found certain constant differences, which to me seem to indicate that they are indeed valid species. When one compares specimens of the same size of both species, those differences, regardless of the age of the specimens, are very apparent, although they are difficult to express sharply in a description. The fact is that in the species in question the head is constantly rather remarkably shorter and more slender whereas the eyes are smaller and the mouth slit and the fin spines occupy a larger part of the head length. But the constant differences are restricted to these peculiarities as both species are similar in all other respects.

Kuhl and Van Hasselt have known this species, as is apparent from a rather good figure left by them, which is in my possession. As this figure has the same length as the Arius argyropleurion described in the large Histoire naturelle des Poissons, the only species of Arius (mihi) that was known from Java prior to my investigations, the suspision arose in me that Arius argyropleurion possibly was none other than the species in question. In the mentioned figure the dorsal fin spine likewise is not elongated, as is indicated in the description of Arius argyropleurion, however the elongated part easily separates from the spine and then by shrinkage of the membrane that connects it to the first fin ray seems to become attached to this ray, so that it appears as if the ray itself has a thread-like elongation. Such an incorrect representation of the facts I find in the mentioned figure, where the first dorsal fin ray has twice the length of the spine. Because in that figure I see nothing that could indicate the processes of the head shield between the crista supraoccipitalis [supraoccipital crest] and the processus suprascapularis, as described in Arius argyropleurion, I hold myself not entitled to combine both species.

77 *Arius microcephalus* Blkr.

Negende Bijdr. Ichtyol. Borneo, Nat. Tydschr. Ned. Ind. IX p. 423.
Atl. Silur. tab. III fig. 1.
Small-headed Arius

An Arius with an elongate body, anterior part about as broad as deep, posterior part compressed, body depth contained 4⅓ to 4¾ times in its length without, and 5½ to 6⅙ times in its length with caudal fin. Head very convex and acute, contained 4⅕ to 4 times in length of body without, and 5¼ to 5 times in length of body with caudal fin; depth of head contained 1⅖ to 1½ times in its length, width 1¼ to 1⅕ times; rostro-dorsal profile convex; eyes free, placed above the mouth corner, totally or nearly totally in the anterior half of the head, eye diameter contained 4½ to slightly more than 5 times in length of head, distance between the eyes 2 to 2⅓ times their diameter. Head shield with a median longitudinal groove nearly reaching the base of supraoccipital crest, nearly totally dividing the head shield, which is granular upwards from the eyes, a rather large number of small granules arranged ray-like; parietal crest nearly triangular, hardly or not longer than base, much less than twice as long as broad near the top, granulated,

its obtuse and emarginate top reaching the short and granulated second interspinal bone; snout convex, longer than eye, hardly protruding beyond mouth opening, rostral profile slightly acutely rounded. Jaw teeth multiple-rowed, acute and small, upper jaw teeth placed in a hardly curved broad band, not or hardly longer than the eye, hardly three times as long as broad, with truncate angles, lower jaw teeth placed in a nearly crescent-shaped band, not much longer than the eye, thinner than the premaxillary band, with acute angles; palatine teeth grain-like, placed in two semi-oval, straight groups much longer than the eye, not touching each other, placed in middle of palate; mouth subinferior, its width contained about 2⅓ times in length of head; maxillary barbels reaching the humeral bone. Outer lower jaw barbels, longer than inner ones, not reaching the humeral bone; anterior and posterior nostrils nearly touching each other, nearer to the tip of the snout than to the eye; the anterior ones round, the posterior ones are oblong and can be closed with a small broad valve that nearly totally surrounds the opening and is much elevated anteriorly; gill cover glabrous and veined: humeral bone medium-sized, acute, slightly rough-reticulated; axillary slime pore conspicuous; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin. Rayed dorsal fin acute, higher than body

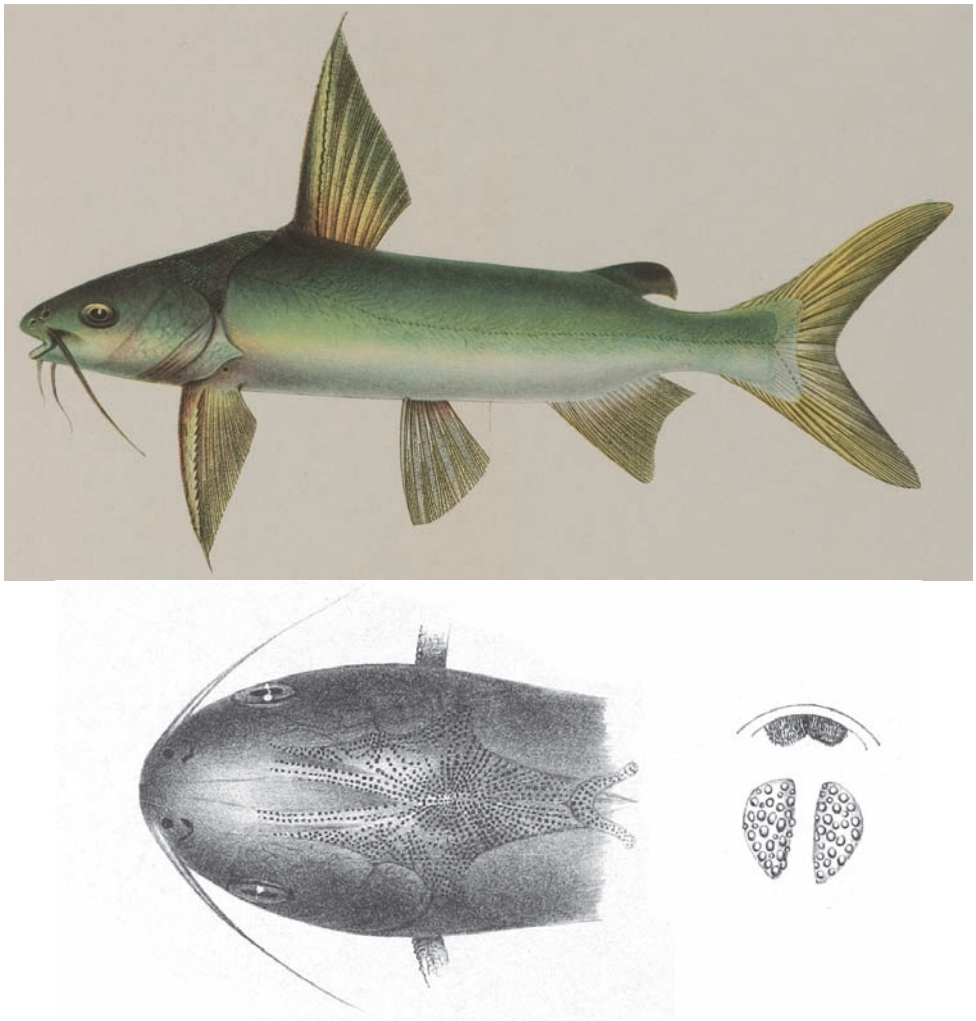

Fig. 3. *Arius microcephalus* Blkr. [In Atlas as *Pseudarius microcephalus* Blkr.]

depth, more than twice as high as the length of the fin base, the spine thick, not or hardly shorter than the head, spine laterally striped, its anterior side grainy basally, the upper part feebly serrated, posterior side armed with conspicuous small teeth, the prolonged part hardly longer than the first ray; adipose dorsal fin placed at a distance of less than three times its length from the rayed dorsal. It is not or hardly shorter than the rayed dorsal, less than twice as long as high and obliquely convex; pectoral fins acute, not or slightly shorter than the head, with a thick spine slightly shorter than the dorsal spine, spine laterally striped, its anterior side grainy near the base, feebly serrated near the top, posterior side armed with conspicuous, small teeth; ventral fins angular, not emarginate, contained about 1½ times in length of head; anal fin acute and emarginate, fin depth much smaller than body depth, about equally high as long, much less than twice as long as adipose fin; caudal fin has a deep incision and acute lobes, the upper one longer than the lower one and contained 4½ to 4⅓ times in length of total body. Colour of upper part of the body bluish-green, lower part pearly or silvery; adipose fin slightly olive-coloured with a large, black spot, other fins yellowish, more or less densely with dark speckles, iris yellow.

78 B. 5. D. 1/7. P. 1/l0. V. 1/7. A. 6/13 or 7/13. C. 1/13/1 and shorter ones alongside.

Hab. Borneo (Bandjermasin), in rivers.

Length of the 2 specimens 140‴ and 213‴.

Remark. Arius microcephalus is very closely related to Arius gagora CV., so much indeed, that I have hesitated to consider it as a species that differs from it. However, a more detailed examination of specimens of both species of almost equal size makes clear that in Arius gagora CV. the head is relatively longer and lower, the eyes are smaller, the bands of teeth in both jaws are considerably longer and those of the upper jaw much more slender and much longer than the eye. Moreover the dorsal and pectoral fin spines are remarkably less developed and fit 1⅓ to 1½ times in the head length, whereas the supraoccipital crest is remarkably more slender (its width at the top fits more than twice in its length) and the rounding of the snout anteriorly is more blunt.

Arius argyropleuron K.v.H.
CV. Poiss. XV. p. 78.
Silver-sided Arius

An Arius rather similar to Arius gagora or Arius arius, but with the rostro-dorsal profile less convex. Head shield between supraoccipital crest and suprascapular process with a distinct process, head shield grainy merely upwards from the praeopercula. The middle of the forehead with a longitudinal groove. The second interspinal bone crescent-shaped, short and nearly glabrous, eye diameter contained five times in length of head. Spines grainy, dorsal spine not prolonged. Colour of back leaden, flanks and belly silvery, rayed dorsal fin and adipose fin blackish, caudal fin grey, other fins whitish, barbels dark.

B. 5. D. 1/6. P. 1/10. V. 6. A. 16. C. 17.

Syn. *Arius aux flancs argentés* CV. Poiss. XV p. 78.

Hab. Java.

Length of the described specimen 6 Parisian inches.

Remark. The diagnosis above was translated from the large fish work. I do not possess this species and till now I did not succeed in observing it. This species seems to be characterised principally by a processus of the head shield between the crista supraoccipitalis and the processus suprascapularis, reason why the shield posteriorly has 5 processes, something I do not see in any of my species of Arius. However, it must be described 79 in more detail and more extensively in order to be able to compare it properly with the remaining species of the genus.

Ariodes Blkr.

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth multiple-rowed, small and acute. Vomerine teeth placed at both sides in a small group anteriorly, palatine teeth placed at both sides in an oblong group in the middle or at the back of the palate. Middle line of the palate more or less edentate. Six fleshy barbels. Branchiostegal membrane with 6 rays. Interbranchial membrane not or slightly emarginate. Nostrils not tubular, the posterior ones with a valve.

Remark. The department Ariodes of the genus Bagrus of Misters J. Müller and Troschel contains my genera Cephalocassis and Ariodes.

Cephalocassis contains only those species, in which the vomer in both corners anterior in the palate bears groups of teeth that are separated from each other, whereas I wish to restrict the genus Ariodes to those species in which 4 separate groups of teeth are present on the palate of which the two anteriormost groups belong to the vomer and the two posterior ones to the palatal bones. The three species described by Misters Müller and Troschel in their Horae ichthyologicae definitely belong to my genus Ariodes.

As far as have been able to ascertain from the exsisting descriptions, to the genus Ariodes can be brought besides the above mentioned species of Mrs Müll.er and Troschel (Ariodes clarias, Arius albicans CV., Ariodes arenarius and Ariodes Meyenii), Arius Dussumierii CV. from Malabar and maybe also Arius nigricans Valenc. from South America.

In my "Siluroideorum bataviensis conspectus diagnosticus" the first of my ichthyological contributions, I briefly described some species that belong to this genus. Two of these, Arius macrocephalus Blkr and Arius acutus Blkr, have been brought there to a group 80 of Arius in which only two groups of grain-like teeth are found on each side in the middle of the palate. However, these two species on each side moreover possess a small group of vomerine teeth, which however are very defective and often are lacking in older specimens, as was the case in specimens then described by me. Therefore in essence they belong to the other group erected by me in the same contribution, which I now propose to raise to a valid genus.

I now possess 6 well characterized species of Ariodes from the Indian archipelago.

In three of those species, Ariodes tonggol Blkr, Ariodes acutus Blkr and Ariodes macrocephalus Blkr the teeth on the palate are placed in large elongate oval patches that posteriorly approach each other. These groups begin only at a large distance from the vomerine teeth. In the three other species, Ariodes leiocephalus Blkr, Ariodes polystaphylodon Blkr and Ariodes goniaspis Blkr, the palatinal teeth are placed in very much elongated more or less triangular groups that diverge posteriorly. These groups reach remarkably further forwards on the palate and therefore begin much closer to the groups of vomerine teeth.

Of the first metioned group Ariodes tonggol is recognisable by the still moderately developed groups of vomerine teeth and the lack of the black adipose fin spot, apart from still other differences in the relative lengths of the head and the supraoccipital crest. In Ariodes macrocephalus and Ariodes acutus the vomerine teeth are very loosely implanted and if they do exist they are always few in number and placed in very small groups. However, Ariodes macrocephalus differs very clearly from Ariodes acu-

tus by its larger and more convex head, which fits only 3 times or not even 3 times in the length of the body without the caudal fin, as well as by its thinner and more slender supraoccipital crest, which width fits twice in its length.

The three remaining species are easy to separate from each other by the shape of the supraoccipital crest and the graining of the head shield.

81 In Ariodes leiocephalus the head shield is almost totally smooth and the supraoccipital crest forms an oval shield, which, although broader in the middle than at its basis, it is still remarkable longer than wide.

Ariodes polystaphylodon and Ariodes goniaspis (even at a young age, because my specimens certainly represent the juvenile age group) have the head shield covered with rather numerous bony grains just like the supraoccipital crest. Between them the species differ principally by the shape of this crest. In Ariodes polystaphylodon the crest is remarkably longer than wide and laterally convex so that its width in the middle of its length is not or hardly different from the width at its base, whereas in Ariodes goniaspis on the contrary the width of the crest exceeds its length and it has a more triangular shape without convex or curved edges.

Comparing my 6 above mentioned species to the descriptions of the remaining species known till now, I found that none of them can be referred to any of these.

Arius Dussumieri CV. from Malabar, to me seems to be very closely related to Ariodes staphylodon, especially because of its cone shaped palatal teeth and the shape and granulation of the supraoccipital crest and head shield, however the upper jaw barbels would only reach to the edge of the interopercle and the numbers of finrays, if they have been mentioned properly, would be less, i.e. P. 10, A. 13 (the ventral fins are said to be 9, which probably must be 6 or 1/5).

Ariodes clarias Müll. Trosch. from South America differs from all my species by its long barbels and large adipose fin, which is said to occupy ⅙ of the length of the entire body, etc. If the number of 9 branchiostegal rays that is mentioned for this species, not has to be read as 6, the generic diagnosis given above would have to be altered accordingly, unless we should think of a genus different from Ariodes.

Of Arius nigricans CV. from South America it still is entirely uncertain whether it does belong to Ariodes. I suspect such only because of the relationship which it is said to have with Ariodes clarias.

82 Ariodes arenatus Müll. Trosch. from China seems to me to be closest related to my Ariodes acutus and I even consider it not improbable that it belongs to my species, in which case the name given by me in 1846 should be preserved.

In Ariodes Meyenii Müll. Trosch. the small eyes, which are 8 to 9 diameters apart and 5 diameters from the snout tip, are placed before the middle of the length of the head, while the supraoccipital crest has a diamond shape, the groups of palatal teeth are roundish, etc. so that this species differs very sharply from the remaining ones.

The species of my collection can be separated from each other as well as from the remaining known species according to the following scheme.

A. Adipose fin much shorter than anal fin. Maxillary barbels not reaching ventral fins.
  I. Groups of palatine teeth oblong-oval converging posteriorly. Shield grainy. P. 1/11
    a. Vomerine tooth groups well formed, teeth not deciduous.
      † Head contained 3½ to 3⅘ times in length of body without caudal fin. Supraoccipital crest triangular-oval, less than twice as long as broad in the middle.

Ariodes tonggol Blkr.

b. Vomerine tooth groups rudimentary, with deciduous teeth.
† Head fitting 3 to nearly 3 times in length of body without caudal fin. Supraoccipital crest triangular, about twice as long as basal width.

Ariodes macrocephalus Blkr.

† Head contained 3⅖ to 3⅓ times in length of body without caudal fin. Supraoccipital crest triangular, slightly longer than basal width.

Aroides acutus Blkr.

II. Palatine tooth groups triangular, very elongate, diverging posteriorly.
a. Head shield glabrous or nearly glabrous. Supraoccipital crest forming an oval shield.
† Head contained 3½ to 3⅔ times in length of body without caudal fin. P. 1/12 or 1/13.

83 *Ariodes leiocephalus* Blkr.

b. Head shield grainy. Supraoccipital crest triangular.
† Head contained 3⅖ to 3¾ times in length of body without caudal fin.
§ Supraoccipital crest convex laterally, much longer than broad. P. 1/12.

Aroides polystaphylodon Blkr.

§ Supraoccipital crest not convex laterally, broader than long. P. 1/11.

Aroides goniaspis Blkr.

Ariodes tonggol Blkr.
Atl. Silur. tab. IX.
Rough headed Ariodes

An Ariodes with an elongate body, anterior part about as broad as deep, posterior part compressed, body depth contained about 5 times in its length without, and 6 to 6¼ times in its length with caudal fin. Head depressed, not convex, acute, contained 3½ to 3⅘ times in length of body without, and 4⅓ to 4⅘ times in length of body with caudal fin; depth of head contained 1⅖ to nearly 2 times in its length, width 1⅖ to 1⅗ times; rostro-dorsal profile sloping, more or less straight; eyes free slightly posterior, placed halfway length of head or for the most part placed in the anterior half of the head, diameter contained 3¾ to 6 times in length of head, distance between the eyes 2½ to 3 times their diameter. Head shield with a median longitudinal groove reaching or nearly reaching the base of the supraoccipital crest, totally or nearly totally dividing the head shield. The shield is grainy upwards from the eyes, a rather large number of rather small grains is arranged ray-like; supraoccipital crest triangular, oval, convex at the sides, slightly longer than the base, less than twice as long as broad in the middle, rough-grainy in the form of rays, generally with many granules, its tip obtuse and rounded in the middle, sometimes emarginate, reaching the short and grainy second interspinal bone; snout acute and slightly convex, in younger fishes less than twice as long as the eye, in older fishes more than twice as long as the eye, hardly protruding beyond the mouth opening, rostral profile obtusely rounded. Jaw teeth multiple-rowed, placed in a nearly crescent-shaped band, the premaxillary band much broader and not or hardly shorter than the lower jaw band; vomerine teeth grain-like or conical-grain-like, on both sides placed in the corner of the vomer anteriorly in the palate in a medium-sized oval group, smaller than the eye; palatine teeth conical-grain-like, placed on both sides in a triangular-

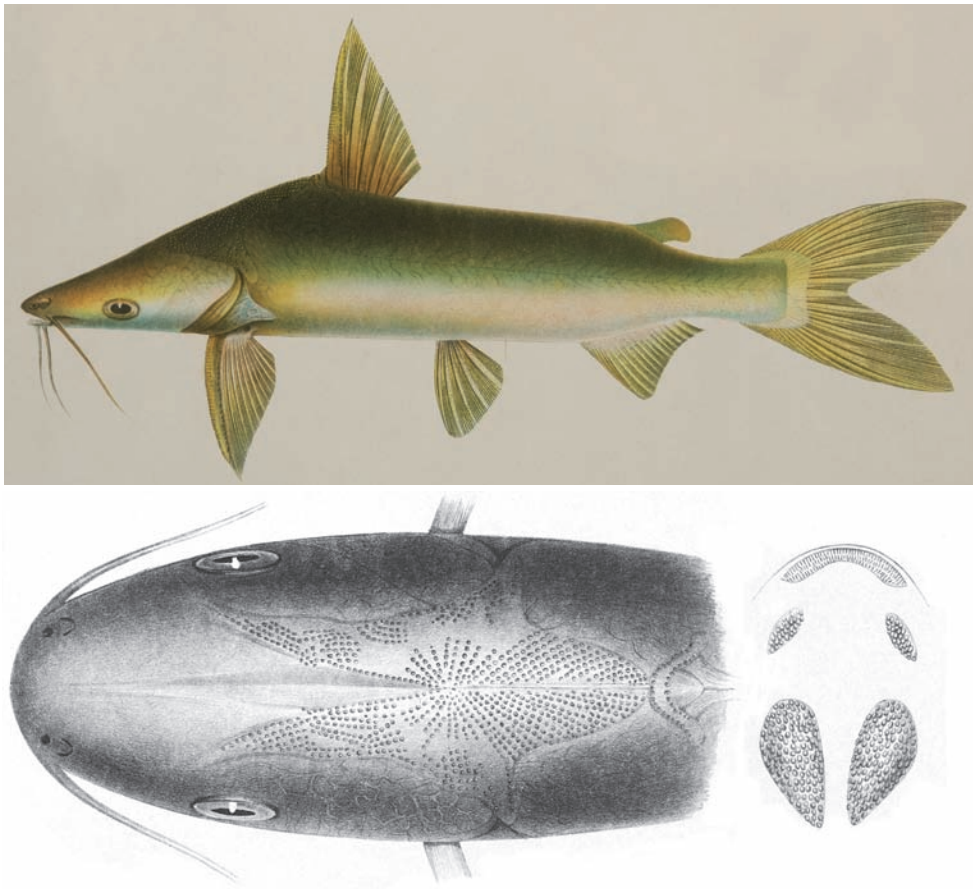

Fig. 4. *Ariodes tonggol* Blkr. [Head and dentition 75% of original size.]

oval group, far from the vomerine group, the nearly straight, placed in the middle of the palate group, which is larger than the eye, is posteriorly converging towards the middle line; mouth inferior, its width contained 2¾ to 3 times in length of head; pores conspicuous, heaped together, placed in a row between the corner of the mouth and the eye; maxillary barbels bony basally, reaching the humeral bone or the gill covers. The outer lower jaw barbels, longer than inner ones, nearly reaching or slightly overreaching the gill opening; anterior and posterior nostrils nearly touching each other, much nearer to the tip of the snout than to the eye; anterior ones are round, the posterior ones are oblong and equipped with an elevated small valve that largely surrounds the opening; gill cover glabrous and veined: humeral bone medium-sized, acute, smooth or feebly rough; axillary slime pore conspicuous; 84 Lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin. The dorso-lateral pores are inconspicuous and placed in about 20 simple transverse parallel lines. Rayed dorsal fin acute, slightly higher than body depth, more than twice as high as the length of the fin base, the spine medium-sized, contained 1⅓ to 1⅖ times in length of head, its anterior side grainy basally, the upper part feebly serrated, posterior side armed with well visible teeth, the soft appendage not or hardly longer than the first ray; adipose dorsal fin placed at a distance of five times to more than six times its length from the rayed dorsal. It is shorter than the rayed dorsal, about as high as long and obliquely convex; pectoral fins acute, contained 1⅖ to 1⅓ times in length of head, the spine thicker and hardly or not longer than the dorsal spine and armed in

the same way; ventral fins acute or obtuse, rounded, twice or more than twice as short as the head; anal fin acute, emarginate, longer than high, less than three times as long as the adipose fin; caudal fin has a deep incision and acute lobes, contained about 5 times in the length of the total body. Colour of upper part of the body bluish-olive or olive, lower part pearly or silvery; adipose fin slightly olive-coloured without large, black spot, other fins whitish-pinkish or yellowish, more or less with dark speckles, iris yellow.

B. 6. D. 1/7. P. 1/11. V. 1/5. A. 6/13 or 7/13. C. 1/13/1 and shorter ones alongside.

Syn. *Arius tonggol* Blkr, Verh. Bat. Gen. XXI, I Silur. bat. consp. p. 48.
Arius crossocheilos Blkr, ibid. p. 46.
Ikan Manjong utik Mal. Batav.

Hab. Java (Batavia), in sea.
Sumatra (Padang, Trussan), in sea.
Bintang (Rio), in sea.
Banka, in sea.

Length of the 6 specimens 190‴ to 375‴.

Remark. Above I have already briefly indicated by which characters Ariodes tonggol distinguishes itself from its related species Ariodes macrocephalus and Arius acutus. Its vomerine teeth are grainlike and rather numerous, so that they form an elongate-oval group, which I observe constantly in old as well as in young individuals. Externally Ariodes tonggol agrees most with Ariodes acutus, but a glance on the supraoccipital crests of both species suffices for not confusing them. Indeed this crest in Ariodes acutus is much more slender, it completely lacks the ovoid shape and is much more sharply keeled than the species in question, which in regard to these characters forms a transition to Arius leiocephalus, in which the supraoccipital crest has a more perfectly ovoid shield, but which species by its smooth shield and caudad diverging 85 groups of palatal teeth differs more from Ariodes tonggol than Ariodes acutus.

In Batavia Ariodes tonggol is less often brought to the market than Ariodes acutus and even than Ariodes leiocephalus. The local people mention all three species and also some others with the same name. Its meat is little tastful and is only eaten by the less well to do class of the local people, just like that of all species of Ariodonts that are caught in the sea.

Ariodes macrocephalus Blkr.
Atl. Silur. tab. X.
Large-headed Ariodes

An Aroides with an elongate body, anterior part about as broad as deep, posterior part compressed, body depth contained nearly 5 to 4½ times in its length without, and 6 to 5⅗ times in its length with caudal fin. Head depressed, slightly convex, acute, contained 3 to nearly 3 times in length of body without, and 3¾ to 3½ times in length of body with caudal fin; depth of head contained about 2 times in its length, width 1⅗ to 1⅔ times; rostro-dorsal profile slightly convex at the snout, forehead and crown, slightly concave at nape; eyes, free, superior, nearly totally in the anterior half of the head, eye diameter contained 6½ to 7 times in length of head, distance between the eyes 3 tot 3⅓ times their diameter. Head shield with a median longitudinal groove reaching the base of the supraoccipital crest, dividing the entire head shield. The shield is grainy upwards from the eyes, with medium-sized, sparse grains, arranged shattered or ray-like; supraoccipital crest triangular, about twice as long as basal width, grainy with sparse grains, its top truncate and emarginate, reaching the short and grainy second interspinal bone; snout convex, more than twice as long as the eye, protruding slightly beyond the mouth opening, rostral profile slightly obtusely rounded. Jaw teeth multiple-rowed, acute and small, the upper jaw teeth

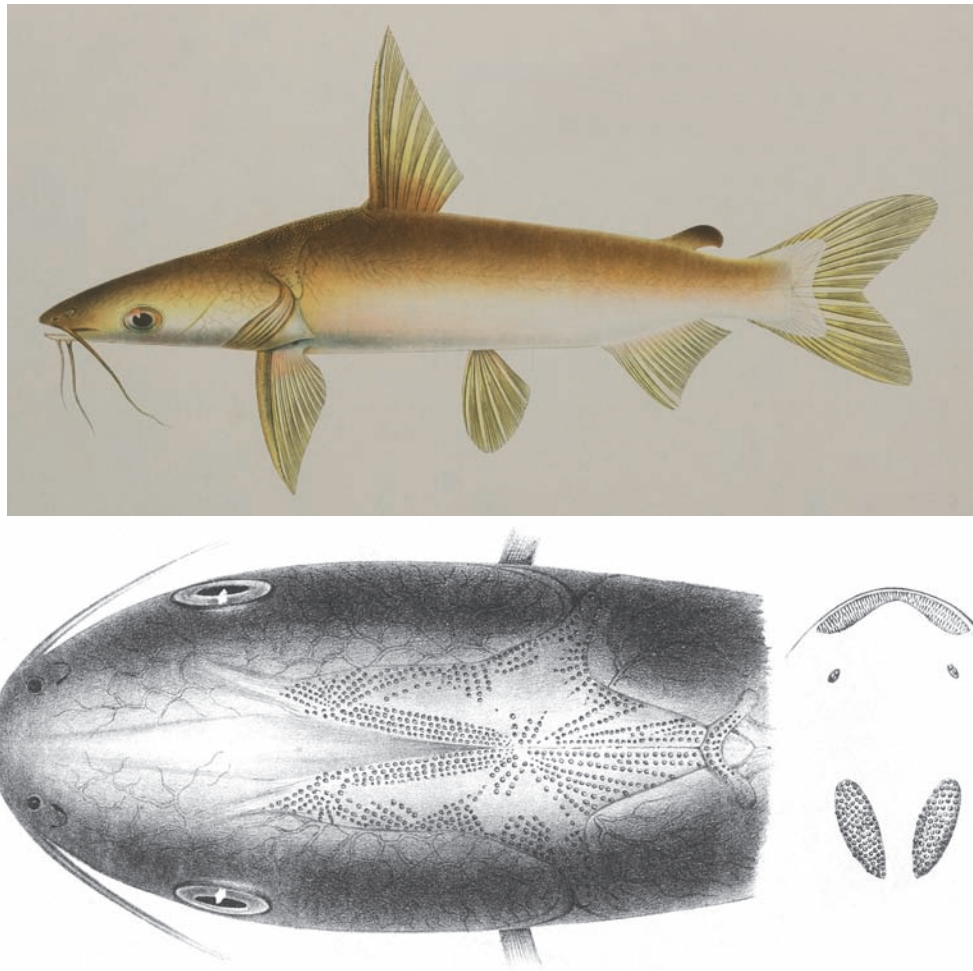

Fig. 5. *Ariodes macrocephalus* Blkr. [Head and dentition 75% of original size.]

placed in a slightly curved band, the lower jaw teeth in a crescent-shaped band, longer but thinner than the premaxillary band; vomerine teeth in older fishes deciduous, placed on both sides in a small group, in the corner of the vomer, anteriorly in the palate; palatine teeth grain-like or conical-grain-like, placed on both sides of the middle of the palate; in an oval or oblong-oval group, far from the vomerine group, not or hardly larger than the eye, nearly straight, posteriorly converging towards the middle line, mouth inferior, its width contained about 3 times in length of head; pores conspicuous, heaped together, placed in a row between the corner of the mouth and the eye; maxillary barbels reaching or nearly reaching the gill covers. Outer lower jaw barbels, slightly longer than inner ones, nearly reaching the gill opening; anterior and posterior nostrils nearly touching each other, much nearer to the tip of the snout than to the eye; anterior ones are round, the posterior ones are oblong and can be closed by a small valve, which surrounds a large part the opening and is elevated anteriorly; gill cover glabrous and veined: humeral bone medium-sized, acute, smooth or feebly rough; axillary slime pore conspicuous; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin; dorso-lateral pores inconspicuous and placed in about 20 simple transverse parallel lines. Rayed

dorsal fin acute, not or slightly lower than the body, more than twice as high as the length of the fin base, the spine thin, contained 1½ to 1⅗ times in length of head, its anterior side grainy, its posterior side feebly serrated with small teeth, the soft appendage hardly or not longer than the first ray; adipose fin placed at a distance of more than six times its length from the rayed dorsal. It is much shorter than the rayed dorsal, hardly or not longer than high and obliquely convex; pectoral fins acute, contained 1½ to 1⅗ times in length of head, the spine 86 slightly shorter and thicker than the dorsal spine, its anterior side grainy, its posterior side serrated with very conspicuous slightly small teeth; ventral fins acute or acutely rounded, more than twice as short as the head; anal fin acute, emarginate, slightly longer than high, about three times as long as the adipose fin; caudal fin with a deep incision and slightly acute lobes, contained about 5½ times in the length of the total body. Colour of upper part of the body slightly olive-coloured, lower part whitish or silvery; adipose fin with a dark spot in the upper part, other fins yellowish, iris yellow of yellowish-rose-coloured.

B. 6. D. 1/7. P. 1/11. V. 1/5. A. 6/14 or 7/14. C. 1/13/ and shorter ones alongside.

Syn. *Arius macrocephalus* Blkr, Verh. Bat. Gen. XXI. I Silur. bat. consp. p. 40.
Ikan Manjong utik. Mal. Bat.

Hab. Java (Batavia), in sea.

Length of the 2 specimens 370''' and 401'''.

Remark. Even at first glance the species in question distinguishes itself from the 6 species of Ariodes that I know from nature by its extremely large head, which fits hardly 3 times or not even 3 times in the length of the body without the caudal fin, and moreover, it is distinguished from the other species by a weakly convex profile of snout and forehead. It moreover possesses various other characters by which it differs from the other species. It is most closely related to Ariodes acutus, especially because of the rudimentary condition and the dropping out of the groups of vomerine teeth, but it differs from this species even in the dentition, as the premaxillary teeth are placed in a broad and more curved band, the supraoccipital crest is remarkably more slender and the grains of the head shield and supraoccipital crest are smaller.

Arius macrocephalus is very rare. I possess both specimens described by me already for 12 years and since then I have observed no others, neither in Batavia nor elsewhere in the Indian archipelago.

Ariodes acutus Blkr.
Atl. Silur tab. XI.
Acute-headed Ariodes

An Ariodes with an elongate body, anterior part about as broad as deep, posterior part compressed, body depth contained 4¾ to 5 times in its length without, and 5¾ to 6⅕ times in its length with caudal fin. Head 87 depressed, not convex, acute, contained 3⅖ to 3⅓ times in length of body without, and 4⅕ to 4 times in length of body with caudal fin; depth of head contained 1⅔ to nearly 4 times in its length, width 1⅔ to 1⅗ times; rostro-dorsal profile sloping and more or less straight; eyes free, nearly superior, placed halfway in length of head or for the most part in the anterior half of the head, eye diameter contained 4⅓ to 7 times in length of head, distance between the eyes 2 to 3⅓ times their diameter. Head shield with a median longitudinal groove reaching the base of the supraoccipital crest, dividing the entire head shield. The head shield is grainy upwards from the eyes or nearly upwards from the eyes, the quite large, rather sparse grains are arranged ray-like; supraoccipital crest triangular, slightly longer than the base, twice or more than twice as long as broad in the middle, longitudinally rough-grainy with sparse grains, its top obtuse and truncated or emarginate, reaching the short and grainy second interspinal bone; snout acute and slightly convex, in younger fishes less than twice, in older fishes more than

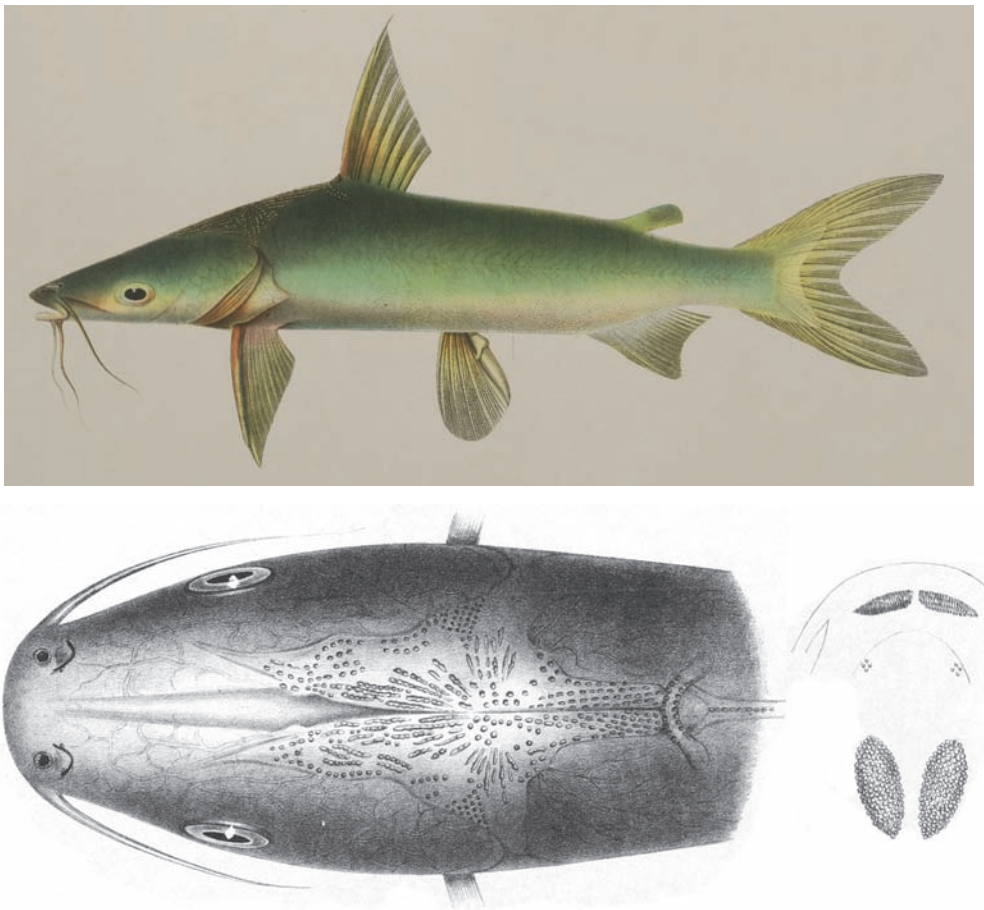

Fig. 6. *Ariodes acutus* Blkr. [In Atlas as *Ariodes argyropleuron* Blkr. Head and dentition 75% of original size.]

twice as long as the eye, hardly protruding beyond the mouth opening; rostral profile obtusely rounded. Jaw teeth multiple-rowed, small and acute, the upper and lower jaw teeth placed in a feebly curved or crescent-shaped band, the premaxillary band is much broader than the lower jaw band and not or hardly shorter than this; vomerine teeth placed at both sides in a very small, oblong or thin group, placed in the corner of the vomer in anterior part of the palate, in older fishes often deciduous; palatine teeth placed on both sides in the middel of the palate in an oval or oblong-oval group, far from the vomerine group, this group is not or hardly larger than the eye and more or less straight, posteriorly converging to the middle line mouth inferior, its width contained 2⅔ to 3 times in length of head; pores conspicuous, heaped together, placed in a row between the corner of the mouth and the eye; maxillary barbels reaching the humeral bone or the gill covers. Outer lower jaw barbels, longer than inner ones, not reaching or slightly overreaching the gill opening; anterior and posterior nostrils nearly touching each other, much nearer to the tip of the snout than to the corner of the mouth; anterior ones are round, the posterior ones have a small valve, which surrounds the opening anteriorly and is elevated; gill cover glabrous and veined: humeral bone medium-sized, acute, smooth or feebly rough; axillary slime pore conspicuous; lateral line branched, its anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin; dorso-lateral pores are inconspicuous and placed in more than 15 simple transverse parallel lines. Rayed dorsal fin acute, slightly higher than the body, more than twice as high as the length

of the fin base, the spine thin, contained 1⅓ to nearly 1½ times in length of head, its anterior side grainy, posterior side feebly serrated with small teeth, the soft appendage is hardly longer than the first ray; adipose fin placed at a distance of less than five times its length from the rayed dorsal. It is shorter than the rayed dorsal, about as high as long or less as twice as long as high and obliquely convex; pectoral fins acute, contained 1⅓ to 1⅔ times in length of head, the spine thicker but slightly shorter than the dorsal spine, upper part of anterior side serrated, posterior side armed with conspicuous teeth; ventral fins acute or obtuse, rounded, twice or less than twice as short as the head; anal fin acute, emarginate, longer than high, less than three times as long as the adipose fin; caudal fin has a deep incision and acute lobes, and is contained about 5 times in length of body. Colour of upper part of the body bluish-green, lower part pearly or silvery; adipose fin slightly olive-coloured with large bluish-black spot, other fins yellowish, more or less with dark speckles, iris yellow.

B. 6. D. 1/7. P. 1/11. V. 1/5. A. 6/13 or 6/14 or 7/13 or 7/14. C. 1/13/1. and shorter ones alongside.

Syn. *Arius acutus* Blkr, Verh. Bat. Gen. XXI, I Silur. bat. consp. p. 41.
88 *Arius Hamiltonis* Blkr, ibid p. 47.
Bagrus (Ariodes) arenarius Müll. Trosch. Hor. ichth. III 1849 p. 9?
Ikan Manjong Mal. Batav.

Hab. Java (Batavia), in sea and river mouths.
Sumatra (Moarakompeh), in rivers.

Length of the 12 specimens 180‴ to 460‴.

Remark. The description of Ariodes arenarius Müll. Trosch. almost completely agrees with my description, but is not detailed enough for me to decide whether it is indeed the same species as Ariodes acutus.

It is more certain that Ariodes acutus specifically differs from Ariodes macrocephalus and Arius tonggol, both species from my collection which are most related to it. It has the loosely attached vomerine teeth of Ariodes macrocephalus and the habitus of the head of Ariodes tonggol, with which species it could easily be confused after only a superficial investigation when no attention would be paid to the vomerine teeth and the shape of the supraoccipital crest.

In Batavia Ariodes acutus is not rare and a few times it is even brought to the market in rather numerous specimens. It is usually only caught in the with riverwater bestowed coastal waters of the bay or in or close to river mouths.

Ariodes leiocephalus Blkr.
Atl. Silur. tab. XII fig. 2.
Smooth-headed Ariodes

An Ariodes with an elongate body, anterior part about as broad as deep, posterior part compressed, body depth contained 5¼ to 4⅔ times in its length without, and 6⅓ to 5⅔ times in its length with caudal fin. Head depressed, not convex, acute, contained 3½ to 3⅔ times in length of body without, and 4½ to 4¾ times in length of body with caudal fin; depth of head contained 1⅔ to 1⅝ times in its length, width 1⅔ to 1⅓ times; rostro-dorsal profile on the forehead and the anterior part of the crown sloping more or less straight; eyes free, nearly posterior, for the most part in the anterior half of the head, eye diameter contained 4½ to 6½ times in length of head, distance between the eyes 2½ to 3½ times their diameter. Head shield with a median longitudinal groove nearly reaching the base of the supraoccipital crest, dividing nearly the entire shield, nearly totally smooth, near the supraoccipital crest and in very old fishes also near the sides feebly rough-grainy, with very sparse grains; supraoccipital crest forms an oval shield, very compressed at the base, much longer but less than twice as long as broad, in younger fishes totally glabrous, in adults grainy- slightly rough, its rounded top, feebly emarginate in the middle, reaching the very short and generally rough second 89 interspinal bone; snout acute and slightly con-

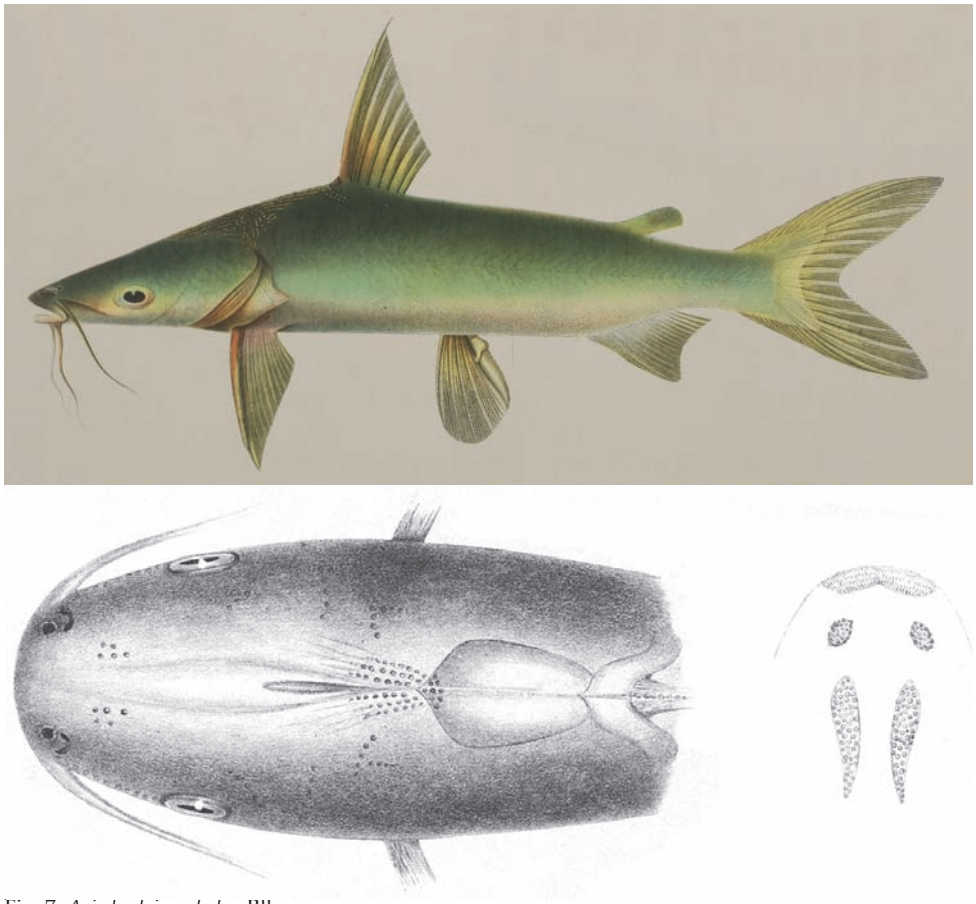

Fig. 7. *Ariodes leiocephalus* Blkr.

vex, in younger fishes less than twice, in older fishes more than twice as long as the eye, hardly protruding beyond the mouth opening; rostral profile slightly obtusely rounded. Jaw teeth multiple-rowed, acute and small, the upper jaw teeth placed in a feebly curved band, about four times as long as broad, with acute angles, the lower jaw teeth placed in a nearly crescent-shaped band, slightly longer but thinner than the premaxillary band; vomerine teeth grain-like, placed on both sides in the corner of the vomer anteriorly in the palate; in a medium-sized oval group, much smaller than the eye, palatine teeth grain-like, placed far from the vomerine group and extending to the posterior part of the palate, on both sides in a triangular, elongate group, twice as long or more than twice as long as the eye, carinate or elevated, posteriorly diverging from the middle line; mouth subinferior, its width contained 2⅔ to 2½ times in length of head; pores conspicuous, heaped together, placed in a row between the corner of the mouth and the eye; maxillary barbels bony basally, reaching the humeral bone or gill cover. Outer lower jaw barbels, longer than inner ones, not reaching or slightly overreaching the gill opening; anterior and posterior nostrils nearly touching each other, much nearer to the tip of the snout than to the eye; anterior ones round, the posterior ones are oblong and can be closed with a small elevated valve, which surrounds the opening anteriorly; gill cover glabrous and veined; humeral bone medium-sized, acute and smooth; axillary slime pore conspicuous; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin; dorso-lateral pores inconspicuous and placed in about 16 simple transverse parallel lines. Rayed dorsal fin acute, not or slightly higher than the

body, twice or more than twice as high as the length of the fin base, the spine thick, contained 1½ to 1⅓ times in length of head, its anterior side grainy basally, feebly serrated near the top, posterior side totally glabrous or only near the top equipped with some small teeth, the soft appendage not or hardly longer than the first ray; adipose dorsal fin placed at a distance of more than six times its length from the rayed dorsal. It is about twice as short as the rayed dorsal, about as high as long and obliquely convex; pectoral fins acute, contained 1¼ to 1⅓ times in length of head, the spine hardly or not shorter than the dorsal spine, its anterior side grainy near the base, feebly serrated near the top, posterior side in younger fishes very conspicuously serrated, in older fishes not serrated or feebly serrated near the top only; ventral fins acute, twice or more than twice as short as the head; anal fin slightly acute, emarginate, longer than high, more than twice as long as the adipose fin; caudal fin has a deep incision and acute lobes, the upper one longer than lower one and contained 4½ to 4⅓ times in the length of the total body. Colour of upper part of the body bluish-green or olive-coloured, lower part pearly or silvery; adipose fin slightly olive-coloured with darkish margins, other fins yellowish, more or less with dark speckles, iris yellowish.

B. 6. D. 1/7. P. 1/12 or 1/13. V. 1/5. A. 5/10 to 5/12 or 4/13. C. 1/13/1 and shorter ones alongside.

Syn. *Arius leiotetocephalus* Blkr, Verh. Bat. Gen. XXI, I Silur. bat. consp. p. 48.
Ikan Manjong tonggol Mal. Bat.

Hab. Java (Batavia, Surabaja), in sea and in brackish water.
Singapore, in sea.
Celebes (Macassar), in sea.

Length of the 12 specimens 220′″ to 470′″

Remark. Ariodes leiocephalus is at the head of a group of species of the genus 90
Ariodes that is characterised by a peculiar arrangement of the vomerine teeth in two elongated groups that diverge caudally. It has this character in common with Ariodes polystaphylodon and Ariodes goniaspis and possibly with other species of which I am not familiar regarding this character. However, it is very easily recognisable at first glance by its smooth or almost smooth head shield and supraoccipital crest, as well as by its more or less ovoid keeled sharp shape of this crest.

In Batavia Ariodes leiocephalus is not extremely rare. On various occasions I have seen individuals of this species being brought to the market, but never in large quantities, and usually with a length of 1 to 2 foot. As a source of food it is sought after as little as the related species.

Ariodes polystaphylodon Blkr.
Atl. Silur. tab. XII fig. 3.
Many-toothed Ariodes

An Aroides with an elongate body, anterior part about as broad as deep, posterior part compressed, body depth contained slightly more than 5 times in its length without, and 6½ times in its length with caudal fin. Head depressed, not convex, acute, contained about 3⅗ times in length of body without, and about 4⅓ times in length of body with caudal fin; depth of head contained about 1⅗ times in its length, width about 1⅖ times; rostro-dorsal profile slightly concave on the forehead and the anterior part of the crown, convex at the posterior part of the crown; eyes free, nearly posterior, for the most part in the anterior part of the head, eye diameter contained about 4½ times in length of head, distance between the eyes about 2 times their diameter. Head shield with a median longitudinal groove nearly reaching the base of the supraoccipital crest, dividing nearly the entire head shield, rough-grainy almost upwards from the eyes. The shield has medium-sized grains on the side and near the median groove, rather densely together; supraoccipital crest forms a triangular-oval shield, convex at the sides, in the middle not or hardly thinner than at the base, much longer than broad, with grains

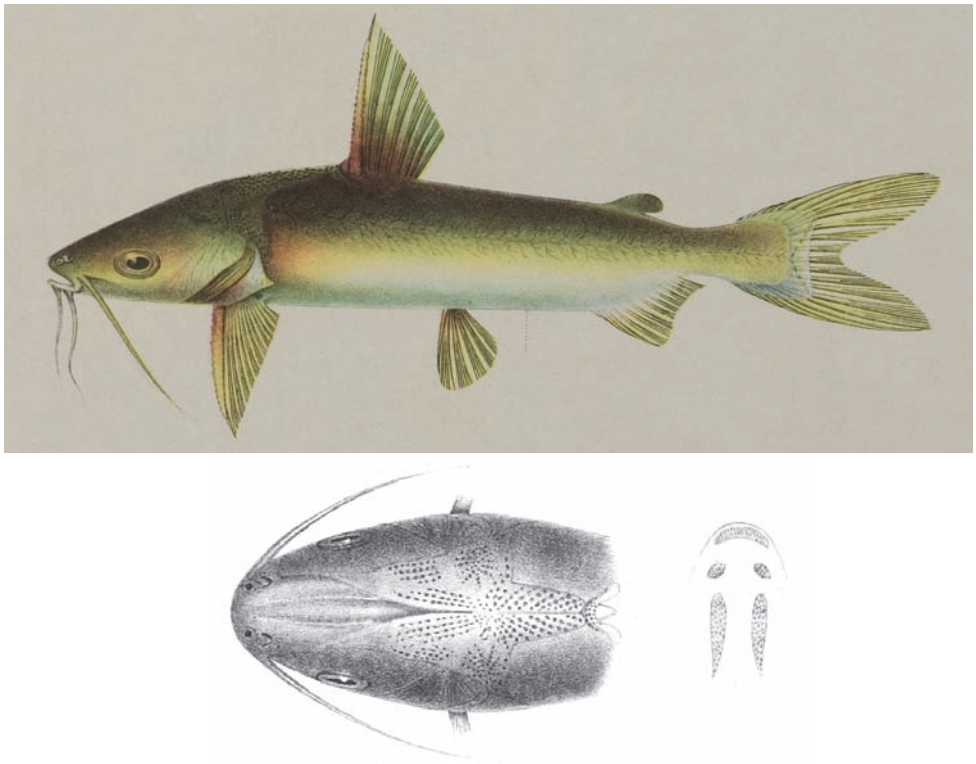

Fig. 8. *Ariodes polystaphylodon* Blkr.

arranged in the form of rays at the base, its top tapering, obtuse, emarginate, reaching the short, rough second interspinal bone; snout acute, convex, less than twice as long at the eye, hardly protruding beyond the mouth opening, rostral profile slightly obtusely rounded. Jaw teeth multiple-rowed, small and acute, the upper jaw teeth placed in a feebly curved band, about four times as long as broad, with acute angles, the lower jaw teeth placed in a nearly crescent-shaped band slightly longer, but thinner than the premaxillary band; vomerine teeth conical, obtuse, placed on both sides in the corner of the vomer anteriorly in the palate; in an oblique, oval, medium-sized group, slightly smaller than the eye, palatine teeth conical, obtuse, placed on both sides of the palate in a triangular, elongate group, rounded at the base, much longer but less than twice as long as the eye, carinate or elevated along the middle line, separate from the vomerine group and extending to posterior part of the palate, posteriorly diverging from the middle line; mouth subinferior, its width contained nearly 3 times in length of head; pores conspicuous, placed in a row between the corner of the mouth and the eye; maxillary barbels reaching the humeral bone. Outer lower jaw barbels, 91 longer than inner ones, reaching beyond the gill opening; anterior and posterior nostrils nearly touching each other, much nearer to the tip of the snout than to the eye; anterior ones round, the posterior ones are oblong and can be closed with a small elevated valve; gill cover slightly rough-veined in the form of rays: humeral bone medium-sized, acute, slightly rough; axillary slime pore conspicuous; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin. The dorso-lateral pores are inconspicuous and placed in about 16 simple transverse parallel lines; dorsal fin acute, slightly higher than the body, about twice as high as length of the fin base, the spine medium-sized, contained about 1⅗ times in length of head, its anterior side grainy basally, feebly serrated near the top, posterior side covered with small, inconspicuous teeth, the soft appendage hardly or not longer

than the first ray; adipose fin placed at a distance of more than four times its length from the rayed dorsal. It is much shorter than the rayed dorsal, not or slightly longer than high and obliquely convex; pectoral fins acute, contained about 1⅖ times in length of head, the spine not or hardly longer and thicker than the dorsal spine and armed in the same way; ventral fins acute or slightly acute, more than twice as short as the head; anal fin slightly acute, emarginate, longer than high, twice or more than twice as long as the adipose fin; caudal fin has a deep incision and acute lobes, contained 5¼ to 5½ times in the length of the total body. Colour of the upper part of the body olive, lower part pearly or silvery; fins yellowish, more or less with dark speckles, iris yellowish.

B. 6. D. 1/7. P. 1/12. V. 1/5. A. 4/11 or 4/12 or 5/11 or 5/12. C. 1/13/1 and shorter ones alongside.

Syn. *Arius polystaphylodon* Blkr, Verh. Bat. Gen. XXI, I, Silur. bat. consp. p. 40.
Ikan Manjong pidada Mal. Batav.

Hab. Java (Batavia), in sea.
Sumatra (Priamau), in sea.

Length of the 2 specimens 150′″ and 160′″.

Remark. Of this Ariodes I possess only the two described small specimens. Presumably, however, the species grows much larger. It cannot be confused with the species described above, partly because of its long, posteriorly diverging groups of palatal teeth, partly because its grained head shield and triangular supraoccipital process which, although the side rims are somewhat convex, is much broader basally than in the middle. It seems to be very rare, as I have not seen any other specimens of it than the described ones from Batavia and Priaman.

Ariodes goniaspis Blkr.
Atl. Silur. tab. XII fig. 1.
Angular-headed Ariodes

An Aroides with an elongate body, anterior part about as broad as deep, posterior part compressed, body depth contained about 5 times in its length without, and about 6 times in its length with caudal fin. Head depressed, at the crown convex, acute, contained 3⅖ times to 3¾ times in length of body without, and 4⅓ to 4⅔ times 92 in length of body with caudal fin; depth of head contained 1⅗ to 1⅔ times in its length, width 1¼ to 1⅕ times; rostro-dorsal profile of the forehead and anterior part of the crown sloping, more or less straight, posterior part of the crown convex, slightly humped; eyes placed above the mouth corner, halfway length of head. Head shield with a median longitudinal groove nearly reaching the base of the supraoccipital crest, dividing nearly the entire head shield. The shield is grainy nearly upwards from the eyes, medium-sized grains are placed on the side of the shield and near the median groove, rather densely together; supraoccipital crest triangular, not convex at the sides, broader than long, with grains arranged in rays, its top obtuse and emarginate, reaching the short and rough second interspinal bone; snout acute and convex, less than twice as long as the eye, hardly protruding beyond the mouth opening, rostral profile obtusely rounded. Jaw teeth multiple-rowed, small and acute, the upper jaw teeth placed in a slightly curved band, about four times as long as broad, with acute angles, the lower jaw teeth placed in a nearly crescent-shaped band slightly longer, but thinner than the premaxillary band; vomerine teeth conical-grain-like, very small, placed on both sides in the corner of the vomer, anteriorly in the palate; in an oblique, oval, medium-sized group, much smaller than the eye, palatine teeth conical-grain-like, obtuse, placed on both sides of the palate in a triangular, elongate group, rounded at the base, much longer than, but less than twice as long as the eye, not carinate or elevated along the middle line, separate from the vomerine group and extending to the posterior part of the palate, posteriorly diverging from the middle line; mouth subinferior, its width contained 2⅓ to 1½ times in length of head; pores conspicuous, placed in a row between the corner of the mouth and the eye; maxillary barbels nearly reaching the tip of the pectoral fin. Outer

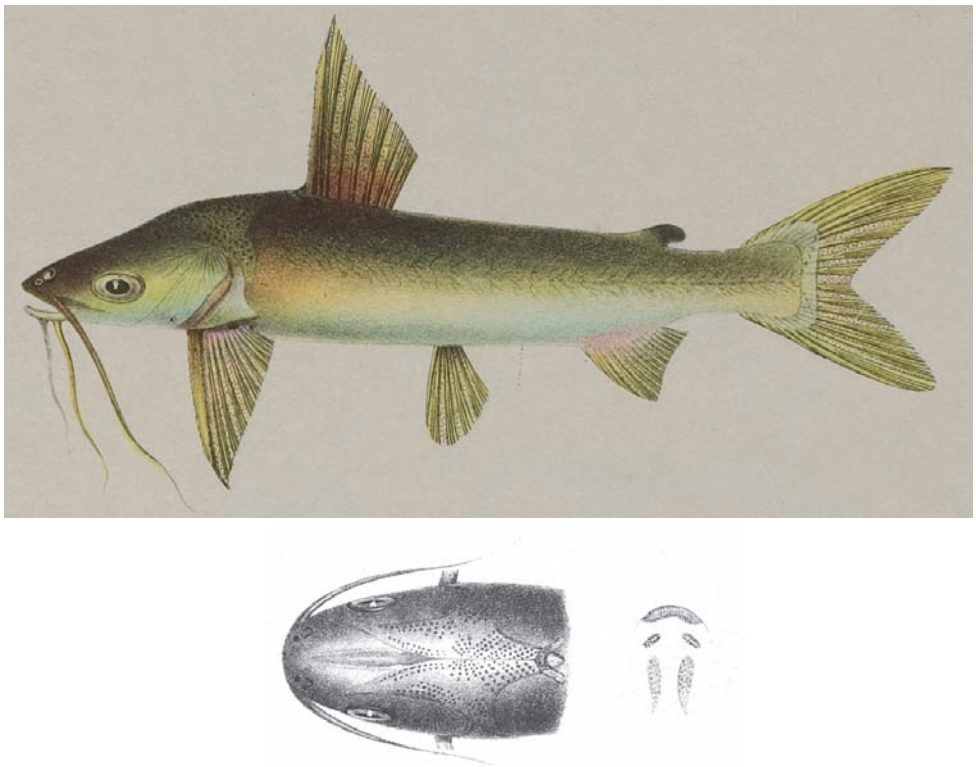

Fig. 9. *Ariodes goniaspis* Blkr.

lower jaw barbels longer than inner ones, reaching beyond the base of the pectoral fin; anterior and posterior nostrils nearly touching each other, nearer to the tip of the snout than to the eye; anterior ones round, the posterior ones are oblong and can be closed with an elevated small valve; gill cover slightly rough-veined, in the form of rays; humeral bone medium-sized, acute and very rough; axillary slime pore conspicuous; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin. Rayed dorsal fin acute, slightly higher than the body, about twice as high as the length of the fin base, the spine medium-sized, contained about 1⅓ to 1⅔ times in length of head, its anterior side grainy basally, the upper part feebly serrated, posterior side feebly covered with teeth, the soft appendage slightly or not longer than the first ray; adipose fin placed at a distance of about five times its length from the rayed dorsal. It is much shorter than this, hardly or not longer than high, obliquely convex; pectoral fins acute, contained 1½ to 1⅕ times in length of head, the spine hardly or not shorter than the dorsal spine, thinner than this and armed in the same way; ventral fins acute, about twice as short as the head; anal fin acute, emarginate, longer than high, about twice as long as the adipose fin; caudal fin with a deep incision and acute lobes, the upper lobe longer than the lower lobe, contained about 5 times in the length of the total body. Colour of the upper part of the body bluish-green or olive, lower part pearly or silvery; adipose fin slightly olive-coloured, fins yellowish, more or less with dark speckles, iris rosy-yellowish.

B. 6. D. 1/7. P. 1/11. V. 1/5. A. 5/11 or 5/12. C. 1/13/1 and shorter ones alongside.

Syn. *Arius goniaspis* Blkr, Act. Soc. Scient. Ind. Neerl. III Zesde Bijdr. Vischfaun. van Sumatra p. 44.

Hab. Sumatra (Prianian), in sea.

Length of the 2 specimens 100′″ and 113′″.

Remark. Ariodes goniaspes is very closely related to Arius [93] polystaphylodon but surely to be regarded as a valid species. It is primarily distinguishable from the last mentioned species by the shape of the supraoccipital crest, which is broader than long and does not have convex lateral edges. Apart from that, it has a similar dentition, which in essence is corresponding with that of Ariodes leiocephalus. I believe both my specimens are of a juvenile age. An investigation of several specimens of this species and the previous one will have to show whether the occurrence of one ray less in the pectoral fin than in Ariodes polystaphylodon justifies the attributing of a specific rank.

Netuma Blkr.

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth multiple-rowed, acute and small. Vomerine-palatine teeth acute, placed on both sides in a triangular, tripartite group, anteriorly in the palate, the middle line of the palate is edentate. 6 Barbels, fleshy, rigid at the base. Branchiostegal membrane with 5 or 6 rays. Interbranchial membrane slightly emarginate. Nostrils not tubular, posterior ones with valves.

Remark. In the large Histoire naturelle des Poissons, under the genus Bagrus some fish species are described, which are said to have a close relationship with each other and also correspond with each other with regard to the nature of the dentition as the vomerine teeth are placed in two triangular groups on each side anterior to the palate and each group being divided into three distinctly separated groups. These species are Bagrus bilineatus CV., Bagrus laevigatus CV., Bagrus netuma CV., Bagrus proöps CV., Bagrus passany CV., Bagrus couma CV. and Arius nasutus CV. These related species, placed in two different genera, offer one more example of the necessity of the revisionof the division of the Ariodonts of Mr Valenciennes.

Indeed the aforenamed species form a proper series, which because of its remarkable dention can be elevated to a proper genus, [94] and if one would believe that dentition alone would not suffice to separate those species generically from Arius, than one would have within this genus a character to define a group under which one could place the too little known species mentioned above.

It is difficult to differentiate the species of Netuma according to the existing descriptions. In these descriptions apparently too much value is given to differences which are dependent on the age of the specimens, especially regarding the species of the Indian ocean and I would not be surprised if Bagrus bilineatus CV., Bagrus netuma CV., Bagrus laevigatus CV. and Arius nasutus CV. turned out to be different names for one and the same species. The American species like Bagrus proöps CV., Bagrus passany CV. and Bagrus couma CV. can be regarded with more certainty as true species. Maybe Bagrus albicans CV. from Cayenne also belongs to the same genus [Netuma].

Kuhl and Van Hasselt proposed for the species that they knew of this genus the generic name Catastoma. However, as this name was given already in 1818 by Lesueur to a genus of Cyprinoïds and in 1830 by Wagler to a genus of reptiles, the name cannot be maintained, reason why I have derived the generic name from one of the species, Bagrus netuma CV. From a manuscript list of species sent to the Netherlands by van Hasselt, I perceive that this species is present under the name Sarcogenys rostratus but I am not able to say by whom this generic name is given.

The only species in my collection is distinguishable from the American species as follows.

I. Eyes much nearer to the edge of the preopercle than to the tip of the snout. Supraoccipital crest longer than broad. In older fishes mouth inferior. B. 5.

Netuma nasuta Blkr.

95 *Netuma nasuta* Blkr.
Atl. Silur. tab. XIII.
Long-nosed Netuma

A Netuma with an elongate body, anterior part as broad as deep or slightly deeper than broad, posterior part compressed, body depth contained 4¾ to 5⅖ times in its length without, and 6¼ to 6⅘ times in its length with caudal fin. Head slightly depressed, acute, contained 4 to 3⅖ times in length of body without, and 5¼ to 4¼ times in length of body with caudal fin; depth of head contained 1¼ to 1⅗ times

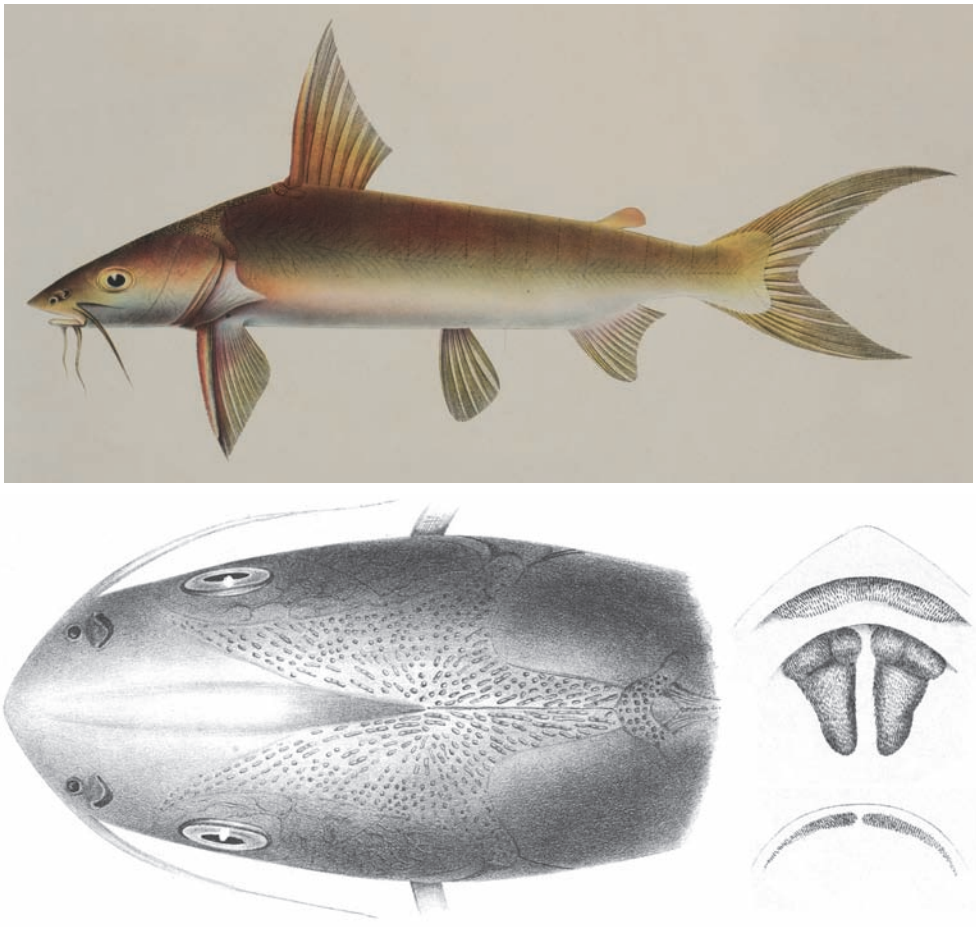

Fig. 10. *Netuma nasuta* Blkr. [Head and dentition 75% of original size.]

in its length, width 1¼ to 1⅗ times; eyes free, facing sideways, placed totally or for the most part in the anterior half of the head, diameter contained 3 to nearly 6 times in length of head, distance between the eyes 1⅓ to 2½ times their diameter. Head shield grainy, with a rather large number of grains on the sides of the shield, and a small number shattered in the middle of the shield. The longitudinal groove does not reach the base of the supraoccipital crest, it divides the shield for the most part; supraoccipital crest triangular, broad, slightly longer than the basal width, grainy, carinate along the middle line, its top truncate, reaching the short and granulated second interspinal bone; snout depressed, slightly convex. In juvenile, not so old fishes snout more than twice as long as the eye, in younger fishes hardly or not, and in not so old fishes protruding rather a long way beyond the mouth opening; rostral profile in younger fishes crescent-shaped, in older fishes acutely rounded. Jaw teeth multiple-rowed, acute and small, the upper jaw teeth placed in a crescent-shaped band, the lower jaw teeth placed in a band in form slightly reminding of a horseshoe; vomerine-palatine teeth small and acute, placed in 2 tripartite, triangular groups in the anterior part of the palate, the smaller group in front is on both sides divided in 2 little groups, the outer small group much shorter than the inner group, posterior part triangular, broad at the base, bordering on the anterior part, longer than broad, rounded at the top, which is facing backwards; mouth in younger fishes subinferior, in older fishes inferior; maxillary barbels reaching or overreaching the gill covers or the humeral bone. Outer lower jaw barbels, longer than inner ones, in younger fishes overreaching the gill opening, in older fishes nearly reaching the gill opening; anterior and posterior nostrils nearly touching each other, nearer to the tip of the snout than to the eye; anterior ones are round, the posterior ones are oblong, with a threefold small valve, much larger anteriorly than on top and below, which covers the whole or nearly the whole opening; gill cover in younger fishes slightly veined, in older fishes slightly rough in the form of rays: humeral bone acute and rough; axillary slime pore conspicuous; dorso-lateral pores small and generally not conspicuous, placed in simple parallel transverse lines; anterior part of lateral line branched and sloping downwards, posterior part straight and forked at the base of the caudal fin. Rayed dorsal fin acute, not or slightly higher than the body, more than twice as high as the length of the fin base, the spine medium-sized, contained about 1⅕ to 1½ times in length of head, anterior side granulated basally, near the top anteriorly and posteriorly serrated with small teeth; adipose dorsal fin two to three times as short as the rayed dorsal, more high than long, obliquely rounded; pectoral fins acute, contained 1 to 1⅖ times in length of head, the spine medium-sized, nearly equal to the dorsal spine, anterior side of the spine granulated near the base, near the top anteriorly and posteriorly serrated with small teeth; ventral fins acute and angular, much shorter than the pectoral fins; anal fin acute, emarginate, longer than high, more than twice to three times as long as the adipose fin; caudal fin with a deep incision and acute lobes, the upper lobe longer than the lower lobe, contained 4⅓ to nearly 4 times in the length of the total body. Colour of the upper part of the body deep brown-reddish-green, lower part grey or pearly or silvery; fins yellowish-hyaline, adipose fin with a blackish-dark spot, iris yellow.

B. 5. D. 1/7. P. 1/11 to 1/13. V. 1/5. A. 6/9 to 6/12. C. 1/13/1 and shorter ones alongside.

96 Syn. *Sarcogenys rostratus* K.v.H. Mss.
Catastoma nasutum K.v.H. Mss.
Bagrus thalassinus Rüpp. N. Wirh. Faun. Abyss. F.R.M. p. 75. tab. 20 fig. 2.
Arius nasutus CV. Poiss. XV p. 45, Blkr, Verh. Bat. Gen. XXI, 1 Silur. batav. consp. p. 31
Arius à nez CV. Poiss. XV p. 45.
Bagrus rhodonotus Blkr, Verh. Bat. Gen. XXI, I Silur. bat. consp. p. 29.
Bagrus carchariorhynchos Blkr, ibid. p. 30.
Bayad Arab.
Ikan Manjong utik, *Manjong karbo* and *Manjong tonggol* Mal. and Sundan.

Hab. Java (Batavia, Bantam, Tjiringin, Pasuruan, Besuki), in sea.
Sumatra (Telokbetong, Benkulen, Padang, Tiku, Sibogha), in sea.
Nias, in sea.
Bintang (Rio), in sea.
Celebes (Macassar), in sea.

Length of the 23 specimens 120‴ to 590‴.

Remark. Netuma nasuta is peculiar because of the change in head shape during ontogeny. In very young specimens the snout does not differ from any of the many related species and even in specimens of over 30 cm long, the snout has nothing exceptional and the rostral margin is bluntly rounded. However, when the fish reaches a greater length the snout gradually begins to protrude more and more before the mouth slit and its margin becomes angular and acutely rounded, so that the fish, in ventral view, obtains a shark-like habitus. The different phases of development can easily occasion to regard them as belonging to different species when one compares specimens of very different ages without looking at the transitional states. This befell me at the start of my investigatons and the nominal species Bagrus rhodonotus and Bagrus carchariorhynchos can be ascribed to this.

Netuma nasuta is spread far across the Indian ocean. One of the few Siluroïds, which preferably lives in the sea, this species visits the coasts from Egypt and Arabia to those of Celebes, its most easterly known living place. In Batavia 97 it is brought to the market nearly daily, although rarely many specimens, which then are usually longer than half a meter and often even more than a meter.

Kuhl and Van Hasselt discovered it in Batavia and Mr Valenciennes received it also from Malabar and the Red Sea. Mr Rüppel gave a good figure and description of it under the name Bagrus thalassinus.

I am also inclined to take Russell's Deddi jellah (Corom Fish. fig. 169) for the same species, just like Bagrus bilineatus, Bagrus netuma and Bagrus laevigatus of Mr Valenciennes, species which after more detailed investigation probably will turn out to be only different age states of a simple species. I am even strengthened in this opinion, as Mr Rüppel, to whom Mr Valenciennes owed his Bagrus laevigatus, which was caught in the Red Sea, mentions of this Sea no other species of Bagrus than his Bagrus thalassinus. The figure of this species given by Mr Rüppel answers totally to my juvenile specimens of Netuma nasuta.

If my opinion concerning the synonymy of this species is correct in all aspects, not less than 6 species should be removed from the genus Bagrus Val., i.e. Bagrus bilineatus CV., Bagrus netuma CV., Bagrus laevigatus CV., Bagrus thalassinus Rüpp., Bagrus rhodonotus Blkr and Bagrus carchariorhynchos Blkr.

The remaining species of Netuma belong to the waters of Guyana and the Antilles and differ from Netuma nasuta by having of the eyes placed much closer to the tip of the snout, other shapes of the supraoccipital crest, etc. Mr Valenciennes gives numbers of branchiostegal rays of those species, at least of his Bagrus proöps as being 6, however Mr Valenciennes also speaks of 6 branchiostegal rays in Arius nasutus, while I after detailed investigations of all my specimens, constantly found only 5 branchiostegal rays.

98 Cephalocassis Blkr.
Shieldhead fish

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth multiple-rowed, acute and small. Vomerine teeth placed on both sides in an undivided group in the anterior part of the palate, the middle line of the palate edentate. 6 Fleshy barbels. Branchiostegal membrane with 6 rays. Interbranchial membrane not or slightly emarginate. Nostrils not tubular, the posterior ones with a valve.

Remark. The genus Cephalocassis comprises those species of the genus Arius of Mr Valenciennes, which are rather sharply characterized by the two undivided groups of vomerine palatal teeth on each side entirely anterior in the palate, as well as by its 6 barbels and 6 branchiostegal rays.

I possess of this genus seven well characterized species three of which are already more or less recognisably described in the large Histoire naturelle des Poissons under the names Arius truncates CV., Arius caelatus CV., and Arius venosus CV., whereas the remaining four were discovered by myself and already described earlier under the names Arius melanochir, Arius leptonotacanthus, Arius macronotacanthus and Arius utik.

Besides these species, to this genus belong moreover Arius grandicassis CV. from Guyana, Arius parmocassis CV. from Bahia, Arius stricticassis CV. from Cayenne, Arius subrostratus CV. from Malabar, Arius rostratus CV. from Alipey, Arius aequibarbis CV. from Bengal and Rangoon, Arius granosus CV., Arius Heudelotii CV. from the Senegal river, Arius Milberti CV. from New York and Charleston, Arius Spixii CV. from Brazil, Arius rugispinis CV. and Arius phrygiatus CV. from Cayenne, Arius falcarius Richds. from China, and probably also Silurus Parkeri Trail from Guyana, besides probably some other species, of which I find the dentition not or not sufficiently described.

The number of 6 branchiostegal rays seems to be constant in this genus.

One of my species, Cephalocassis melanochir Blkr, which seems to be a real riverine species and is caught near the city of Palembang, 99 is remarkable by the presence of lateral fontanels posterior in the head shields, as well as by its relatively long adipose fin and the posterior dorsal spines that are bent upwards.

In all my other species the head shield on the sides of the crown is complete.

One of the six is distinctly recognisable by its flat and at the anterior edge truncated head and the forward directed and small eyes. This species is Cephalocassis truncates or Arius truncates CV.

Of the remaing five species three have relatively slender or thin dorsal spines and the head shields entirely or almost entirely smooth, at most with a small number of bony granulations. They can easily be differentiated from each other. Thus Cephalocassis leptonotacanthus has the peculiarity that the vomerine-palatal teeth are placed in slender elongated triangular slightly curved groups, which diverge in front and the tips of which are directed nearly straight backwards. This species also distinguishes itself by its large head, which length passes only three times in length of body, the caudal fin not included. In the two other species Cephalocassis venosus and Cephalocassis utik, the forenamed groups of teeth are more massive and in the former species even heart shaped. In Cephalocassis venosus these groups are with the base forwards and the tip turned backwards while the head goes almost or even more than four times in length of body without the caudal fin. In Cephalocassis utik on the contrary the tips of the dental triangles are turned forward and the head length is contained only 3 to 3½ times in length of body without the caudal fin.

The two remaining species in my collection are Cephalocassis caelatus and Cephalocassis macronotacanthus. Both have in common very strongly developed dorsal and pectoral fin spines, a strongly granular head shield and a large black blotch on the adipose fin, but apart from that they clearly differ from each other. Wheras in Cephalocassis caelatus the upper jaw is longer than the lower jaw, the groups of vomerine-palatal

teeth are massive or heart shaped with the tip turned backwards and the head fits 3½ to 4 times 100 in length of body without the caudal fin, Cephalocassis macronotacanthus has the lower jaw at least as long as the upper jaw, the head only 3⅖ times in the forementioned body length and the vomerine-palatal teeth placed in two slender oval-elongated, rostrally acutely tapering and strongly converging groups.

Although it is now easy to separate the seven above mentioned species, the nature of the existing descriptions, make it difficult to sharply define the characters of the other species belonging to this genus.

Arius aequibarbis CV. and Arius granosus CV. appear to me not to differ specifically from Arius caelatus CV. and therefore appear to coincide with my Cephalocassis caelatus.

Arius grandicassis CV. is recognisable by its remarkably wide supraoccipital crest.

In Arius parmocassis CV. this crest is oval and narrowed at its base, just as in Arius stricticassis CV. where the crest however is much longer and more slender.

Arius subrostratus CV. and Arius rostratus CV. seem to be related to Cephalocassis truncatus, however in the first mentioned species the head fits 3½ times in the *entire* length of the body and the upper jaw barbels would not reach beyond the eye which is placed in the middle of the head length, whereas in Arius rostratus the snout would still be larger and the upper jaw barbels would not reach the projecting angle of the os frontale.

Arius Heudeloti CV. in habitus resembles Cephalocassis caelatus closely but has the head relatively longer (3 times in the body without the caudal fin) while the anal fin would have only 16 rays and the adipose fin would be without a black spot, and it would have very small groups of teeth placed far apart on the palatine.

Arius Milberti CV. would also be realated to Cephalocassis caelatus but be characterized by the very dense but not radially granulation of the head shield. The statement that there would only be 5 branchiostegal rays needs confirmation and if it turnes out to be true it would necessitate a small change in the generic diagnosis 101 of Cephalocassis.

Without doubt Arius Spixii CV. is closely related to Cephalocassis venosus and Cephalocassis utik. According to the description it is distinguished by a smaller number of anal fin rays and by longer upper jaw barbels.

Arius rugispinis CV. and Arius phrygiatus CV. are recognisable, among others, by small eyes (9-10 times in the head) and a large adipose fin (almost as long or as long as the anal fin).

Arius falcarius Richds according to the figure of the dentition (Voy. Sulphur Zoöl. Tab 62 fig. 9) belongs to Cephalocassis as well. The inner margins of the vomerine teeth would be parallel to each other. However, I would not be surprised if this species would be the same as Netuma nasuta.

Regarding Silurus Parkeri Trail, the "geelbrik" of the Dutch West Indies, the teeth in the palate would be placed in two large elongated convex groups, the pectoral would have 11 and the anal fin 18 rays, the mouth would be terminal and the upper jaw barbels reach the top of the pectoral fins. It is a real possibility that this species belongs to the genus Arius, following my definition.

Finally belong to this genus those species, described in the large Histoire naturelle des Poissons under the names Bagrus arioides CV., Bagrus gagorides CV. and Bagrus trachipomus CV.

In Bagrus arioides CV. according to Mr Valenciennes the vomerine palatal teeth form two broad triangles touching each other with their angles in the median, which is not the case in any of my species.

Bagrus gagoroides CV. on the anterior part of its lateral line would have a number of small angular knobs, the posterior edge of the fin spines not grooved, and dorsal spines without teeth. Bagrus trachipomus CV. according to the opinion of Mr Valenciennes maybe only is a sexual variety of his Bagrus gagorides.

My species can be identified according to the following scheme.

102 I. Supraoccipital crest longer than broad in the middle. Groups of vomerine teeth separate. Lateral line everywhere smooth.

A. Head shield with lateral and posterior fontanels. Adipose fin longer than anal fin.

a. Teeth on posterior side of dorsal spine curved upwards. Lateral line not forked at caudal fin base.

† Vomero-palatine teeth groups oblong-oval, converging anteriorly.

§ Head contained 4 times in length of body without caudal fin. Eye diameter contained 7 to 8 times in length of head. Dorsal spine thick, slightly shorter than the head. P. 1/12.

Cephalocassis melanochir Blkr.

B. Head shield without any lateral or posterior fontanels. Adipose fin much shorter than anal fin.

a. Lateral line forked at caudal thin base. Supraoccipital crest broad.

† Vomerine-palatine dental groups oblong-rounded or elongate.

§ Tooth groups converging posteriorly, triangular-pear-shaped, tips pointing backwards.

* Head with very sparse grains, contained 3 times in length of body without caudal fin. Eyes contained about 5⅔ times in length of head. P 1/11. Dorsal spine tapering, contained 1½ times in length of head.

Cephalocassis leptonotacanthus Blkr.

§ Tooth groups converging anteriorly, oblong-oval P. 1/0.

* Head grainy in the form of rays, contained about 3⅖ times in length of body without caudal fin, depth of head contained nearly 1½ times in its length. Eyes contained 5⅓ to 5½ times in length of head. Dorsal spine thick, much shorter than head. Lower jaw not shorter than upper jaw.

Cephalocassis macronotacanthus Blkr.

* Head sparsely grainy far behind the eyes. Head contained 3⅖ tot 3¾ times in length of body without caudal fin, twice as long as high. Eyes contained 6 to 8 times in length of head. Dorsal spine thick, contained 1⅓ to 1¼ times in length of head.

Cephalocassis truncatus Blkr.

† Vomerine-palatine teeth groups heart-shaped or triangular.

§ Tips of tooth groups pointing backwards; depth of head contained 1⅓ to 1½ times in its length.

103 * Head very grainy in the form of rays, head contained 3½ to nearly 4 times in length of body without caudal fin. Eye diameter contained 4 to 5⅓ times in length of head. Dorsal spine very thick, slightly shorter to slightly longer than the head. P. 1/9. Adipose fin with a large black spot.

Cephalocassis caelatus Blkr.

* Head totally smooth or with very sparse granules, contained nearly 4 to 4⅕ times in length of body without caudal fin. Eyes contained 3½ to slightly more than 4 times in length of head. Dorsal spine thin, contained 1 to 1⅕ times in length of head. P. 1/10. Adipose fin without black spot.

Cephalocassis venosus Blkr.

§ Tips of tooth groups pointing forwards; depth of head contained 1⅔ tot 1½ times in its length.

* Entire head smooth or with very sparse granules, head contained 3¼ to 3½ times in length of body without caudal fin. Eyes contained 3¾ to 5 times in length of head. Dorsal spine thin, contained 1¼ to 1⅔ times in length of head. P. 1/10. Adipose fin without spots.

Cephalocassis utik Blkr.

Cephalocassis melanochir Blkr.
Atl. Silur. tab. IV.
Black-handed shieldhead fish

A Cephalocassus with an elongate body, anterior part about as broad as deep, posterior part compressed, body depth contained about 4⅔ times in its length without, and about 6 times in its length with caudal fin. Head slightly depressed, acute, contained about 4 times in length of body without, and slightly more than 5 times in length of body with caudal fin, depth and width of head contained 1⅓ to 1⅖ times in its length; eyes, free, facing sideways rather than upwards, placed totally in the anterior half of the head, diameter contained 7 to 8 times in length of head, distance between the eyes 2½ to 3 times their diameter. Head shield with a longitudinal groove (median fontanel) not reaching the base of the supraoccipital crest, posterior part very broad, dividing nearly the entire head shield. The shield has lateral fontanels larger than the eye and is rough-grainy only behind the eyes, the lateral parts are irregularly rough, posterior part is granulated in the middle with many small granules which are arranged in the form of rays; supraoccipital crest less than twice as long as the base, more than three times as long as broad at the middle, totally rough-grainy, with small granules, its top obtuse, hardly or not thinner than the middle part, reaching the very short and grainy second interspinal bone; snout slightly depressed, convex, about twice as long as the eye, protruding slightly beyond the mouth opening, 104 rostral profile obtusely rounded. Jaw teeth multiple-rowed, acute and small, the upper jaw teeth placed in a hardly curved band, the lower jaw teeth in a crescent-shaped band; vomerine-palatal teeth conical, acute and small, placed in two oblong, rounded groups, shorter than the eye and thin, placed obliquely in anterior part of the palate, strongly diverging posteriorly; mouth inferior, its width contained about 3 times in length of head; maxillary barbels reaching slightly beyond the humeral bone. Outer lower jaw barbels, longer than inner ones, reaching the base of the pectoral fin; anterior and posterior nostrils nearly touching each other, much nearer to the tip of the snout than to the eye; anterior ones round, the posterior ones are oblong and can be closed with a small broad valve that nearly totally surrounds the opening and is elevated anteriorly; gill cover and humeral bone veined and smooth, humeral bone short and acute; axillary slime pore conspicuous; lateral line much branched, generally with simple elongate branches, its anterior part sloping downwards, posterior part straight, not forked at the base of the caudal fin, but curved upwards. Rayed dorsal fin acute, not or hardly higher than body, around twice as high as the length of the fin base, the spine very thick, slightly shorter than the head, spine laterally striped, its anterior side grainy basally, feebly serrated near the top, posterior side over the total length serrated with conspicuous teeth curved upwards; adipose dorsal fin longer than rayed dorsal fin and anal fin, placed at a distance of slightly more than its length from the rayed dorsal, about three times as long as high, the upper margin oblique

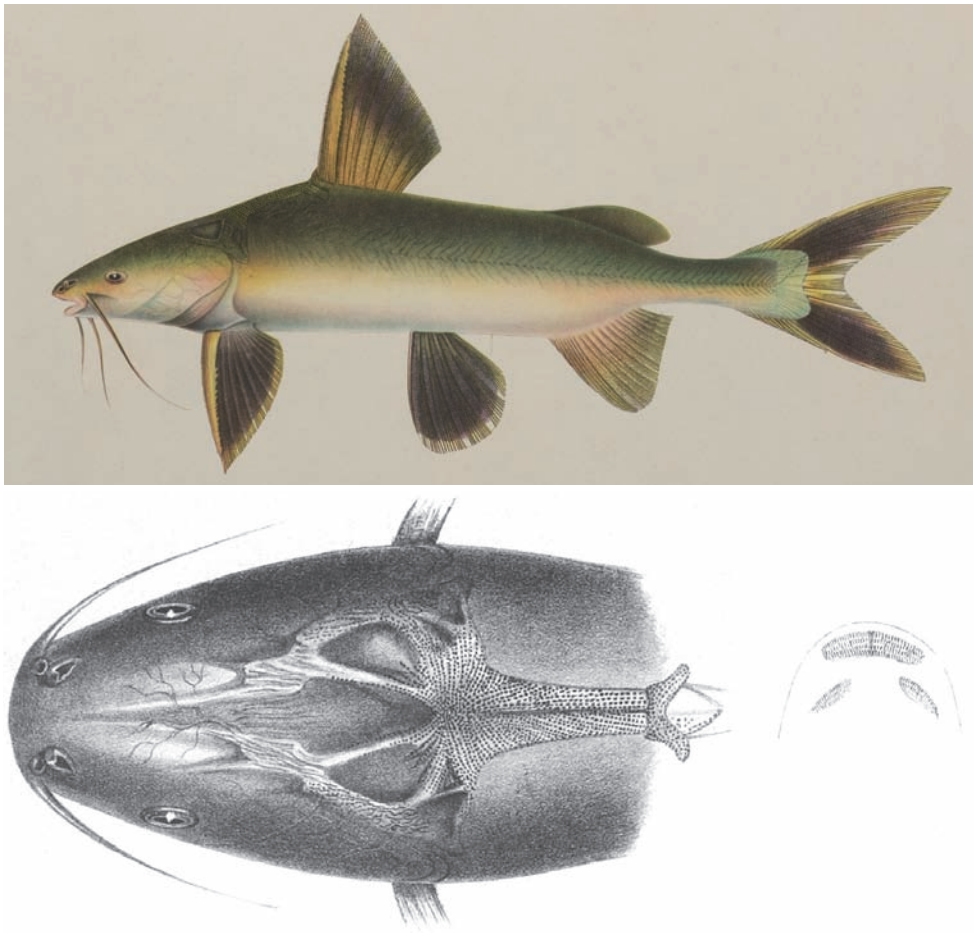

Fig. 11. *Cephalocassis melanochir* Blkr.

and convex; pectoral fins acute, hardly shorter than the head, the spine very thick, not or hardly longer than the dorsal spine, the spine laterally striped, its anterior side granulated at the front, feebly serrated near the top, posterior side over the total length with armed with medium-sized teeth; ventral fins obtuse, rounded, shorter than the pectoral fins; anal fin slightly higher than long, hardly emarginate, rounded at the top. Caudal fin with a deep incision and acute lobes, the upper lobe longer than the lower lobe, contained 4⅓ to 4½ times in the length of the total body. Colour of upper part of the body slightly violet-olive, lower part silvery or pearly; fins yellowish with a more or less broad blackish stripe in the middle, except for the olive-coloured adipose fin without spots.

B. 6. D. 1/7. P. 1/12. V. 1/5. A. 7/13. C. 1/13/1 or 2/13/2 and shorter ones alongside.

Syn. *Arius melanochir* Blkr, Diagn. Vischs. Sumatr. Tient. I to IV, Nat. T. Ned. Ind. III p. 590.

Hab. Sumatra (Palembang) in the Mussi river.

Length of the only specimen 302‘‘‘.

Remark. This species because of its habitus reminds one of the species of Bagrus with a flattened head and moderately developed adipose fin. Because of the lateral fontanels posteriorly in the head shield, it stands, as far as I know, entirely alone in its genus, while,

apart from that, it is also remarkable by its upwards turned teeth at the backside of the dorsal fin spine, its for this genus very long adipose fin, the lateral line that is not divided but turned upwards at the base of the caudal fin, the short band of premaxillary teeth, which in total is only four times longer than broad, etc. I possess of the species in question only the specimen described here. It seems to be rare, even near Palembang.

105 *Cephalocassis leptonothacanthus* Blkr.
Atl. Silur. tab. VI fig. 2.
Slender-spined shieldhead fish

A Cephalocassis with an elongate body, anterior part about as broad as high, posterior part compressed, body depth contained about 4⅔ times in its length without, and about 5⅔ times in its length with caudal

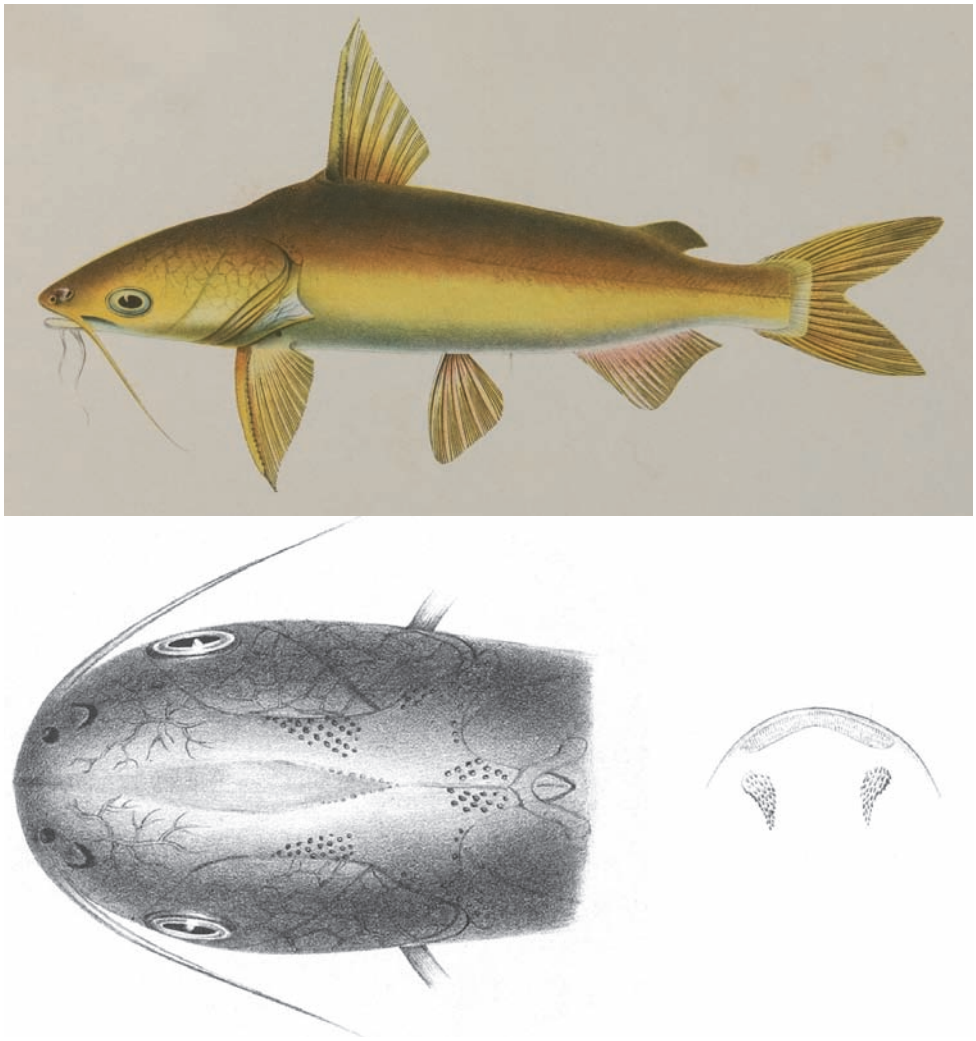

Fig. 12. *Cephalocassis leptonothacanthus* Blkr. [In Atlas as *Arius leptonothacanthus* Blkr.]

fin. Head slightly depressed, acute, contained about 3 times in length of body without, and about 3⅗ times in length of body with caudal fin; depth of head contained about 1⅔ times in its length, body width about 1⅖ times; eyes free, facing sideways, placed behind the mouth corner in the anterior half of the head, eye diameter contained about 5⅔ times in length of head, distance between the eyes about 3 times their diameter. Head shield with a longitudinal groove (median fontanel) reaching the base of supraoccipital crest, broad in the middle, dividing the entire head shield. The shield has no lateral or posterior fontanels, from this point onwards the crest is very sparsely covered with small granules; supraoccipital crest triangular, shorter than the basal width, its top broad, truncate or emarginate, reaching the very short and glabrous second interspinal bone. The middle ridge is elevated and rough laterally; snout slightly depressed, convex, less than twice as long as the eye, protruding slightly beyond the mouth opening, the rostral profile obtusely rounded. Jaw teeth multiple-rowed, acute and small, the upper jaw teeth placed in a feebly curved band, the lower jaw teeth in a crescent-shaped band, longer but thinner than the premaxillary band; vomerine-palatinal teeth conical, slightly obtuse, placed in two nearly triangular, feebly arcuate, thin groups, shorter than the eye, placed at a distance of more than their length from each other anteriorly in the palate, feebly converging backwards, the acute top facing backwards; mouth inferior, its width contained about 2⅓ times in length of head; Maxillary barbels reaching the base of the pectoral fin. Outer lower jaw barbels, longer than inner ones, reaching the gill opening; anterior and posterior nostrils nearly touching each other, much closer to the tip of the snout than to the eye; the anterior ones round, the posterior ones are oblong and can be closed with a small broad valve that nearly totally surrounds the opening and is elevated anteriorly; gill cover glabrous and veined: humeral bone acute, medium-sized and slightly rough; axillary slime pore conspicuous; anterior part of lateral line sloping downwards, posterior part straight and forked at the base of the caudal fin. Rayed dorsal fin acute, not or hardly lower than the body, about twice as high as the length of the fin base, the spine rather thin, contained about 1½ times in length of head, spine laterally striped, its anterior side grainy basally, feebly serrated near the top, posterior side over the total length armed with conspicuous downwards facing teeth; adipose dorsal fin placed at a distance of more than three times its length from the rayed dorsal. It is much shorter than but less than twice as short as the rayed dorsal, less than twice as long as high, angular; pectoral fins acute, contained about 11/2 times in length of head, the spine thicker, but slightly shorter than the dorsal spine, spine laterally striped, its anterior side grainy near the base, serrated near the top, posterior side over the total length armed with conspicuous teeth; ventral fins acutely rounded, shorter than the pectoral fins; anal fin anteriorly rounded, feebly emarginate, about twice as long as the adipose dorsal fin, much longer than high; caudal fin with a deep incision and acute lobes, contained 5½ to 6 times in the length of the total body. Colour of upper part of the body slightly olive-coloured, lower part whitish or silvery; fins yellowish, more or less with dark speckles, except for the more or less olive-coloured adipose fin.

B. 6. D. 1/7. P. 1/11. V. 1/5. A. 7/14. C. 1/13/1 and shorter ones alongside.

Syn. *Arius leptonotacanthus* Blkr, Verh. Bat. Gen. XXII Bijdr. ichth. Madura p. 11.
Ikan Keteng Madurens.

Hab. In the Strait of Madura near Surabaja and Kammal.

Length of the only specimen 211‴.

106 Remark. All my species of Cephalocassis are, as mentioned already, well recognisable by their dentition, because although they all have in common two separate groups of acutely pointed teeth anterior in the palate, there are no two species in which the shape, direction and size of those groups are the same. Cephalocassis leptonotacanthus is the only one of those species in which those tooth groups diverge anteriorly and converge posteriorly, while moreover they have a very long pear shaped and somewhat curved shape, the tip of which is directed backwards. Otherwise, this species, because of its little grained head shield and slender dorsal spine, is related to Cephalocassis venosus and Cephalicassis utik, although it also besides the dentition, differs in several points, especially by its relatively larger head.

I know it, till now, only from the Strait of Madura.

Cephalocassis macronothacanthus Blkr.
Atl. Silur. tab. VII.
Large-spined shieldhead fish

A Cephalocassis with an elongate body, anterior part about as broad as high, posterior part compressed, body depth contained about 4 times in its length without, and about 5½ times in its length with caudal fin. Head depressed, acute, contained about 3⅖ times in length of body without, and about 4⅕ tot 4⅙ times in length of body with caudal fin; depth of head contained nearly 1½ times in its length, width 1⅖ times; eyes, free, facing sideways, placed behind the mouth corner in the anterior half of the head, eye diameter contained 5⅓ tot 5½ times in length of head, distance between the eyes about 2½ times their

Fig. 13. *Cephalocassis macronothacanthus* Blkr. [In Atlas as *Arius macronothacanthus* Blkr.]

diameter. Head shield with a longitudinal groove (median fontanel) reaching the base of the supraoccipital crest, broad in the middle, dividing the entire head shield. The shield has no lateral or posterior fontanels and is granulated irregularly or ray-like, with a rather large number of small granules, sparser on the middle of the shield than near its corners; supraoccipital crest triangular, shorter than the basal width, its top very broadly truncate or emarginate, reaching short and grainy second interspinal bone, the middle ridge slightly elevated, rough laterally; snout depressed, convex, less than twice as long as the eye, not protruding beyond the mouth opening, rostral profile obtusely rounded. Jaw teeth multiple-rowed, acute and small, the upper jaw teeth placed in a nearly crescent-shaped band, the lower jaw teeth in a crescent-shaped band; vomerine-palatinal teeth conical and acute, placed in two oblong-rounded groups, anteriorly acute. The groups are in length nearly equal to the eye diameter and placed less than their length apart. The groups are placed very obliquely in the anterior part of the palate and diverging very much backwards; mouth opening terminal, its width contained 1⅝ to 1⅘ times in length of head; maxillary barbels reaching the top of the humeral bone. Outer lower jaw barbels, longer than inner ones, reaching the base of the pectoral fin; anterior and posterior nostrils nearly touching each other, much closer to the tip of the snout than to the eye; the anterior ones round, 107 the posterior ones are oblong and can be closed with a small valve that nearly totally surrounds the opening and is elevated anteriorly; gill cover glabrous and veined: humeral bone acute, medium-sized and rough-granulated; axillary slime pore conspicuous; lateral line very much branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin; dorso-lateral pores conspicuous and placed in about 15 simple, transverse parallel lines. Rayed dorsal fin acute, rather a lot higher than the body, first ray slightly prolonged, more than twice as high as length of the fin base, the spine very thick, slightly shorter than the head, spine reticulatedly rough laterally, its anterior side grainy basally and feebly serrated near the top, posterior side is feebly armed with small teeth facing upwards and downwards; adipose dorsal fin placed at a distance of more than three times its length from the rayed dorsal, not much shorter than rayed dorsal, less than twice as long as high and obtusely rounded; pectoral fins acute, contained about 1⅔ times in length of head, the spine thick, shorter than the dorsal spine, spine reticulatedly rough laterally, its anterior side feebly serrated near the base, posterior side armed with conspicuous teeth; ventral fins acute, shorter than the pectoral fins; anal fin rounded anteriorly, feebly emarginate, less than twice as long as the adipose dorsal fin, not much longer than high; caudal fin has a deep incision and slightly acute lobes, the upper one longer than the lower one and contained 5⅓ to 6 times in the length of the total body. Colour of upper part of the body slightly olive-green, lower part whitish or silvery; adipose dorsal fin olive-coloured with large black spot, the other fins yellowish, more or less with dark speckles.

B. 6. D. 1/7. P. 1/9. V. 1/5. A. 8/11 or 7/12. C. 1/13/1 and shorter ones alongside.

Syn. *Arius macronotacanthus* Blkr, Verh. Bat. Gen. XXI, I Silur. batav. consp. p. 32.
Ikan Manjong pidada Mal. Batav.

Hab. Java (Batavia), in sea.

Length of the only specimen 290‴.

Remark. Among my species of Cephalocassis there are 4, which differ from the remaining ones by very strongly developed dorsal fin spines and pectoral fin spines and a strongly grained head shield. One of those species I have shown in more detail above as being remarkable by its lateral head shield fontanels, up turned dorsal fin spine teeth, etc. In the remaining species these fontanels are lacking, the dorsal fin spine teeth are not turned upwards, the lateral line is forked at the caudal fin base and the adipose fin is shorter than the anal fin. These species are the present one, as well as Cephalocassis caelatus and Cephalocassis truncates. But these three species still differ from each other in numerous characters, in shape and relative size of the head and the supraoccipital crest and especially with regard to the dentition, fin spines, adipose fin, etc.

Cephalocassis macronotacanthus is most closely related to Cephalocassis caelatus, but it is easily recognisable by its 108 vomerine teeth, which groups are elongated pear

shaped and placed with the tips forward and converging. Moreover, the fin spines do posess the longitudinal grooves but they miss the hony rate cells or recesses which one perceives in Cephalocassis caelatus, whereas in the last named species the lower jaw is also shorter, head and supraoccipital crest are remarkably broader, etc.

Of Cephalocassis macronotacanthus I also did not succeed in obtaining more than a single specimen.

Cephalocassis truncatus Blkr.
Atl. Silur. tab VIII.
Truncated shieldhead fish

A Cephalocassis with an elongate body, anterior part about as broad as high, posterior part compressed, body depth contained 4¾ to slightly more than 6 times in its length without, and 6½ to 8½ times in its length with caudal fin. Head depressed and acute, contained 3⅜ to 3¾ times in length of body without, and about 4⅓ tot 4½ times in length of body with caudal fin; depth of head contained about 2 times in its length, width 1¾ to nearly 2 times; eyes free, facing sideways, placed for a large part in the anterior

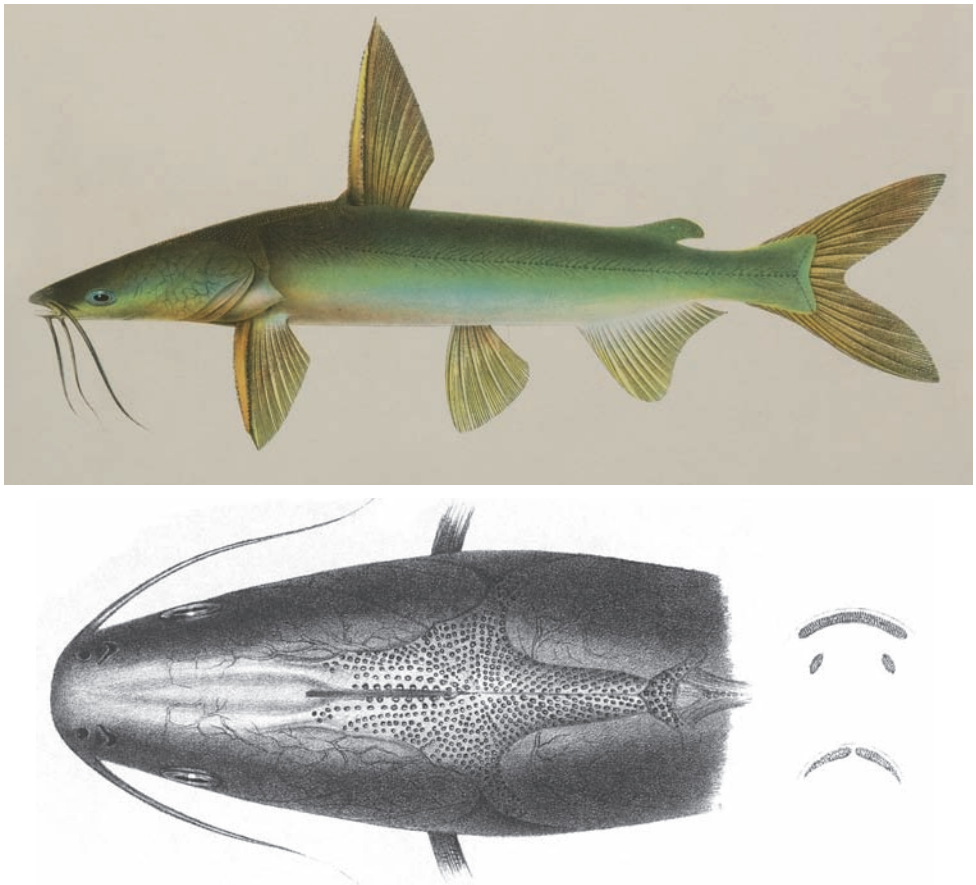

Fig. 14. *Cephalocassis truncatus* Blkr. [In Atlas as *Arius truncatus* Val. Head and dentition 75% of original size.]

third part of the head, diameter contained 6 to 8 times in length of head, distance between the eyes 2 to 2½ times their diameter. Head shield with a longitudinal groove (median fontanel) reaching or nearly reaching the base of the supraoccipital crest, rather narrow, totally or nearly totally dividing the head shield.The shield has no lateral or posterior fontanels and is glabrous to a point behind the eyes, its posterior part is irregularly grainy, in juveniles with sparse medium-sized grains, in older fishes with more numerous medium-sized grains; supraoccipital crest less than twice as long as the base, more than twice as long as broad in the middle, the middle ridge is low and longitudinally rough and grainy. Its broadly truncate or emarginate top reaches the short and glabrous or grainy second interspinal bone. Jaw teeth multiple-rowed, acute and small, the upper jaw teeth placed in a slightly curved band, the lower jaw teeth in a crescent-shaped band; vomerine-palatinal teeth conical and acute, placed in two oblong-rounded groups, generally shorter than the diameter of the eye. The groups are placed obliquely in the anterior part of the palate and diverge backwards; snout depressed, slightly convex, not protruding beyond the mouth opening, rostral profile more or less truncate; mouth subinferior, its width contained about 3 times in length of head; maxillary barbels reaching the humeral bone. Outer lower jaw barbels, about equally long as inner ones, reaching or nearly reaching the gill opening; nostrils close to each other much nearer to the tip of the snout than to the eye, posterior ones are oblong and can be closed with a small valve; gill cover and humeral bone smooth and veined, humeral bone medium-sized and acute; axillary slime pore conspicuous; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin, dorso-lateral pores inconspicuous and placed in 16 to 20 simple, transverse parallel lines. Rayed dorsal fin acute, much higher than the body, more than twice as high as the length of the fin base, no ray sticking out, the spine robust, contained 1⅓ tot 1¼ times in length of head, spine rough laterally, its anterior side grainy basally, the upper part feebly serrated, posterior side over the total length armed with medium-sized, downwards pointing teeth; adipose dorsal fin placed at a distance of more than three times its length from the rayed dorsal. 109 Adipose fin is not or only slightly shorter than the rayed dorsal, longer than high and obliquely rounded; pectoral fins acute, contained about 1½ times in length of head, the spine robust, shorter than the dorsal spine, its anterior side serrated near the base, posterior side over the total length armed with medium-sized teeth; ventral fins angular, rounded at the top, shorter than the pectoral fins; anal fin rounded anteriorly, emarginate, twice or more than twice as long as the adipose dorsal fin, longer than high; caudal fin with a deep incision and acute lobes, the upper one generally longer than the lower one, contained 5½ to 6 times in the length of the total body. Colour of upper part of the body bluish-olive, lower part whitish or silvery; fins yellowish, more or less with dark speckles, except for the slightly olive-coloured adipose fin, maxillary barbels blackish, iris yellow.

B. 6. D. 1/7. P. 1/9. V. 1/5. A. 6/16 to 6/18 or 7/16 to 7/18. C. 1/13/1 and shorter ones alongside.

Syn. *Arius truncatus* CV. Poiss. XV p. 48, Cantor Catal. Mal. Fish. p. 256. Blkr. Zesde bijdrage Ichth. Borneo, Nat. Tijdschr. Ned. Ind. III p. 426.
Arius à nez tronqué CV. Poiss. XV p. 48.

Hab. Sumatra (Palembang), in rivers.
Borneo (Pamangkat, Sinkawang), in rivers and brackish water.

Length of the 5 specimens 121‴ to 330‴.

Remark. Even though this species is said to live on or near Java, till now I did not succeed to obtain it from this island. Moreover, it is also known from Malakka and Pinang.

In habitus Cephalocassis truncates reminds one of certain slender headed species of Bagrus, but especially of the species of Ariodes.

The groups of vomerine teeth in the present species are smaller than in the other species, and they also lie farther removed from each other and from the premaxillary teeth band. Already by this and by the oval shape of these groups this species can be recognized, but its recognition is also easy at first glance because of its relatively slender head, the ceasing of the head shield granules already far behind the eyes, the shape of the supraoccipital crest, which is more than twice as long as its width in the middle

and moreover by the absence of a black spot on the adipose fin, which is strongly expressed in the related species Cephalocassis caelatus and Cephalocassis macronotacanthus.

110 *Cephalocassis caelatus* Blkr.
Atl. Silur. tab. V.
Sculptured shieldhead fish

A Cephalocassis with an elongate body, anterior part about as broad as long or slightly broader than long, posterior part compressed, body depth contained 4⅔ to 4¾ times in its length without, and 6 to 5¾ times in its length with caudal fin. Head depressed and acute, contained nearly 4 to 3½ times in length of body without, and 5 to 4¼ times in length of body with caudal fin; depth of head contained 1⅓ to 1½

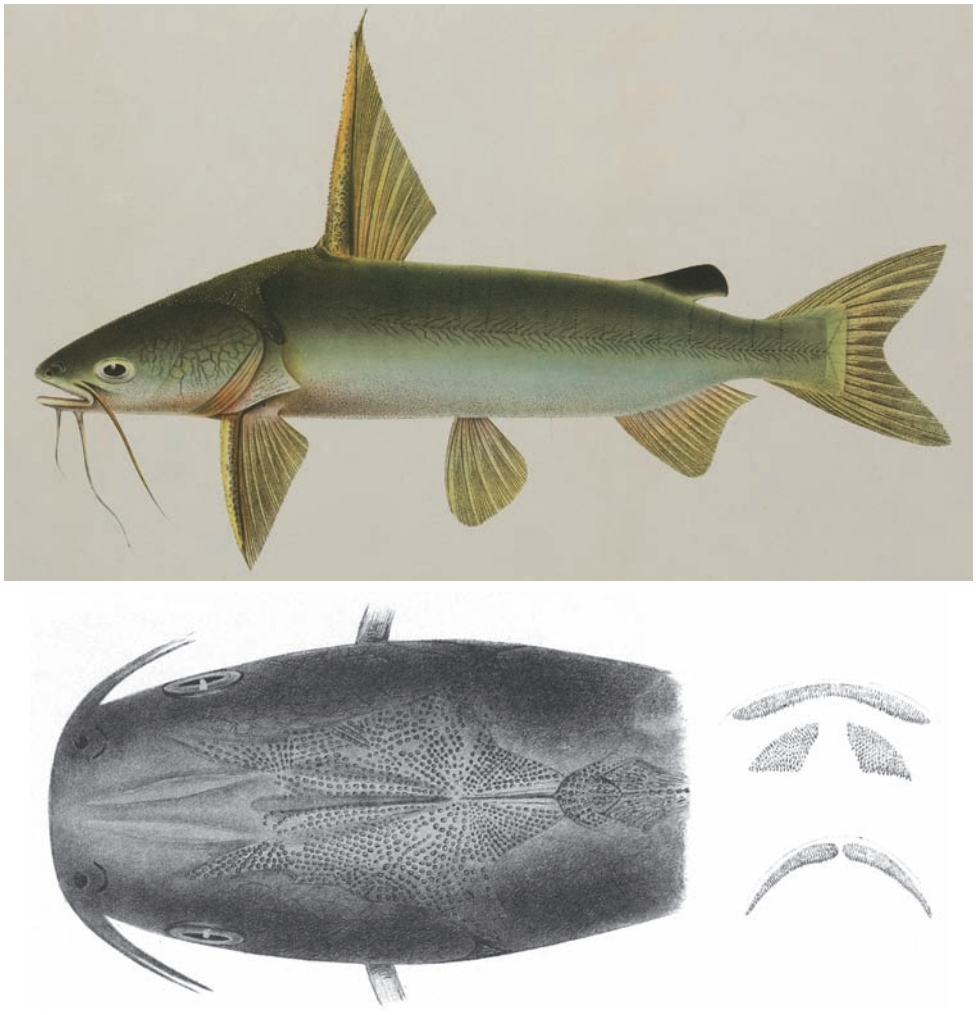

Fig. 15. *Cephalocassis caelatus* Blkr. [In Atlas as *Arius coelatus* Val. Head and dentition 75% of original size.]

times in its length, width 1⅓ to 1⅕ times; eyes, free, placed behind the mouth corner in the anterior half of the head, facing sideways, eye diameter contained 4 to 5⅓ times in length of head, distance between the eyes nearly 2 to 3 times their diameter. Head shield with longitudinal groove (median fontanel) reaching the base of the supraoccipital crest, very broad in the middle, dividing the entire head shield. The shield has no lateral or posterior fontanels, it is grainy upwards from the eyes in the form of rays or ray-like, with medium-sized grains, in older fishes rather densely together; supraoccipital crest shorther than basal width, median ridge low, totally grainy, its very broadly truncate or emarginate top reaching the short and grainy second interspinal bone; snout depressed, slightly convex, less than twice as long as the eye, not protruding beyond the mouth opening, rostral profile obtusely rounded. Jaw teeth multiple-rowed, acute and small, the upper jaw teeth placed in a slightly crescent-shaped band, the lower jaw teeth placed in a crescent-shaped band; vomerine-palatinal teeth acute, placed in two heart-shaped groups, hardly or not smaller than the eye, facing forward at the top and strongly converging, placed at a distance of much less than their length from each other, obliquely in anterior part of the palate; mouth nearly terminal, its width contained about twice in length of head; maxillary barbels reaching the humeral bone upwards from the tip of the pectoral fins; outer lower jaw barbels, longer than inner ones, reaching or overreaching the humeral bone; anterior and posterior nostrils, nearly touching each other, much closer to the tip of the snout than to the eye; anterior ones are round, the posterior ones are oblong and can be closed with a small valve that nearly totally surrounds the opening and is elevated anteriorly. Gill cover glabrous and veined: humeral bone acute, medium-sized and rough; axillary slime pore conspicuous; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin; dorso-lateral pores are inconspicuous and placed in about 15 simple, transverse parallel lines. Rayed dorsal fin acute, much higher than the body, more than twice as high as the length of the fin base, the spine very thick, bony part in younger fishes generally longer than the head, in older fishes generally slightly shorter than the head, spine reticulatedly rough laterally, its anterior side grainy basally, the upper part feebly serrated, posterior side armed with downwards point medium-sized teeth, the soft appendage generally twice or more than twice as short as the bony part; adipose fin placed at a distance of three times or less than three times its length from rayed dorsal, slightly shorter than the rayed dorsal, twice or less than twice as long as high and obliquely rounded; pectoral fins acute, in younger fishes slightly shorter than the head, in older fishes much shorter than the head, the spine shorter and thinner than the dorsal spine, spine reticulatedly rough laterally, its anterior side grainy near the base, serrated near the top, posterior side armed with medium-sized teeth; ventral fins acute, angular or rounded, shorter than the pectoral fins, posterior ray sometimes very tumid and cartilaginous; anal fin acute, emarginate, nearly twice to much less than twice as long as the adipose dorsal fin, longer than high; caudal fin has a deep incision and acute lobes and is contained 4⅖ to 6 times in the length of the total body. Colour of upper part of the body bluish-olive, lower part whitish or silvery; adipose fin slightly olive-coloured with a large blackish-violet spot, the other fins yellowish, 111 more or less with dark speckles, the barbels generally for the upper half blackish, iris yellow.

B. 6. D. 1/7. P. 1/0. V. 1/5. A. 7/13 to 7/15 or 8/13 to 8/15. C. 1/13/1 and shorter ones alongside.

Syn. *Arius caelatus* CV. Poiss. XV. p. 49.
Arius à casque ciselé CV. ib.
Arius aequibarbus CV., ibid. p. 51.
Arius à barbillons égaux CV. ibid. p. 5I.
Arius granosus CV., ibid. p. 51.
Arius à gros grains CV. ibid. p. 51.
Arius coelatoides Blkr, Verh. Bat. Gen. XXI, II Silur. bat. consp. p. 32.
Arius microgastropterygius Blkr, ibid. p. 33.
Arius clypeaster Blkr, ibid. p. 34.
Arius c1ypeastroides Blkr, ibid. p. 34.
Arius chondropterygius Blkr, ibid. p. 35.
Arius melanopterygius Blkr, Verh. Bat. Gen. XXII Bijdr. Ichth. Madur. p. 10.
Ikan Keteng Jav.

Ikan Uteh Maduranese.
Ikan Manjong pidada Mal. Bat.
Hab. Java (Batavia, Surabaja, Pasuruan), in sea and river mouths.
Madura (Kamma1), in sea and in brackish water.
Sumatra (Padang), in sea.
Borneo (Bandjermasin), in rivers.
Length of the more than 20 specimens 135‴ to 320‴.

Remark. When I erected the species mentioned in the above-mentioned synonymy, I attached too much value to some subordinate characters, which in later research proved to have no specific value. Led by this experience and after having reduced the species concerned to a simple species, I believed it necessary to compare these species again with the description given by Mr Valenciennes of Arius caelatus, a species which has become known from Bombay, but which by Quoy and Guimard was also observed in Batavia. I am now of the opinion that Arius caelatus CV. is no other species that the one in question. The differences in the descriptions of Mr Valenciennes and myself are partly of no specific value and can be attributed to individual variation, while some other differences, like those of the relative sizes of the eyes and supraoccipital crest can be explained by the way in which the measurements 112 were made. Concening my way of taking measurements, I always take the largest diameter of the eye including the eye membrane, while I then measure this length against the entire length of the head without the curvature, from the snout tip to the end of the gill cover. It seems to me that Mr Valenciennes, just like myself in earlier days, for the Ariodont species often attached too much value to characters of subordinate value, like small, sometimes accidental differences in the length of the barbels, larger or smaller and more or less numerous head shield grains etc. and I believe, based on this, that also his Arius aequibarbis from Rangoon and Bengal and his Arius granosus from Pondichery do not essentially differ from Arius caelatus.

Cephalocassis caelatus is primarily recognizable by the peculiar shape of its fin spines, which are very thick and possess, especially on the basal half, numerous closely together lying cel-like recesses, which give them a peculiar appearance. Another recognition character is found in the shape of the groups of vomerine teeth, which are triangular-heart shaped with the tip turned forwards and converging whereas the edge that is turned backwards is convex. As is already mentioned above, it moreover differs fom Cephalocassis macronotacanthus by a broader head and broader supraoccipital crest.

Cephalocassis caelatus is one of the most common Siluroïds in Batavia and is sometimes brought to the market in large quantities. It does not seem to become much larger than my largest specimen, that is, I have never seen specimens exceeding a length of 1½ foot. It often occurs together with Arius arius CV. and Arius pidada Blkr in river mouths and the strongly with riverwater diluted coastal waters. Along the swampy beaches of the Bay of Batavia it is often caught proahs full in drag nets. Its meat however, is little sought after and generally only eaten by less well to do natives and Chinese, who for a few pennies find an ample meal in this species.

The eggs develop, as in Arius, in the belly of the 113 mother until the embryo's are sufficiently developed to be able to move freely in the water with the yolk-sac.

Cephalocassis venosus Blkr.
Atl. Silur. tab VI fig. 1.
Veined shield head fish

A Cephalocassis with an elongate body, the anterior part about as broad as high, posterior part compressed, body depth contained 5 to 4¾ times in its length without, and 6 to 6½ times in its length with caudal fin: head depressed, acute, contained 4⅕ times to nearly 4 times in length of body without, and 5⅕ to nearly 5 times in length of body with caudal fin; depth of head contained 1⅖ to 1½ times in length of head, width 1¼ to 1⅓ times; eyes free, placed nearly totally in the anterior half of the head, eye diameter contained 3½ to slightly more than 4 times in length of head, distance between the eyes 1⅖ to 1¾ times their diameter: head shield with a longitudinal groove (median fonta-

Fig. 16. *Cephalocassis venosus* Blkr. [In Atlas as *Arius venosus* Val.]

nel) reaching the base of the supraoccipital crest, thin, dividing the entire head shield. The shield has no lateral or posterior fontanels and is generally only covered with some granules near the median groove and the sides; supraoccipital crest triangular, slightly longer than the basal width, median ridge low and sometimes grainy, smooth at the sides or covered with sparse granules, the top of the supraoccipital crest truncate, reaching the short and smooth or feebly grainy second interspinal bone; snout depressed, convex, in younger fishes hardly longer than the eye, in older fishes not much longer than the eye, hardly protruding beyond the mouth opening, rostral profile rounded nearly crescent-shaped; jaw teeth multiple-rowed, acute and small, the upper jaw teeth placed in a slightly curved band, the lower jaw teeth in a crescent-shaped band; vomerine-palatinal teeth acute, placed in two triangular or nearly heart-shaped groups, smaller than the eye, the top facing backwards, nearly equally broad as long, anteriorly (at the base) very close to each other, placed hardly oblique in the anterior part of the palate; mouth subinferior, its width contained twice or nearly twice in length of head; maxillary barbels reaching or overreaching the humeral bone, outer lower jaw barbels, longer than inner ones, reaching the base of the pectoral fin; anterior nostrils and posterior nostrils nearly touching each other, nearer to the tip of the snout than to the eye; anterior ones are round, the posterior ones are oblong and can be closed with a small valve that totally surrounds the opening and is elevated anteriorly; gill cover and humeral bone smooth, humeral bone medium-sized and acute; axillary slime pore conspicuous; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin; the dorso-lateral pores are hardly visible and placed in about 15 simple, transverse parallel lines; rayed dorsal fin acute, higher than the body, more than twice as high as the length of the fin base, the spine thin, contained 1 tot 1⅕ times in length of head, spine laterally striped, its anterior side and lower part grainy, the upper part feebly serrated, posterior side armed with conspicuous, medium-sized, downward pointing teeth, the prolonged filiform part hardly higher to less than twice as high as the spine itself; adipose fin placed at a distance of more than three times its length from the rayed dorsal, shorter than the rayed dorsal, less than twice as long as high and obliquely rounded; pectoral fins acute and not or hardly shorter than the head, the spine thin, not or hardly shorter than the dorsal spine, pectoral spine laterally striped, its anterior side grainy near the base, feebly serrated near the top, posterior side armed with medium-sized teeth; ventral fins acute or rounded, varying very much in length, much shorter to hardly shorter than the pectoral fins, the posterior ray is sometimes tumid, very broad and cartilaginous; anal fin anterior part acute or slightly acute and rounded, feebly emarginate, about twice as long as adipose dorsal fin, longer than high; caudal fin has a deep incision and acute lobes, 114 the upper one longer than the lower one and varying very much in length, contained 4½ to 6 times in the length of the total body. Colour of upper part of the body deep-brown and slightly olive-coloured or olive-coloured, lower part whitish or silvery; adipose dorsal olive-coloured, other fins yellowish, more or less with dark speckles; iris yellow.

B. 6. D. 1/7 P. 1/10. V. 1/5. A. 7/11 to 7/13. C. 1/13/1 and shorter ones alongside.

Syn. *Arius venosus* CV. Poiss. XV. p. 52? Blkr, Verh. Bat. Gen. XXI, I Silur. bat. consp. p. 39.
Arius veiné CV. Poiss. XV p. 52.
Arius laeviceps Blkr, Verh. Bat. Gen. XXI. I, Silur. bat. consp. p. 38.
Arius micruropterygius Blkr, ibid. p. 38.
Ariius macruropterygius Blkr, ibid. p. 37.
Arius manjong Blkr, ibid. p. 36.
Arius micronotacanthus Blkr, ibid. p. 36.
Ikan Manjong utik Mal. Batav.

Hab. Java (Batavia, Surabaja), in sea.
Madura (Kammal), in sea.
Bintang (Rio), in sea.
Banka, in sea.
Singapora, in sea.

Length of the 20 specimens 200''' to 260'''.

Remark. Although the description of Arius venosus given by Mr Valenciennes does not permit to determine whether the above described species is that same species, or that his description refers to Cephalocassis utik Blkr, I believe I may bring it to the species under consideration, because it is more common than Cephalocassis utik and apart from near the above mentioned islands it is also found near Rangoon and Manilla.

The differences found in these species with regard to the relative length of the fin spines, of the head, of the ventral fins and the caudal fin and of the number of anal fin rays, at the start of my ichthyological investigations, led me to erect the species, mentioned above in the synonymy. Later observations have made it clear to me that they were all only one species.

It belongs to the group with slender fin spines and in relationship stands close to Cephalocassis utik, from which is distinguished however, by a remarkably 115 shorter and relatively higher head, and relative to the head longer fin spines, as well as by the shape of its groups of vomerine teeth, which here, in contrast to those of Cephalocassis utik, are broadly triangular, approaching each other very closely, with the tip directed backwards and the base directed to the band of premaxillary teeth.

Cephalocassis venosus does not seem to become larger than slightly more than three decimetres, as I have not seen any specimens exceeding that length.

Cephalocassis utik Blkr.
Atl. Silur. tab. III fig. 2.
Large-headed shieldhead fish

A Cephalocassis with an elongate body, anterior part about as broad as high, posterior part compressed, body depth contained 5¼ to 4¾ times in its length without, and 6½ to 6 times in its length with caudal fin. Head depressed, acute, contained 3½ to 3¼ times in length of body without, and 4½ to 4⅛ times in length of body with caudal fin; depth of head contained 1⅔ to 1¾ times in its length, width 1⅖ to 1⅗ times; eyes free, placed totally or nearly totally in the anterior half of the head, eye diameter contained 3¾ to 5 times in length of head, distance between the eyes 1½ to nearly 2 times their diameter. Head shield with a longitudinal groove (median fontanel) reaching the base of the supraoccipital crest, thin, dividing the entire head shield. The shield has no lateral or posterior fontanels and is smooth, sometimes covered with some granules only near the median groove and near the sides; supraoccipital crest triangular, slightly longer than the basal width, the median ridge is low, sometimes grainy, generally smooth at the sides or covered with very sparse granules, truncate or emarginate top reaching the short and smooth or feebly grainy second interspinal bone; snout depressed and convex, in younger fishes hardly longer than the eye, in older fishes not much longer than the eye, hardly protruding beyond the mouth opening, rostral profile rounded nearly crescent-shaped; jaw teeth multiple-rowed, acute and small, the upper jaw teeth placed in a nearly crescent-shaped band, the lower jaw teeth placed in crescent-shaped band; vomerine-palatinal teeth acute, placed in two triangular or nearly heart-shaped groups, smaller than the eye, the tip facing forwards and strongly converging, placed obliquely at a distance of less than their length from each other, in anterior part of the palate; mouth subinferior, its width contained 2⅓ to 2½ times in length of head; maxillary barbels reaching the humeral bone, outer lower jaw barbels, longer than inner ones, reaching the gill covers; anterior nostrils and posterior nostrils nearly touching each other, nearer to the tip of the snout than to the eye; anterior ones are round, the posterior ones are oblong and can be closed by a small valve that surrounds the total opening and is elevated anteriorly; gill cover and humeral bone smooth and veined, humeral bone medium-sized and acute; axillary slime pore conspicuous; lateral line branched, anterior part sloping downwards, posterior part straight, and forked at the base of the caudal fin. Rayed dorsal fin acute, higher than the body, more than twice as high as the length of the fin base, the spine thin, con-

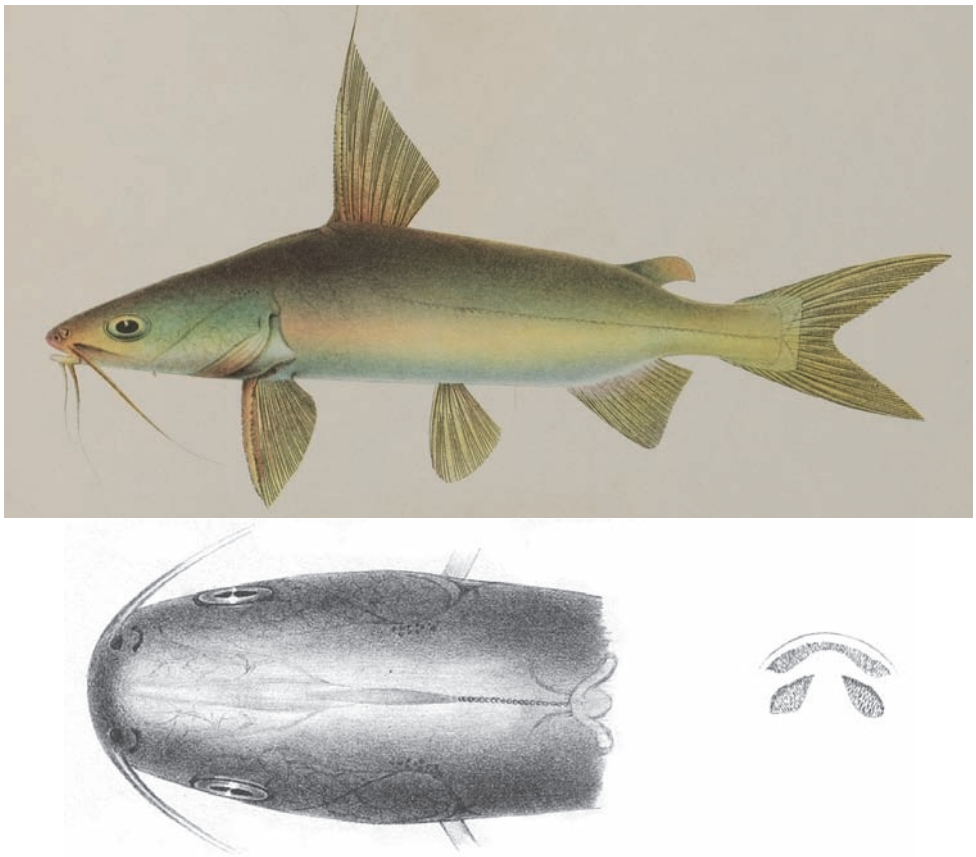

Fig. 17. *Cephalocassis utik* Blkr. [In Atlas as *Arius utik* Blkr.]

tained 1¼ to 1⅔ times in length of head, spine laterally striped, its anterior side grainy basally, the upper part feebly serrated, posterior side serrated with medium-sized, downwards pointing teeth, the prolonged filiform part less or more than twice as short as the spine itself; adipose fin placed at a distance of more than three times its length from the rayed 116 dorsal, slightly shorter than the rayed dorsal, less than twice as long as high and obliquely rounded; pectoral fins acute, contained 1⅓ to 1⅖ times in length of head, the spine thin, not or slightly shorter than the dorsal spine, spine laterally striped, its anterior side grainy near the base, feebly serrated near the top, posterior side armed with conspicuous teeth; ventral fins acute or acutely rounded, shorter than pectoral fins; anal fin anteriorly acute or acutely rounded, feebly emarginate. It is twice or nearly twice as long as the adipose dorsal fin and longer than high; caudal fin has a deep incision and acute lobes, the upper one longer than the lower one and contained 4¾ to about 5 times in the length of the total body. Colour: upper part of the body deep brown to slightly olive-green or pale olive-green, lower part whitish or silvery; adipose dorsal fin iridiscent-olive-coloured, sometimes more or less yellowish on top, other fins yellowish, more or less with dark speckles, iris yellow, barbels rosy-whitish.

B. 6. D. 1/7. P. 1/10. V. 1/5. A. 7/11 to 7/13 to 8/10 or 8/12. C. 1/13/1 and shorter ones alongside.

Syn. *Arius utik* Blkr, Verh. Bat. Gen. XXI, I Silur. batav. consp. p. 40.
Ikan Manong utik Mal. Batav.

Hab. Java (Batavia), in sea.

Length of the 11 specimens 200‴ to 225‴.

Remark. The species at issue is so closely related to the foregoing one, that a superficial examination would easily make them seem to be the same. However, it differs essentially by a remarkably larger and lower head, a different arrangement of the groups of vomerine teeth, which are slender triangular, placed very obliquely, with the base directed backwards and their diverging and the acute tips approaching each other very closely, etc.

In Batavia Cephalocassis utik is much more rare than Cephalocassis venosus and it does not seem to grow larger than its related species. I have observed it nowhere else than in Batavia, nor recived it from elsewhere.

Batrachocephalus Blkr.
Verh. Bat. Gen. XXI, I Silur, bat. consp. p. 52.
Froghead fish

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth conical or cylindrical, obtuse and multiple-rowed, with a glabrous space between the anterior and posterior series. Palatine teeth conical or cylindrical, placed obtusely on both sides in the anterior part of the palate in an oblong, longitudinal group. Vomer edentate. Two rudimentary, fleshy, lower jaw barbels. Eyes free and placed above the mouth corner. Branchiostegal membrane with 5 rays. Interbranchial 117 membrane not or hardly emarginate. Nostrils not tubular. Lower jaw prominent.

Remark. I discovered this genus in the year 1845 and described it at the place cited above. For a long time I possessed only one specimen, but after 1850 from time to time a new specimen enriched my collection, so that I now possess already tens of specimens and moreover I was able to send some to Leiden, Paris and Vienna. My previous diagnosis has had to be changed a little, since I perceived in the specimens I received later, that the lower jaw has two small barbels, which easily escape attention.

The genus is very remarkable and immediately recognisable by the habitus of the head, which greatly resembles that of a frog, a resemblance on which I have based the name. The eyes placed above the mouth cleft, the lower jaw bulging before the upper, the remarkable dentition, the strong development of the premaxillary bones, which are tightly connected with each other and with the broad inner process of the anteriormost frontals, and the withering of the maxillary bones which have been reduced to small pieces of bone, give Batrachocephalus a sharply delineated place in the division of the Ariodonts in which it indeed has to be placed near the genera Rita and Cephalocassis.

Buchanan undoubtedly has had this genus before him in his Ageneiosus mino, described on pp. 159 and 160 of his “Account of the fishes found in the Ganges and its branches” and it even would not surprise me if his Ageneiosus mino does not differ from the species for which I have erected the genus Batrachocephalus. The short barbels have no more been observed by Buchanan than by myself in the first instance, but everything he remarks about his Ageneiosus mino points at the genus under consideration and not at all at Ageneiosus Lac.

118 *Batrachocephalus micropogon* Blkr.
Atl. Silur. tab. XVII [Fig. 1].
Short-barbelled froghead fish

A Batracephalus with an elongate body, the anterior part slightly or hardly higher than broad, posterior part compressed, body depth contained 4½ to slightly more than 4 times in its length without, and 5⅔ to slightly more than 5 times in its length with caudal fin. Head depressed and acute, contained 3⅘ to 3⅖ times in length of body without, and 4⅘ to 4¼ times in length of body with caudal fin; depth of head contained 1⅖ to 1¼ times in its length, width 1⅖ to 1½ times; eyes placed above the corner of the mouth, eye diameter contained 4 to 4½ times in length of head, distance between the eyes 1¾ to 2 times their diameter. Head shield mainly at the top covered with small granules, the longitudinal groove divides only the anterior half; supraoccipital crest covered with a large number of small granules, slightly longer than the basal width, its emarginate top reaching the rough, triangular, short second interspinal bone; snout depressed and slightly convex, shorter than the eye, rostral profile rounded crescent-shaped; nostrils close to the orbit, posterior and anterior one nearly touching each other, the anterior ones round, the posterior ones are oblong with valves; two barbels on the chin very small, very thin, generally shorter

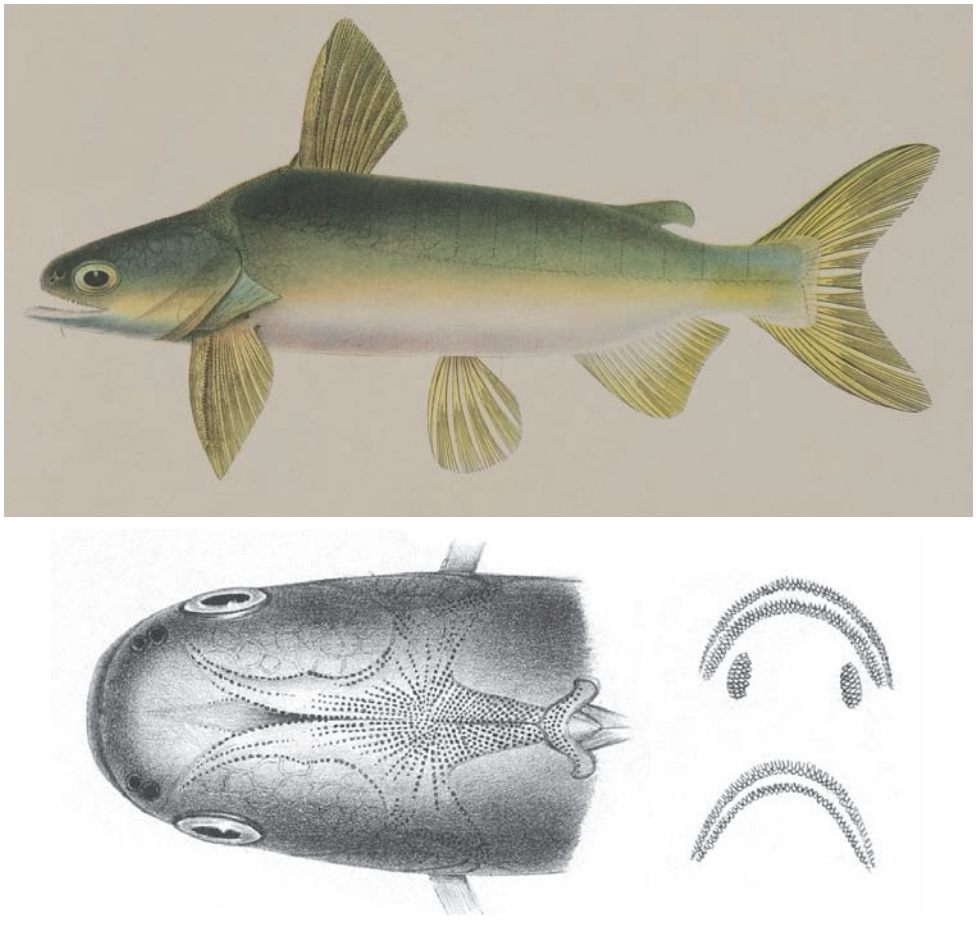

Fig. 18. *Batrachocephalus micropogon* Blkr.

than the pupil. Jaw teeth and palatine teeth cylindrical or conical and obtuse, placed in the jaws in 4 or 5 rows, with a small edentate space between the outer and inner rows, the premaxillary teeth forming a broad, crescent-shaped band, the lower jaw teeth forming a broad band reminding of a horseshoe; palatine teeth placed in two oblong, small groups, placed far from each other but close to the band of premaxillary teeth; lower jaw slightly longer than the upper jaw; mouth placed under the eye, the posterior margin contained 2¼ to 2⅓ times in length of head; gill cover smooth and slightly veined: humeral bone acute and rough; axillary slime pore conspicuous; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin, rayed dorsal fin acute, slightly lower or higher than the body, more than twice as high as the length of the fin base, the spine thick, contained 1⅓ to 1½ times in length of head, spine laterally rough, the anterior side granulated basally, the upper part feebly serrated, posterior side totally serrated with small teeth; adipose dorsal fin placed at a distance of more than three times its length from the rayed dorsal, generally slightly shorter than rayed dorsal, longer than high and obliquely rounded; pectoral fins acute, contained 1⅓ times to slightly more than once in length of head, the spine thick, generally slightly longer than the dorsal spine, spine laterally rough, its anterior side granulated near the base and serrated near the top, posterior side totally serrated with conspicuous teeth; ventral fins obtusely angular or rounded, shorter than the pectoral fins; anal fin slightly acute, feebly emarginate, its length contained 5¾ to 6½ times in length of body without caudal fin, longer than high; caudal fin has a deep incision and acute lobes, the upper one generally longer than the lower one and contained nearly 5 to 5½ times in length of the total body. Colour of upper part of the body bluish-green, lower part pearly or silvery-whitish; fins yellowish-hyaline or pearly on the membrane, dorsal fins generally densely with dark speckles, caudal fin with a wide but diffusely dark margin, iris yellow.

B. 5. D. 1/7. P. 1/9. V. 1/5. A. 7/12 to 7/14. C. 1/13/1 and shorter ones alongside.

Syn. *Ageneiosus mino* Buch. Gang. Fish. p. 159, 375.
Batrachocephalus ageneiosus Blkr, Verh. Bat. Gen. XXI, I, Silur. bat. consp. p. 52.
Ikan Manjong kodokh Mal. Batav.

Hab. Java (Batavia, Surabaja), in sea and in brackish water.
Sumatra (Palembang), in the Mussi river.

Length of the 10 specimens 180‴ to 248‴.

119 Remark. As the name previously given to this species, probably cannot be preserved because it was based on a wrongly recorded character, I propose to name it micropogon after its exceptionally small barbels. It does not seem improbable to me that the Bengal species, found by Buchanan in the higher parts of the rivermouths of Bengal, where the water is only a little or not at all brackish, does not differ from the one at issue. The description of Ageneiosus mino Buch., although rather extensive, deals more with general generic characters than with specific peculiarities, so that it can fit more than one species and does not permit to judge whether the Bengal species differs from that of Java and Sumatra. When I, as yet, take the two species to be different, it is only because of the large distance between their habitats, although more than one Bengal siluroïd also lives in the Sundanic waters.

Osteogeneiosus Blkr.

Verh. Bat. Gen. XXI, I Silur. bat. consp. p. 49.

Bonethread fish

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth multiple-rowed, small and acute. Palatine teeth placed in two oblongly arcuate groups in anterior part of the palate, the middle line of the palate glabrous. Barbels: 2 maxillary barbels, bony and rigid. Eyes free and posterior. Branchiostegal membrane with 5 rays.

Interbranchial membrane with angular incision, incision ending posterior to the eye. Nostrils not tubular.

Remark. The genus Osteogeneiosus, erected by myself at the cost of the genus Arius of Mr Valenciennes, is very natural and recognisable not only by its bony barbels or elongated premaxillary bones, but also by the absence of vomerine teeth, the arrangement of the palatal teeth in two curved elongated, at the outer side convex and at the tips converging groups, and the strong development of the anterior most frontals and their cell-like structure.

I possess of this genus 3 species, one of them from Bengal, described 120 by me under the name Osteogeneiosus Cantoris in my Nalezingen op de ichthyologische fauna van Bengalen en Hindostan, and two from the Indian archipelago.

The two species of this archipelago in former times were erroneously considered by me to belong to various species. At the onset of my ichthyological explorations I attached more value to small differences in relative lengths of head and barbels and the extendability of the branchial skin than later observations could justify, and thus I have reduced my six previous species to two, described below as Osteogeneiosus Valenciennesii and Osteogeneiosus macrocephalus.

The first species that became known of this genus, is Silurus militaris L. The characters, ascribed to it by Linnaeus, however, fit all of the four now known species and therefore it is completely uncertain to which of those species Silurus militaris must be brought. This is the great shortcoming of the diagnoses of Linnaeus, who, with the still scarce natural history material of his time, believed it possible to characterise a species in a few words. He could not know that the stimulus to the study of nature caused by his books, in a few generations would lead to the discovery of thousands and thousands of new species of plants and animals, which would reject his diagnoses because of their shortness as unusable or insufficient.

Of the 4 species known at present, Osteogeneiosus Cantoris departs remarkably from the other 3 because of its strongly granular-like head shield and the remarkable development of the anteriormost frontals.

Of the remaining three species, Osteogeneiosus militaris CV. and Osteogeneiosus Valenciennesii Blkr are very closely related, if not the same species, which for the moment cannot be determined. Osteogeneiosus macrocephalus distinguishes itself from the remaining species primarily by its remarkably large head.

The two or three species of the Indian archipelago can be recognised according to the following scheme.

121 I. Head shield totally or nearly totally glabrous.

a. Head contained 4⅓ to 4⅝ times in length of total body.

† Body depth contained 6¼ to 6¾ times in its total length. Longititudinal diameter of eyes contained 4½ to 5⅓ times in length of head, distance between the eyes 2⅓ to 2½ times their diameter.

Osteogeneiosus Valecienesii Blkr.

† Body depth contained 5 times to slightly more than 5 times in its total length. Longitudinal diameter of eyes contained 6 times to slightly more than 6 times in length of head, distance between eyes 5 (or 3?) times their diameter.

Osteogeneiosus militaris CV.

b. Head contained 3⅝ to 4⅙ times in length of total body.

Osteogeneiosus macrocephalus Blkr.

Osteogeneiosus Valenciennesii Blkr.

Verh. Bat. gen. XXI, I Silur. bat. consp. p. 51. Atl. Silur. tab. XV.

Valenciennes' bonethread fish

An Osteogeneiosus with an elongate body, anterior part deeper than broad or as deep as broad, posterior part compressed, body depth contained 5½ to 5¼ times in its length without, and 6¾ to 6¼ times in its length with caudal fin. Head slightly convex and acute, contained 3⅘ to 4⅙ times in length of body without, and 4⅓ to 4⅝ times in length of body with caudal fin; depth of head contained 1⅔ to 1¾ times in its length, width 1⅖ to 1½ times; eyes about twice as long as high, longitudinal diameter contained 4½ to 5⅓ times in length of head, distance between the eyes 2⅓ to about 2½ times the longitudinal diameter. Head shield glabrous and slightly veined, on the crests sometimes only from this point onwards covered with sparse small granules, with a longitudinal groove not reaching the base of the supraoccipital crest, dividing nearly the entire head shield; anterior frontal bone cellular and nearly club-shaped, anterior part thinner than the eye, with numerous bony cells under the skin or more or less conspicuous; supraoccipital crest in the middle not or hardly broader than the base, about three times as long as broad, longitudinally rough and grainy, its top reaching the second interspinal bone; snout slightly convex, less than twice as long as the eye, rostral profile rounded crescent-shaped; nostrils close to each other, posterior ones oblong and anterior ones round, placed at a distance of more than an eye diameter in front of the orbit; barbels reaching or overreaching the humeral bone. Jaw teeth small, multiple-rowed and acute, the upper jaw teeth placed in a crescent-shaped band, the lower jaw teeth in a band of which the form reminds slightly of a horseshoe; palatine teeth conical-grain-like or grain-like, placed in 2 oblong, curved groups, which converge anteriorly and posteriorly; gill cover veined; 122 humeral bone short, acute and smooth; axillary slime pore conspicuous; lateral line anterior part branched, posterior part generally simple; dorso-lateral pores inconspicuous, placed in 12 to 15 transverse, parallel lines. Rayed dorsal fin acute, slightly or not higher than the body, twice or more than twice as as high as the length of the fin base, the spine medium-sized, contained 1¼ to 1⅖ times in length of head, its anterior side granulated, posterior side serrated with small teeth; adipose dorsal fin placed at a distance of more than four times its length from the rayed dorsal. It is shorter than the rayed dorsal, about as high as the length of the fin base and obliquely rounded; pectoral fins acute, contained 1⅖ to 1⅔ times in length of head, the spine medium-sized, generally shorter than dorsal spine, its anterior side granulated and serrated with small teeth, posterior side totally serrated with small teeth; ventral fins obtuse and rounded, shorter than the pectoral fins; anal fin slightly acute, emarginate, its length contained 1⅗ to 1⅖ times in length of head, longer than high; caudal fin has a deep incision and broad lobes, which are nearly equal, the fin contained 5¾ to 6¼ times in the length of the total body. Colour of upper part of the body brightly bluish-green or olive, lower part silvery or whitish; fins yellowish, flanks, belly and fins frequently with dark speckles. Adipose dorsal fin with a large violet-black spot on top.

B. 5. D. 1/7. P. 1/9 or 1/10. V. 1/5. A. 6/14 to 6/17. C. 1/15/1 and shorter ones alongside.

Syn. *Osteogeneiosus gracilis* Blkr, Verh. Bat. Gen. XXI. I Silur. bat. consp. p. 51.
Osteogeneiosus Blochii Blkr, ibid p. 51.
Ikan Manjong-karbo Mal. Batav.
Ikan Lundu Indig Samar.
Ikan Keting Indig Surabaja.

Hab. Java (Batavia Samaraug, Surabaja, Pasuruan), in sea and in brackish water.
Banka (Paukalpinang), in brackish water.

Length of more than 20 specimens 210‴ to 350‴.

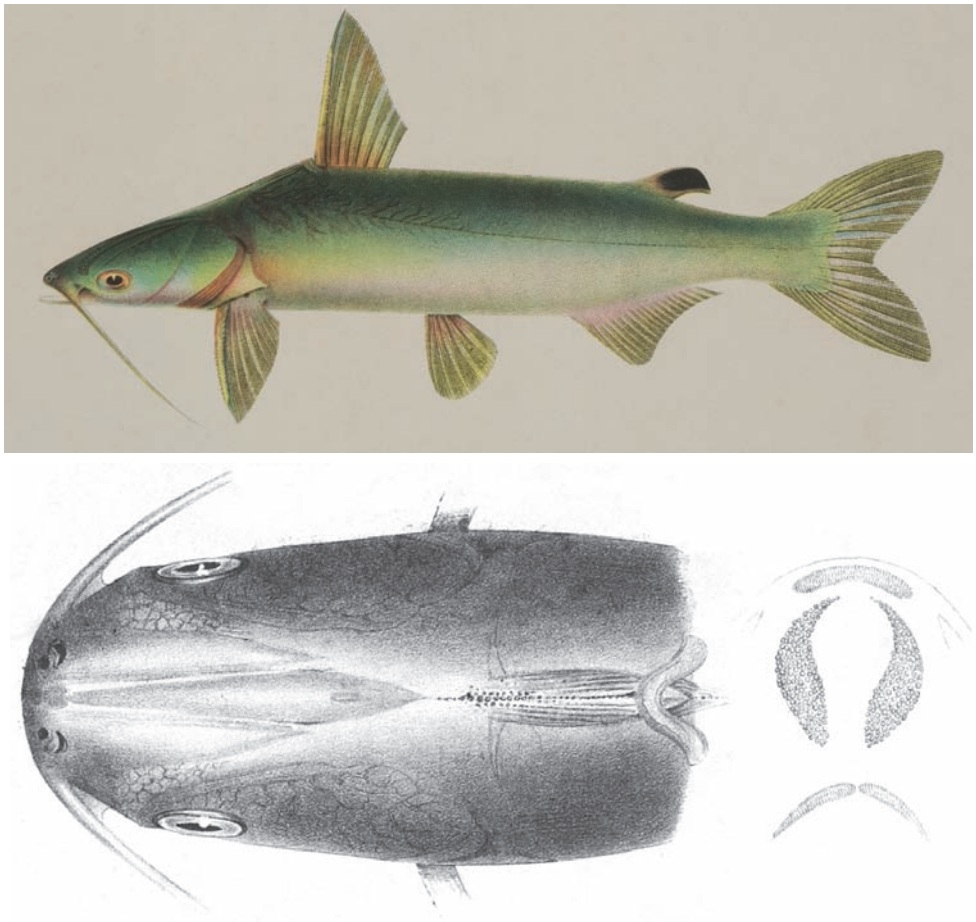

Fig. 19. *Osteiogeneiosus Valenciennesii* Blkr.

Remark. After I had concluded from the examination of a large series of specimens of the species at issue, that my Osteogeneiosus Valenciennesii, Osteogeneiosus gracilis and Osteogeneiosus Blochii can be reduced to individual varieties of one and the same species, I believed I had to test this species once more against the description and figure of Arius militaris made public by Mr Valenciennes in order to determine whether my three nominal species possibly also would not sufficiently resemble Arius miltaris Val. to arrange them all under the last mentioned species. For this comparison I have chosen specimens of the same size as the one described by Mr Valenciennes. However, I find in my specimens so many deviations from Arius militaris Val. that I can only conclude that Arius militaris indeed is a different species. In order to make these differences more apparent, I will cite here those parts 123 of the description of Mr Valenciennes, which are related to this.

"Sa hauteur est un peu plus de cinq fois dans sa longueur. Sa hauteur (de la tête) est de moitié de sa longueur. Son diamètre longitudinal (de l'oeil) est d'un peu plus

d'un sixième de la longueur de la tête. Il y a cinq de ses diameters d'un oeil à l'autre. Sa forme (de la production interpariétale) est une ellipse alongée."

According to these details in Arius militaris Val. the body would be less slender, the head lower, and the eyes smaller and be placed much wider apart and the supraoccipital crest would be rounded ellipsoid shaped.

Mr Cantor when giving a new description of the species (Catal. Mal. Fishes p. 259-26.) he considers to be Arius militaris CV., speaks of a black axil spot and eyes that stand only 3 diameters apart. The last character therefore would answer more to Osteogeneiosus Valenciennesii, although the description of Mr Cantor for the rest resembles more that [the species of] of Mr Valenciennes.

Only a direct comparison of the specimens, observed by Mr Valenciennes and Mr Cantor, with those collected by myself, will enable to judge whether both species differ essentially or fall together.

In Batavia Osteogeneiosus Valenciennesii is although not common, also not rare, being brought to the market from time to time, but always only a few specimens. It is considered to be, like all other species of Siluroïds in Batavia, a rather unpalatable species and therefore is only eaten by natives and Chinese people.

Osteogeneiosus militaris Blkr.
Soldier bonethread fish

An Osteogeneiosus with an elongate body, posterior part compressed, body depth contained 5 to slightly more than 5 times in its total length. Head contained 4⅓ to 4⅝ times in the length of the total body. Head shield totally or nearly totally glabrous. Eyes with a longitudinal diameter contained 6 to slightly more than 6 times in length of head, distance between the eyes 5 (?) times their diameter.

124 B. 5. D. 1/6. P. 1/10. V. 6. A. 19. C. 17.

Syn. *Silurus militaris* L. Syst. nat. ed. 13" p. 1356? (nec Bl.),
Arius militaris CV. Poiss. XV p. 85 fig. 430, Cant. Catal. Mal. Fisch. p. 959.
Arius à deux traits CV. Poiss. XV p. 85 fig. 430.

Hab. Singapora, Pinang, Malacca (Cantor), Hindostan, Bengalen, Pegu (Valenc).

Remark. As I do not possess this species, if it really is different from Osteogeneiosus Valenciennesii, I have only described it above by its main characters by which it would differ from other species. If the illustration in the large Histoire naturelle des Poissons can claim a sufficient measure of detail, my opinion regarding the difference between the two species is at least strengthened, as the shapes of the body in this figure are more compressed and the head presented more flattened than they are in Osteogeneiosus Valenciennesii. This opinion moreover is explained in more detail under the description of the last mentioned species.

Osteogeneiosus macrocephalus Blkr.
Verh. Bat. Gen. XXII, Silur. Bat. consp. p. 49., Atl. Silur. tab. XVI.
Large-headed bonethread fish

An Osteogeneiosus with an elongate body, anterior part broader than deep or equally broad as deep, posterior part compressed, body depth contained 6 to 5¼ times in its length without, and 7½ to 6½ times in its length with caudal fin. Head convex and acute, contained 3⅔ to 3⅖ in length of body without, and nearly 4 to 4⅛ times in length of body with caudal fin; depth of head contained 2 to 2⅕ times in its

length, width 1⅔ to 1⅘ times; eyes about twice as long as high, longitudinal diameter contained about 6 times in length of head, distance between the eyes about 2½ times the longitudinal diameter. Head shield glabrous and slightly veined, on the crests sometimes only from this point onwards covered with sparse small granules, the longitudinal groove not reaching the base of the supraoccipital crest, dividing nearly the entire head shield; Frontal bone anterior part cellular, nearly club-shaped, anteriorly much more narrow than the eye, with numerous bony cells which are inconspicuous, because the skin covers them; supraoccipital crest generally broader in the middle than at the top and base, about three times as long as broad, longitudinally rough and grainy, its top reaching the second interspinal bone; snout convex, less than twice as long as the eye, rostral profile rounded, crescent-shaped; nostrils placed close to each other, the anterior ones round an the posterior ones oblong, placed more than one eye diameter before the orbit; barbels reaching or nearly reaching the humeral bone. Jaw teeth small, multiple-rowed and acute, the upper jaw teeth placed in a crescent-shaped band, the lower jaw teeth placed in a band of which the 125 form reminds slightly of a horse-shoe; palatine teeth conical-grain-like, placed in 2 oblong, curved groups, which converge anteriorly and posteriorly; gill cover veined: humeral bone short, acute and smooth; axillary slime pore con-

Fig. 20. *Osteiogeneiosus macrocephalus* Blkr.

spicuous; anterior part of lateral line branched, posterior part simple; dorso-lateral pores inconspicuous and small, placed in 12 to 15 transverse, parallel lines. Rayed dorsal fin acute, not or slightly higher than the body, more than twice as high as the length of the fin base, the spine medium-sized, contained 1⅔ to 1½ times in length of head, its anterior side granulated, posterior side serrated with small teeth; adipose dorsal fin placed at a distance of more than four times its length from the rayed dorsal fin, shorter than the rayed dorsal, about as high as length of the fin base and obliquely rounded; pectoral fins acute, contained 1⅔ to 1¾ times in length of head, the spine medium-sized, generally shorter than the dorsal spine, its anterior side granulated, posterior side serrated with small teeth; ventral fins obtuse and rounded, much shorter than the pectoral fins; anal fin acute, feebly emarginate, length contained 1¾ to 2 times in length of head, higher than long; caudal fin has a deep incision and broad lobes, nearly equal, slightly acute, contained 5¾ to 6⅔ times in the length of the total body. Colour of upper part of the body brightly bluish-green or gold-olive, lower part pearly or whitish; fins yellowish, flanks, belly and fins more or less with dark speckles, adipose dorsal fin with a large violet-black spot in the upper part.

B. 5. D. 1/7. P. 1/9 or 1/10. V. 1/5. A. 5/14 to 5/17. C. 1/15/1 and shorter ones alongside.

Syn. *Osteogeneiosus longiceps* Blkr, Verh. Bat. Gen. XXI, I Silur. batav. consp. p. 50.
Osteogeneiosus ingluvies Blkr, ibid. p. 50.
Ikan Manjong-kabo Mal. Batav.
Ikan Keteng Indig. Surabaj.
Ikan Songop Indig. Pasur.

Hab. Java (Batavia, Samarang, Surabaja, Pasuruan), in sea and in brackish water.
Madura, in sea.

Length of the 8 specimens 260‴ to 304‴.

Remark. Just like Osteogeneiosus Valenciennesii has appeared to me to contain two other nominal species, my former species Osteogeneiosus longiceps and Osteogeneiosus ingluves dissolve themselves in Osteogeneiosus macrocephalus. The relative lengths of the head, although separating this species from Osteogeneiosus Valenciennesii at first glance, show minor differences, to which I previously attached too much value and the very week skin of the throat in one of my specimens which could be extended in a wide gizzard, was the principal reason for erecting my Osteogeneiosus ingluvies.

The species at issue is much more rare than Osteogeneiosus Valenciennesii and is brought to the market in Batavia only a few times as simple individuals.

126 Hexanematichthys Blkr.
Kedoekan

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw and vomero-palatine teeth multiple-rowed, small and acute, vomero-palatine teeth placed in a transverse, quadripartite band in the anterior part of the palate. Six fleshy barbels. Branchostegial membrane with 7 rays. Nostrils not tubular, posterior ones with valves. Interbranchial membrane hardly emarginate.

Remark. With regard to its dentition the genus Hexanematichthys is closely related to Bagrus. However, whereas the band of vomerine teeth in Bagrus is undivided, in Hexanematichthys it clearly consists of four different, though connected groups, two on each side of the median of the palate.

Moreover Hexanematichthys differs from Bagrus because the nasal barbels are lacking, the nostrils are placed close together near the anterior edge of the snout, the

anterior nostrils are not tube-shaped, and the posterior ones can be closed with a kind of valve. Further differences consist of the branchiostegal membrane being hardly concave, the low number of branchiostegal rays, and moreover in the entire shape of the body, which because the form of the head shield and the covering of the neck is a totally different one, than encountered in any species of Bagrus.

Of Hexanematichthys I possess only one species, i.e. Hexanematichthys sundaicus, the same one, which in the large Histoire naturelle de Poissons is described under the names Bagrus sondaicus and Bagrus javanensis.

In the same large work some other species have been described, which I believe must also be placed in this genus, like Bagrus chinta CV. and Bagrus sagor CV. from Hindustan and Bengal, species by the way, of which the differences with Hexanematichthys sundaicus should be made clearer than has been done till now, in order to keep considering them as separate species. I believe that two species from the North west coast of New Holland, described from badly preserved specimens by Mr Richardson in the Zoology of the journey of the 127 Erebus and Terror also should be placed in this genus. These species with the names Bagrus vanatius and Bagrus vertagus differ primarily from Hexanematichthys sundaicus by their numerous anal fin rays (28 through 30). Maybe? Bagrus crinalis Richds. from Canton might also be placed in this genus, but this species is only described after a drawing so as yet nothing can be said with certainty about this. With more certainty can be placed in Hexanematichthys the species described and depicted by Mr Valenciennes under the name Bagrus doroides, a species which seems to be closely related to the Sundanese Kekoedan. It differs from this species mostly by a three lobed supraoccipital process, blunt and sharply delineated anterior border of the head shield and more developed and more numerous bony plates on the anterior part of the lateral line. Judging by the knowledge now available I believe that the characters of the only species in my collection principally come down to the following.

I. Supraoccipital crest not lobed. Anal fin with about 18 or 19 rays.

Hexanematichtys sundaicus Blkr.

Hexanematichthys sundaicus Blkr.
Atl. Silur. tab. XIV.
Sundanese Kedoekan

An Hexanematichtys with an elongate body, anterior part broader than deep, posterior part compressed, body depth contained 5½ to nearly 6 times in its length without, and 7 to 6⅔ times in its length with caudal fin. Head depressed, acute, contained 4 to 3¾ times in length of body without, and 5 to about 4⅔ times in length of body with caudal fin; depth of head contained 1½ to 1¾ times in its length, width slightly more than once; eyes free, more sideways than upwards facing, eye diameter contained 5 to 7⅓ times in length of head, distance between the eyes 2 tot 3⅓ times their diameter. Head shield very grainy, granules arranged in the form of rays or ray-like, posterior part slightly longer than broad, the anterior half divided by the longitudinal groove, posterior part merging with the supraoccipital crest; supraoccipital crest scutiform, broader than long at the base, middle line carinate, posterior part broadly rounded, entering the incision of the broad, granulated, carinate, scutiform, two-winged spinal bone; snout depressed and convex, longer than the eye, rostral profile very obtusely rounded; mouth nearly crescent-shaped, its width contained about 2 times in length of head. Jaw teeth and vomero-palatine teeth multiple-rowed, acute, equal

and small, placed in nearly crescent-shaped groups, the vomerine-palatine band divided in 4 touching or nearly touching rounded 128 groups; mouth subinferior; 6 fleshy barbels, maxillary barbels reaching or overreaching the pectoral fins. Outer lower jaw barbels, longer than inner ones, reaching or nearly reaching the pectoral fins; nostrils large, close to each other, the posterior ones oblong, the anterior ones round and larger; gill covers in younger fishes hardly or not grainy, in older fishes very grainy; preopercular margin, scapular bone and anterior part of the lateral line in older fishes frequently scabby with granules: humeral bone acute, grainy, more than twice as short as the head; axillary slime pore conspicuous; dorso-lateral pores small, but conspicuous, placed in 14 transverse, parallel simple lines; lateral line forming small inferior branches, anteriorly sloping downwards, posterior part more or less straight; rayed dorsal fin acute, generally higher than the body, the spine thick, slightly longer to twice as long as the head, grainy, the posterior and anterior side serrated with small teeth near the top; adipose dorsal fin shorter than rayed dorsal, placed at a distance of three to four times its length from the rayed dorsal, less than twice as long as high and obliquely rounded; pectoral fins acute, shorter than the head, the spine thick, generally longer than the dorsal spine, granulated, the posterior and anterior side serrated with conspicuous teeth near the top; ventral fins acute or rounded, much shorter than the pectoral fins; anal fin angular, anterior part generally rounded, lower than the body, much longer than the adipose fin; caudal fin with a deep incision and acute lobes, the upper one longer than the lower one, contained about 5 times in the length of the total body.

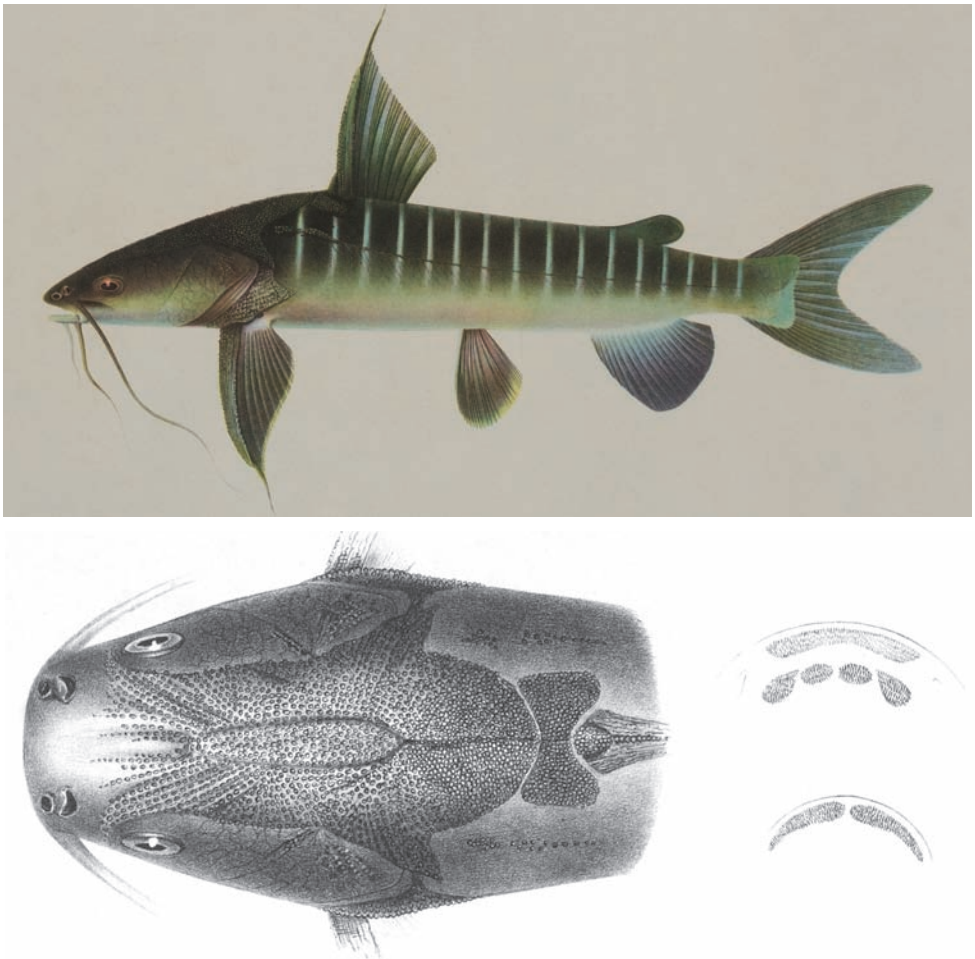

Fig. 21. *Hexanemathichthys sundaicus* Blkr. [Head and dentition 75% of original size.]

Colour of upper part of the body deeply olive-green or bluish-olive, lower part white or rosy-pearly, the back and flanks at the upper part with 10 or more transverse separate parallel bands, (disappearing when specimens are kept in alcohol), fins with yellowish rays, membrane slightly violet-hyaline more or less with dark speckles, adipose fin generally slightly olive-coloured, maxillary barbels olive-dark or blackish.

B. 7. D. 1/7. P. 1/11. V. 1/5. A. 7/11 or 7/12. C. 1/13/1 and shorter ones alongside.

Syn. *Bagrus sondaicus* CV. Poiss. XIV p. 329, Blkr, Verh. Bat. Gen. XXI, I, Silur. batav. consp. p. 29. Cantor Catal. Mal. Fish. p. 255.
Bagre de la Sonde CV. Poiss. XIV p. 329.
Bagrus javensis CV. Poiss. XIV p. 330.
Bagre de Java CV. Poiss. XIV p. 330.
Ikan Kedukan Mal. Batav.

Hab. Java (Batavia, Bantam, Surabaja, Kamma1, Pasuruan), in sea and river mouths.
Madura (Kammal), in sea.
Sumatra (Palembang), in the mouth of the river Mussi river.
Banka (Pankalpinang), in brackish water.
Borneo (Sinkawang), in brackish water.

Length of the 40 specimens 140''' to 443'''.

Remark. It can be said that the Kedoekan with Bagrus gulio CV. and Cephalocassis caelatus Blkr in Batavia is the most common catfish. The species, just like the Loendoe (Bagrus gulio CV.), is mainly found in river mouths and along muddy 129 beaches. In Batavaia there is hardly a day on which it is not brought to the market and it comes often in proahs full. However, it has little value and is only eaten by the lower class of the native people.

The species grows to at least half a metre, however the specimens brought to the market as a rule are not much longer than 3 to 5 decimetre.

Hexanematichthys sundaicus is viviparous or anyway the eggs at least develop in the ovaria till they reach the size of marbles. When the eggs leave the body of the mother, the young fishes are completely developed and move around very lively on the then still large yolk sac, with which they freely swim in the first period of their existence outside the mother. The eggs are not very numerous. In a large specimen I found in the left ovary 16 eggs of a size of small marbles and 15 of a similar size in the right egg nest. However on the inner side of the ovary moreover a hundred eggs in the size of hail grains were attached.

The intestines, without stomach, has approximately the same length as the total body. The stomach forms a large blind pouch, taking up approximately one third of its entire length. The duodenum, leaving the stomach, goes past it and closely connected to it by cell tissue and blood vessels runs forward uptil the oesophagus or cardia, where it bends to the right and changes into the remaining intestinal canal the twistings of which are connected by a strong mesenterium. The swim bladder tube opens itself in the first quarter of the stomach, on its posterior side. In the stomach I usually found small shells, gastropods and crustaceans. The swim bladder has a thick wall, not divided in cells but only in two lateral halves, which represent two pouches separated by a membrane.

Of the four groups of vomero-palatine teeth, the two medial ones are sometimes, but very rarely, united, just like in some species of Pangasius.

130 The kedoekan lives, besides near the mentioned islands, also near Pinang and Malakka.

Bagrichthys Blkr.
Liptooth fish

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth and vomero-palatine teeth multiple-rowed and acute, the vomero-palatine teeth placed in a continuous crescent-shaped band, the lower jaw teeth in a double band. Lower jaw teeth in inner band very small, multiple-rowed, in outer band in three or four rows, elongate and subulate. Eight barbels, fleshy, lower jaw barbels appendiculate. Head covered with glandular skin. Eyes covered by skin of the head. Branchiostegal membrane with 7 rays. Nostrils separate from each other, the posterior ones foramen-formed, anterior ones tubular. Skin in postscapular area villous.

Remark. I separate from the other Bagrus species under a generic name of its own a very remarkable species that I discovered in 1852 and described under the name Bagrus hypselopterus. Indeed this species possesses peculiarities in its habitus and dentition, which in every way legitimize its raising to a genus of its own. Especially remarkable is the dentition of the lower jaw. The edge of the jaw itself is covered with very small, hardly visible teeth, placed in several rows, but anterior to these in the gums and also between jaw and under lip, appears a band of piercer shaped, slightly curved, movable teeth, which are set in 3 or 4 rows and surpass the true lower jaw teeth as well as the premaxillary- and vomerine palatal teeth considerably in length. This dentition, as well as the appendages with which the lower jaw barbels are provided, indicate a strong relationship of Bagrichthys with the African genus Synodontis, and indeed it seems to replace the genus Synodontis in the Indian archipelago. But that does not mean Bagrichthys can be combined with Synodontis to form one genus. Synodontis differs considerably from Bagrichthys 131 in general habitus and the shape of the head shield, which with its extensions also covers the nape with a broad shield; and moreover the dentition is also not entirely the same, whereas the vomerine palatal teeth are even totally lacking, at least in Synodontis macrodon Is. Geoffr. S. Hil., in which I see this character especially mentioned.

Bagrichthys hypselopterus Blkr.
Atl. Silur. tab. XX.
High-finned liptooth fish

An Bagrichthys with an elongate and compressed body, body depth contained 3⅗ to 3¼ times in its length without, and 5½ to slightly more than 5 times in its length with caudal fin. Head compressed, convex and slightly acute, contained 6¼ to 7 times in length of body without, and more than 9 to 11 times in length of body with caudal fin: Depth of the head contained about once in its length, width 1½ to 1⅓ times; rostral head profile strongly sloping, with a concave nape and very convex snout; eyes facing sideways, eye diameter contained 7 to 8 times in length of head, distance between the eyes 2 to 3 times their diameter. Head shield glabrous, covered with glandular skin, longitudinal groove reaching or nearly reaching the base of the supraoccipital crest, dividing the head shield; supraoccipital crest thin, in younger fishes glabrous, in older fishes rough, three times or more than three times as long as the basal width, its top is emarginate, embracing the elongate and rough first interspinal bone; snout very convex, more than twice as long as the eye, rostral profile slightly acutely rounded; premaxillary teeth multiple-rowed, conical, small, nearly equal, placed in a broad, bipartite, slightly

curved band, vomero-palatine teeth multiple-rowed, small, equal, placed in a thin, continuous, feebly curved band; lower jaw teeth: inner teeth multiple-rowed, very small and equal, placed in a broad, bipartite, hardly curved band, outer teeth labial, setiform, subulate, inequal, feebly curved, placed in three or four rows, darkening at the top; mouth anterior; 8 barbels, nasal barbels reaching the preopercle or the gill cover, maxillary barbels reaching the humeral bone, lower jaw barbels with a short appendage, outer ones, longer than inner ones, reaching or nearly reaching the gill covers; Interbranchial membrane slightly emarginate. Gill cover and scapular bone glabrous: humeral bone very acute and rough; axillary slime pore conspicuous; lateral line anterior part without any visible filaments or with some hardly visible filaments, simple, anterior part curved, posterior part straight; back much elevated, angular. Rayed dorsal fin with a very long spine, first ray is much higher up to twice as high as the body. The spine is compressed and rough, posterior side serrated with conspicuous upwards facing teeth; adipose dorsal fin touching the rayed dorsal fin, less than twice as short as length of body without caudal fin and five times or six times as long as rayed dorsal, five or more than five times as long as high, the upper margin convex in a regular way; pectoral fins acute, not or slightly longer than the head, its spine thick, not or slightly longer than the head, rough, posterior side serrated with small teeth; ventral fins acute, slightly longer or equal to the pectoral fins; anal fin acute, less than twice as low as the body, much higher than long, placed opposite the middle of the adipose dorsal fin, and nearly five to six times as short as this; caudal fin with a deep incision and very 132 acute lobes, more or less prolonged into filaments, contained less than 3 times in the length of the total body. Colour of body deep brown-darkish, with 4 very broad, irregular bands of a deeper dark colour, the 1st band cephalic, 2nd dorso-ventral, 3rd adipose-postanal and the 4th caudal; adipose and caudal fin dark, other fins dark-violet-coloured.

B. 7. D. 1/7. P. 1/10 or 1/11. V. 1/5. A. 5/10 or 4/11. C. 1/15/1 and shorter ones alongside.

Syn. *Bagrus hypselopterus* Blkr, Diagnost. Beschr. Vischs. Sumatr. Tiental I - IV Nat. Tijdschr. Ned. Ind. III p. 588 tab.

Hab. Sumatra (Palembang), in Mussi river.
Borneo (Sintang), in Kapuas river.

Length of the 3 specimens 200‴ to 402‴.

Fig. 22. *Bagrichthys hypselopterus* Blkr.

Remark. When I described this species for the first time from my smallest specimen, I brought it to the genus Bagrus. Two specimens that I received later, made me observe more peculiarities in the build of this remarkable species, which made clear without any doubt that it belongs to a proper genus, which has to be placed next to Synodontis.

Bagroides Blkr.
Bagrodes

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth and vomerine teeth multiple-rowed, small, conical or grain-like, vomerine teeth placed in a rounded, oval or crescent-shaped, undivided group. Lower jaw teeth placed in a simple band. 8 Fleshy barbels. Eyes totally covered with head skin. Interbranchial membrane without incision. Branchiostegal membrane with 7 or 8 rays. Anterior nostrils tubular, posterior nostrils not tubular. Head covered with glandular skin. Teeth on dorsal spine facing upwards. Snout conical. Skin in postscapular area villous.

Remark. I erected this genus in the year 1851 for a species from the rivers of Borneo, which I then named Bagroides melapterus [= melanopterus]. Since then I discovered two more species, which belong to the same genus and which have taught me that the generic 133 characters that I indicated earlier have to undergo some changes.

The principal characters by which Bagroides can be distinguished from Bagrus (following my definition) lie in the dentition of the palate where only the vomerine bone and not the palatine bones bear teeth; as well as in far posteriorly united or not indented branchial membrane and the upwards turned teeth on the dorsal fin spine. The three mentioned characters completely define the genus. One could add the rudimentary condition of the premaxillary bones, the eyes that are covered with the skin of the head, the chin pores, the placement of the anal fin opposite the middle of the adipose fin, the small number of branchial rays and the small mouth slit. However, these characters are also found in Leiocassis poecilopterus CV. and Leiocassis micropogon, and in a way these species show a transition to Bagroides. Both these species also possess the colour pattern of Bagroides, but 9-11 branchiostegal rays, the gill membranes of both sides separated till the anterior most point, the teeth on the dorsal fin spines directed downwards and the palatal teeth expanding horse-shoe shaped on the palatine bones, whereas the snout is not cone-shaped but more flat and the mouth slit relatively remarkably wider. Therefore I was of the opinion that these species needed to be placed in a genus of their own.

Bagroides seems to belong to Sumatra and Borneo. It is almost certain that this genus is not present on Java, but I suspect that later investigations will discover it on Biliton or Banka. The three species in my collection all live in the drainage basins of the east coast of Sumatra. One of these species, Bagroides melanopterus, seems to live also in all large rivers of Borneo.

The three aforementioned species can easily be distinguished according to the scheme below.

134 I. Vomerine teeth placed in a rounded or oval group. Anal fin less than twice as short as adipose fin.

Bagroides melanopterus Blkr.

II. Vomerine teeth placed in a short, nearly crescent-shaped band. Anal fin more than three times as short as adipose fin.

a. Mouth opening not broader than eye diameter. Dorsal spine not or hardly longer than the head. Depth of body contained 5 times in its length without caudal fin. Jaw teeth and vomerine teeth very small and hardly visible.

Bagroides macropterus Blkr.

b. Mouth opening nearly twice as broad as eye diameter. Dorsal spine much longer than the head. Depth of body contained slightly more than 4 times in its length without caudal fin. Jaw teeth and vomerine teeth very conspicuous.

Bagroides macracanthus Blkr.

Bagroides melanopterus Blkr.

Vierde Bijdr. Ichth. Borneo, Nat. Tijdschr. Ned. Ind. II p. 204. Atl. Silur. tab. XVIII fig. 3.

Black-finned Bagrodes

A Bagroides with an elongate, compressed body, deeper than broad, body depth contained 4 to slightly more than 4 times in its length without, and 5⅓ to 5 times in its length with caudal fin. Head acute, convex and conical, contained 4½ to nearly 5 times in length of body without, and 5¼ to slightly more than 6 times in length of body with caudal fin. Depth and width of head contained 1¼ to 1⅙ times in its length; eyes facing sideways, eye diameter contained 5 times to slightly more than 5 times in length of head, distance between the eyes 1 to 1⅓ times their diameter. Head shield smooth, longitudinal groove reaching or nearly reaching the base of the supraoccipital crest, dividing the entire head shield; supraoccipital crest in younger fishes glabrous, in older fishes slightly rough, thin, more than three times as long as the basal width, convex, its top reaching the first interspinal bone which is triangular or oval, hardly longer than broad, glabrous or slightly rough; snout convex, rounded, protruding beyond the mouth opening, less than twice as long as the eye, rostral profile slightly acutely rounded; nostrils only anterior nostrils tubular, posterior ones close to the orbit, placed at a distance of nearly the eye diameter from the anterior nostrils; mouth opening inferior, nearly twice as broad as the eye diameter, lips broad, fleshy, slightly villous. Jaw teeth conical, slightly acute, multiple-rowed, the teeth in the outer row slightly longer than the other ones, the upper jaw teeth placed in a short, transverse band, the lower jaw teeth in a band reminding slightly of a horseshoe; vomerine teeth grain-like, obtuse, placed in an oval or round group; chin 135 with 6 hardly visible pores ; 8 thin barbels, nasal barbels shorter than maxillary barbels, nearly reaching the postocular area, maxillary barbels nearly reaching the gill cover or the humeral bone. Outer lower jaw barbels, longer than inner ones, nearly reaching the gill opening; interbranchial membrane not or hardly emarginate; gill cover glabrous: humeral bone broad, rough, much shorter than the head, posterior part acute; 1 or 2 conspicuous axillary slime pores; anterior part of lateral line very thread-like simple, more or less straight. Rayed dorsal fin acute, lower than the body, less than twice as deep as the length of the fin base, the spine robust, generally (but not always) shorter than the head, striped, posterior side serrated with robust teeth, which point upwards at the top; adipose dorsal fin placed at a distance of the length of the rayed dorsal from the rayed dorsal. It is about twice as long as this fin, about three times as long as high, upper margin oblique and convex; pectoral fins acute, slightly longer or not longer than the head, the spine very thick, generally (but not always) longer than the dorsal spine, spine striped, its posterior side serrated with large teeth; ventral fins slightly acutely rounded, much shorter than the pectoral fins; anal fin placed opposite the middle of the adipose fin, lower than the body, obtuse, rounded, slightly higher

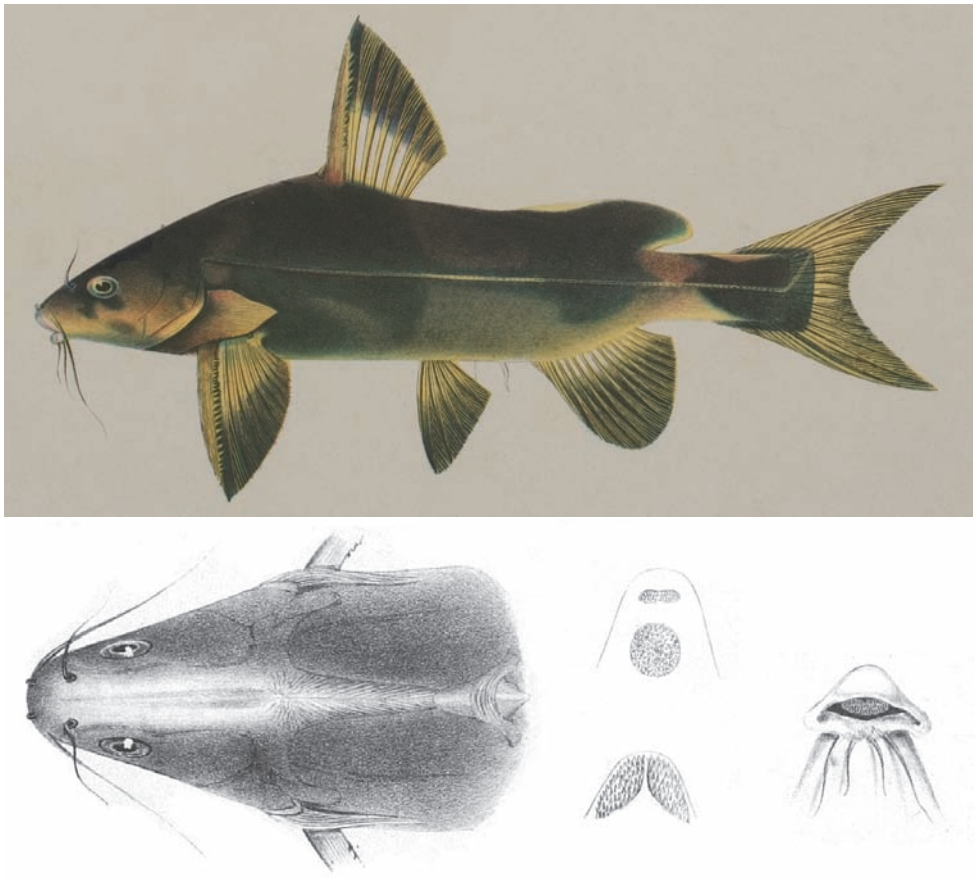

Fig. 23. *Bagroides melanopterus* Blkr.

than the length of the fin base, less than twice as short as the adipose fin; caudal fin with a deep incision and acute lobes, the upper one slightly longer than the lower one, contained 4⅔ to 5 times in the length of the total body. Colour of body yellow-deep brown, fins orange-yellow, body with very irregular broad, transverse, black-violet bands, the 1st cephalic, the 2nd dorso-ventral, the 3rd dorso-anal running into the adipose fin and the 4th caudal. The bands are frequently joined around the lateral line and are always traversed by a yellow-deep brown longitudinal band. The rayed dorsal fin, pectoral fins, ventral fins and anal fin are for the free half violet-black, the caudal fin at the posterior margin generally is bordered with black-violet.

B. 7 or 8. D. 17. P. 19. V. 1/5. A. 5/11 to 5/13. C. 1/15/1 and shorter ones alongside.

Hab. Sumatra (Palembang), in rivers.
Borneo (Bandjermasin, Kahajan, Sintang, Sambas) in rivers.

Length of the 21 specimens 128‴ to 235‴.

Remark. My abovementioned description was based only on a few specimens, the only ones which I then possessed. Since then I received, both from Sumatra and Borneo, a large series of specimens of the same species, which enabled me to complete the older description. The normal number of branchiostegal rays is 7 and not 8. The last number I encountered only in a single specimen.

The species is much shorter of body and tail than both the following ones, and very remarkable by its granular vomerine teeth, which are very numerous and placed in a round or oval group. It moreover distinguishes itself from the following ones by its much shorter adipose fin, its broad shoulder bone and strong dorsal- and pectoral fin spine teeth.

136 The pattern of bars, although in general terms constantly similar, in the various specimens offers numerous gradations regarding the width, connection and extension of the bars.

Bagroides macropterus Blkr.
Nieuwe Tientall. Vischsoort. Sumatra, Natuurk. Tijdschr. v. Ned. Indië V p. 515,
Atl. Silur. tab. XIX fig. 2.
Large-finned Bagrodes

A Bagroides with an elongate, compressed body, much deeper than broad, body depth contained about 5 times in its length without, and 6⅓ to 6½ times in its length with caudal fin. Head acute, convex and conical, contained about 6 times in length of body without, and about 7¾ times in length of body with caudal fin; eyes facing sideways, eye diameter contained about 5 times in length of head, distance between the eyes 1½ to 1¼ times their diameter. Head shield smooth, or with some longitudinal creases only, longitudinal groove nearly reaching the base of the supraoccipital crest, dividing the head shield;

Fig. 24. *Bagroides macropterus* Blkr. [In Atlas as *Pseudobagrichthys macropterus* Blkr.]

supraoccipital crest in younger fishes glabrous, in older fishes rough, thin, about three times as long as the length of the basal width, convex, its top thin, reaching the first interspinal bone which is elongate, smooth or rough-grainy; snout very convex, compressed, protruding beyond the mouth opening, less than twice as long as the eye, rostral profile acutely rounded; posterior nostrils close to the orbit, placed at a distance of about the eye diameter from the anterior nostrils; mouth inferior, not broader than the eye diameter, lips fleshy, feebly villous; teeth small, jaw teeth multiple-rowed, placed in short, slightly curved bands; vomerine teeth placed in a small, nearly crescent-shaped group; 8 thin barbels, nasal barbels reaching the postocular area, maxillary barbels longer than nasal barbels, reaching the gill cover or humeral bone, outer lower jaw barbels longer than inner ones, reaching the gill opening; interbranchial membrane not emarginate; gill cover glabrous: humeral bone hardly or not rough, slightly shorter than the head, posterior part acute; 1 or 2 conspicuous axillary slime pores; anterior part of lateral line thread-like, simple, more or less straight. Rayed dorsal fin acute and convex, not or hardly lower than the body, about twice as high as the length of the fin base, the spine medium-sized, not or hardly longer than the head, spine striped, posterior side serrated with medium-sized, upwards directed teeth; adipose dorsal fin very close to rayed dorsal fin and more than four times as long, about five times as long as high, the upper margin obliquely convex; pectoral fins acute, slightly longer than the head, the spine robust, thicker but hardly or not longer than the dorsal spine, spine striped, posterior side serrated with robust teeth; ventral fins slightly acutely rounded, shorter than pectoral fins; anal fin placed opposite the middle of the adipose fin, lower than the body, obtuse, convex, slightly higher than the length of the fin base, more than three times to four times as short as the adipose fin; caudal fin with a deep incision and acute lobes, the upper one shorter than the lower one, very acute, contained slightly more than 4 times to 4¾ times in the length of the total body. Colour of body yellowish-deep brown, fins yellowish. The body has 4 broad, irregular, transverse blackish-violet bands, much broader than the intermediate space, the 1st band covering forehead, crown and 137 temporal area, the 2nd dorso-ventral, much broader than rayed dorsal fin, and descending towards the axilla and the ventral fins, the 3rd dorso-anal, not thinner than the anal fin and reaching the upper margin of the adipose fin, the 4th caudal, broader than the anal fin and ending on the adipose fin. The bands on the body are crossed by a longitudinal yellow band on the lateral line. Upper half of the fins are, except for the adipose and caudal fin, blackish-violet.

B. 7. D. 1/7. P. 119. V. 1/5. A. 3/12 or 3/11. C. 1/15/1 and shorter ones alongside.

Hab. Sumatra (Palembang, Moarakompeh), in rivers.

Length of the 2 specimens. 152''' and 256'''.

Remark. Just like Bagroides macracanthus the species in question till now is only known from the rivers of the east coast of Sumatra. I discovered it in 1853 and described it in the above mentioned publication. Since then I came in the possession of a smaller specimen. This species is remarkable because of its small mouth slit, rudimentary premaxillary bones and little developed dentition. Not only are the oral and vomerine teeth placed in small groups, but they are so small that for a remotely fair observation a magnifying lens is indispensable. In none of my two specimens I could observe the chin pores, which are pesent in the other species of the genus, however I believe they exist all the same, as their recognition in various specimens of Bagroides melanopterus was equally difficult. In the little developed lower jaw of the species in question they may be very small and therefore may fall out of reach of observation.

Bagroides macracanthus Blkr.
Overz. der Ichthyol. van Sumatra, Nat. Tijdschr. Ned. Ind. VII p. 88,
Atl. Silur. tab. XIX fig. 1.
Long-spined Bagrodes

A Bagroides with an elongate, compressed body, much deeper than broad, body depth contained slightly more than 4 times in its length without, and about 5¼ times in its length with caudal fin. Head slightly acute, convex and conical, contained about 5½ times in length of body without, and slightly more than 7 times in length of body with caudal fin; depth of head contained about 1⅕ times in its length, width about 1½ times; eyes facing sideways, eye diameter contained about 4⅔ times in length of head, distance between the eyes slightly more than once their diameter. Head shield smooth, longitudinal groove reaching the base of the supraoccipital crest, dividing the head shield; supraoccipital crest rough, thin, more than three times as long as the basal width, 138 more or less straight, its thin top reaching the very elongate, thin and glabrous first interspinal bone; snout very convex, rounded, protruding beyond the mouth opening, less than twice as long as the eye, rostral profile slightly acutely rounded; posterior nostrils placed close to the orbit, at a distance of about the eye diameter from the anterior nostrils; mouth inferior, much broader, but not twice as broad as the eye diameter; lips fleshy, feebly villous; jaw and vomerine teeth well visible, placed in crescent-shaped or nearly crescent-shaped groups, the jaw teeth conical, slightly obtuse, straight, teeth in the outer row larger than the others; chin with 6 well visible pores ; 8 thin barbels, nasal barbels shorter than maxillary

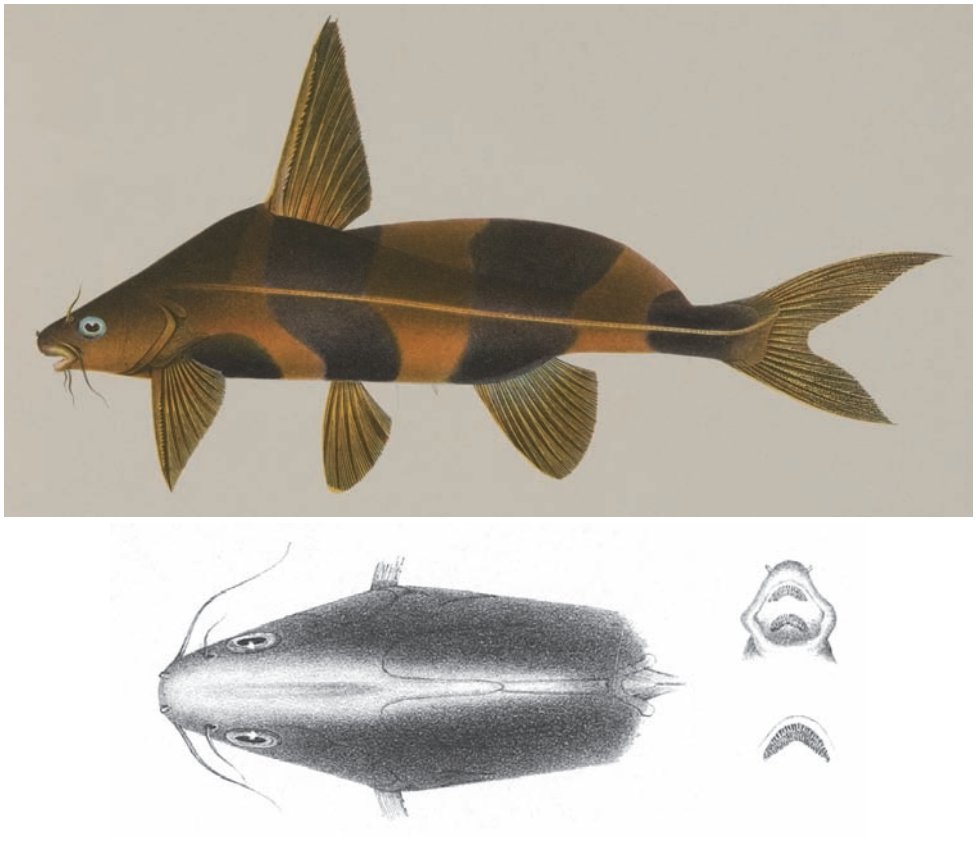

Fig. 25. *Bagroides macracanthus* Blkr. [In Atlas as *Pseudobagrichthys macracanthus* Blkr.]

barbels, reaching posterior part of the eye, maxillary barbels reaching the gill cover, outer lower jaw barbels longer than inner ones, reaching the gill opening; interbranchial membrane not or hardly emarginate; gill cover glabrous: humeral bone hardly or not rough, much shorter than the head, posterior part acute; 1 or 2 conspicuous axillary slime pores; anterior part lateral line hardly thread-like, simple, more or less straight. Rayed dorsal fin acute, slightly higher than the body, more than twice as high as the length of the fin base, the spine medium-sized, much longer than the head, spine feebly striped, posterior side serrated with very conspicuous, upwards directed teeth; adipose dorsal fin very close to rayed dorsal, more than four times as long as the rayed dorsal and about five times as long as high, the upper margin convex in a rather regular way; pectoral fins acute, not or slightly longer than the head, the spine medium-sized, no thicker and much shorter than the dorsal spine, spine striped, posterior side serrated with robust teeth; ventral fins slightly obtusely rounded, shorter than the pectoral fins; anal fin placed opposite the middle of the adipose fin, lower than the body, obtuse, convex, higher than the length of the fin base, about four times as short as the adipose fin; caudal fin with a deep incision and acute lobes, the upper one longer than the lower one, contained about 4⅔ times in the length of the total body. Colour of body deep brown-dark, with 4 broad, transverse diffuse, irregular, blackish-dark bands, the 1st band cephalic, the 2nd dorso-ventral, the 3rd dorso-anal, the 4th caudal; fins darkish.

B. 7. D. 1/7. P. 1/9. V. 1/5. A. 4/11 or 3/12. C. 1/15/1 and shorter ones alongside.

Hab. East Sumatra, where the rivers called Lamatang and Enim flow together.

Length of the only specimen 240‴.

Remark. The specimen from which the description given above is taken, is in an insufficient state of preservation concerning the colouration. Previously I even believed that the colour of the entire body was brown. However, made attentive by the colour pattern of other species of Bagroides and related species of Bagrus, I have examined my specimen in more detail and although the borders of the colours are not sharp one can recognize that this species has a similar cloud or band marking like Bagroides melanopterus and Bagroides macropterus, a bar marking however which is less distinct because of the darker basic colour of the body.

139 Bagroides macracanthus is most closely related to Bagroides macropterus, however it clearly differs from it by its larger mouth slit, its more developed dentition, a higher body, relatively larger head, blunter snout, longer dorsal spine, etc.

Leiocassis Blkr.
Smoothshield fish

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw and vomero-palatine teeth small and acute, vomero-palatine teeth placed in a continuous transverse band, the lower jaw teeth in the form of a simple band. 8 Fleshy barbels. Eyes totally covered by head skin. Interbranchial membrane with deep incision. Branchiostegal membrane with 9 to 11 rays. Lower jaw pores conspicuous. Anterior nostrils tubular, posterior nostrils not tubular. Head covered with glandular skin. Teeth on dorsal spine directed downwards. Snout depressed. Skin in postscapular area villous.

Remark. By its general habitus, colour pattern and [skin] covered eyes this genus is related to Bagroides and Bagrichthys. It differs from both principally by its deeply indented branchial membrane, by its downward directed dorsal spine teeth, flat snout and more numerous branchiostegal rays. In the known species the skin of the anterior

lateral line area is velvet-like hairy, and the lateral line is provided with short thread-like appendages, which clearly shows a relationship with the genera Bagroides and Bagrichthys.

To this genus belongs Bagrus poecilopterus K.v.H., whereas I myself discovered another new form of the same genus in my former Bagrus micropogon. In both my species there are 6 clearly visible chin pores, which are placed next to each other in two scalene triangles.

My species can be distinguished according to the following scheme.

140 I. Lateral line simple (not branched)

a. Depth of head contained about 1½ times in its length. Supraoccipital crest more than twice as long as the basal width, reaching the 1st interspinal bone.

Leoiocassis poecilopterus Blkr.

b. Depth of head contained about 2 times in its length. Supraoccipital crest hardly longer than the eye, ending long before the interspinal bone.

Leiocassis micropogon Blkr.

Leiocassis poecilopterus Blkr.
Atl. Silur. tab. XVIII fig. 2.
High-headed smoothshield fish

A Leiocassis with an elongate, compressed body, deeper than broad, body depth contained slightly more than 4 times in its length without, and slightly more than 5 times in its length with caudal fin. Head slightly depressed, conical and acute, contained about 3⅔ times in length of body without, and more than 4½ times in length of body with caudal fin. Depth and width of the head contained about 1½ times in its length; eyes facing more sideways than upwards, eye diameter contained about 6 times in length of head, distance between the eyes about 1¾ times their diameter. Head shield smooth, not granulated or rough, longitudinal groove reaching or nearly reaching the base of the supraoccipital crest, dividing the head shield; supraoccipital crest elongate, more than twice as long as the eye, more than twice as long as the basal width, smooth, its top reaching or nearly reaching the glabrous and acute interspinal bone; snout convex, protruding beyond the mouth opening, no more than twice as long as the eye, rostral profile rounded more or less crescent-shaped; posterior nostrils placed less than the diameter of the eye in front of the orbit, at a distance of more than the eye diameter from the anterior nostrils; teeth multiple-rowed, conical and small, premaxillary teeth placed in a feebly curved band; vomeropalatine teeth and lower jaw teeth placed in a band which reminds of the form of a horseshoe; lower jaw and premaxillary teeth with the outer row slightly longer than in the inner rows; 8 thin barbels, nasal barbels and maxillary barbels reaching the eye, outer lower jaw barbels, longer than inner ones, not reaching the eye; mouth inferior; chin with 6 conspicuous pores ∴ ; gill cover and scapular bone smooth: humeral bone slightly veined; axillary slime pore hardly visible; lateral line anterior part thread-like, simple, more or less straight. Rayed dorsal fin acute, convex, lower than the body, much deeper than length of fin base, the spine medium-sized, contained about 1¾ times in length of head, spine rough, posterior side serrated with conspicuous small teeth; adipose dorsal fin placed at a distance of nearly its total length from the rayed dorsal. It is less than twice as long as rayed dorsal, about three times as long as high posteriorly, at the upper margin obliquely convex; pectoral fins acute, contained 1⅓ to 1⅖ times in length of head, the spine thick, no longer than the dorsal spine, rough, posterior side serrated with conspicuous 141 teeth; ventral fins slightly acute, angular or rounded, shorter than the pectoral fins; anal fin much lower than the body, obtuse, rounded, longer than high, hardly

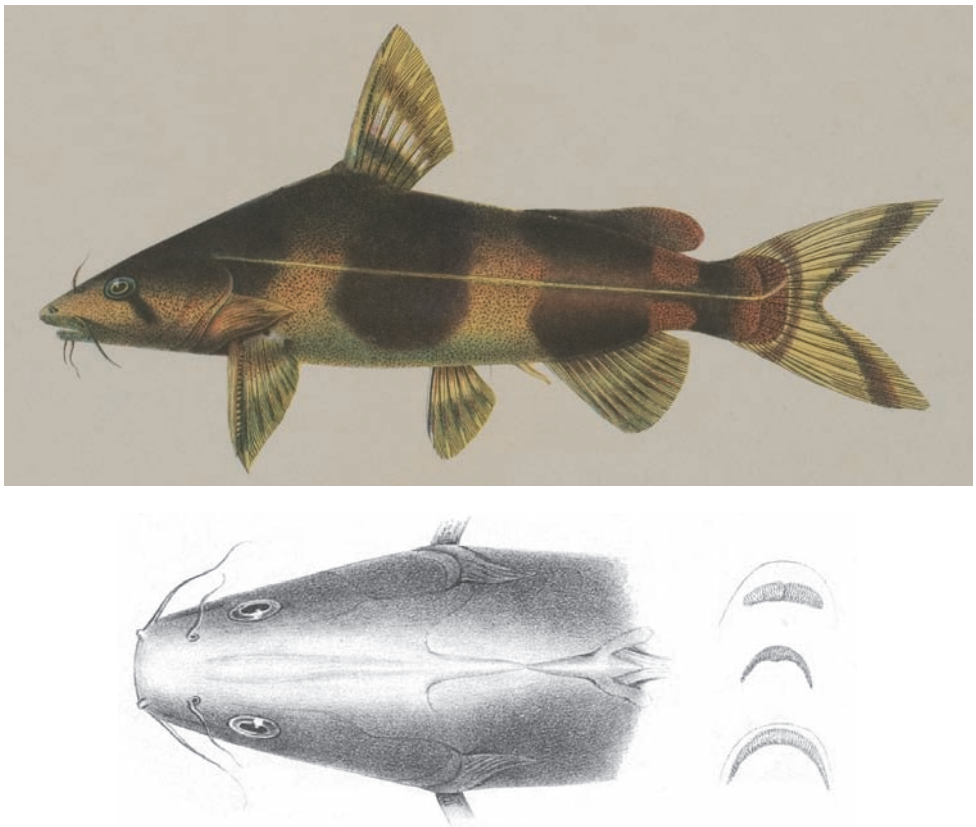

Fig. 26. *Leiocassis poecilopterus* Blkr.

shorter than the adipose dorsal fin; caudal fin with a deep incision and acutely pointed lobes. The lobes are nearly equal and contained about 5 times in the length of the total body. Colour of body darkish or deep brown-reddish, with broad, transverse, irregular bands, deeply dark, the 1st band nucho-opercular, the 2nd dorso-ventral, the 3rd adipose-anal, the 4th caudal. The bands are crossed along the lateral line by a longitudinal, deep brown stripe. Fins deep brown-reddish, blackish-dark, with two broad blackish-dark double bands; iris blue.

B. 10 or 11. D. 1/7. P. 1/7 or 1/8, V. 1/5. A. 4/12. C. 1/15/1 and shorter ones alongside.

Syn. *Bagrus poecilopterus* K.v.H. CV. Poiss. XIV p. 320.
Bagre à nageoires variées CV. Poiss. XIV p. 320.
Bagrus (Bagrus) ramentosus Müll. Trosch. Hor. ichthyol. III p. 7 ??

Hab. Java (Buitenzorg), in rivers.

Length of the descibed specimen 187‴.

Remark. Van Hasselt discovered this species during his trip in the Bantam Residency, where it was caught in the Lebak river. I previously thought to have rediscovered it in specimens from Borneo, Sumatra, Banka and Biliton, but since then I have received from the Buitenzorg area a specimen, which belongs without any doubt to Bagrus poecilopterus K.v.H. but surely differs specifically from the specimens which I previously described as Bagrus micropogon and Bagrus poecilopterus. I have ascer-

tained myself on the identity of that specimen of Bagrus poecilopterus K.v.H. as I possess a drawing of that species left by Van Hasselt which in size, shape and coloration is so exactly the same as my specimen described above, that it is impossible to doubt its identity. My Bagrus micropogon, which I erected as a new species in my Bijdrage tot de kennis der ichthyologishe fauna van Biliton (Nat. Tijdschr. Ned. Ind. III 1852 p. 94) but later, in my Zevende bijdrage tot de kennis der ichthyologische fauna van Borneo (Nat. Tijdschr. Ned. Ind. V p. 445) brought to Bagrus poecilopterus K.v.H., also should be considered as a valid species, as will be apparent from the description following below.

There is a brief description of this species in the large Histoire naturelle des Poissons. However, it is not true what is mentioned there that the 142 dorsal spine is not serrated and that the pectoral fin [spine] is hardly serrated, and also that both the pectoral and the dorsal fins possess only 6 spines.

Besides the above mentioned specimen, I also possess a very juvenile specimen of this species with a length of only 34 mm, which agrees with the full grown specimen in the essential characters.

According to the description of Bagrus (Bagrus) ramentosus by Misters J. Müller and Trosschel, that species must be closely related to Leiocassis poecilopterus Blkr, and I even would be inclined to consider these species for identical, if not in the mentioned description were mentioned some, be it very minor, differences in relative length of the head etc. The statement concerning the habitat which is "America", can also not be considered absolutely reliable, as the species is said to originate from Bloch's collection and every ichthyologist knows how much value often can be attached to Bloch's statements concerning the habitats of the extra-European species described by him. I rather believe that Bagrus ramentosus is at home in the Sunda archipelago and does not essentially differ from Leiocassis poecilopterus.

Leiocassis micropogon Blkr.
Atl. Silur. tab. XVIII fig. 1.
Low-headed smoothshield fish

A Leiocassis with an elongate body, anterior part about as broad as deep, posterior part compressed, body depth contained 5½ to 6 times in its length without, and 6½ to nearly 8 times in its length with caudal fin. Head slightly depressed, conical and acute, contained 3⅖ to 3¾ times in length of body without, and more than 4 to 4⅖ times in length of body with caudal fin; depth of head contained about 2 times in its length, width 1⅘ to 1¾ times; eyes facing more upwards than sideways, eye diameter contained 6 to 8 times in length of head, distance between the eyes 1 to 1½ times their diameter. Head shield smooth, not granulated or rough, longitudinal groove reaching or nearly reaching the base of the supraoccipital crest, dividing the head shield; supraoccipital crest short, hardly longer than the eye, less than twice as long as the basal width, smooth, far distant from the glabrous interspinal bones; snout convex, protruding beyond the mouth, in juveniles less than twice as long as the eye, in older fishes more than twice as long as the eye, rostral profile rounded, 143 crescent-shaped; posterior nostrils placed less than the diameter of the eye in front of the orbit, placed at a distance of more than an eye diameter from the anterior nostrils; teeth multiple-rowed, conical and small, premaxillary teeth placed in a feebly curved band, vomero-palatine teeth and lower jaw teeth placed in a band which reminds of the form of a horseshoe; lower jaw and premaxillary teeth in outer row longer than

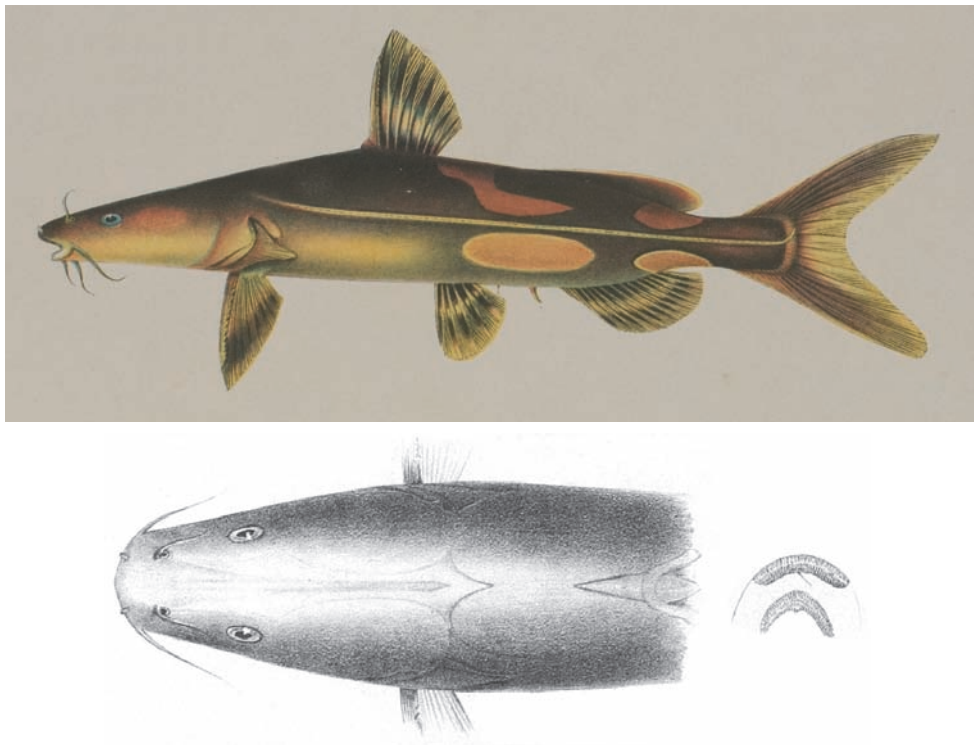

Fig. 27. *Leiocassis micropogon* Blkr.

in inner rows; 8 thin barbels, very much varying in length, nasal barbels nearly reaching or overreaching the eye, maxillary barbels reaching the eye, the preopercle or gill cover, outer lower jaw barbels, longer than inner ones, shorter than maxillary barbels; mouth inferior; chin with 6 conspicuous pores ; gill cover, scapular bone and humeral bone smooth; axillary slime pore hardly visible or invisible; anterior part of lateral line thread-like, simple, more or less straight. Rayed dorsal fin acute, convex, not higher or hardly higher than the body, much higher than length of the fin base, the spine medium-sized, contained 1⅔ times to 2 times in length of head, slightly rough, posterior side serrated with small teeth; adipose dorsal fin placed at a distance of more than half its length from the rayed dorsal, more than twice as long as the rayed dorsal, more than three times as long as high posteriorly, the upper margin oblique and convex; pectoral fins acute, contained 1⅔ to 1½ times in length of head, the spine robust, slightly longer or shorter than the dorsal spine, rough, posterior side with very conspicuous teeth; ventral fins acutely or slightly acutely rounded, shorter than the pectoral fins; anal fin in older fishes lower than the body, obtuse, rounded, longer than high, shorter than the adipose fin; caudal fin with a deep incision and acute or acutely rounded lobes. The lobes are nearly equal, contained 5 to 5½ times in the length of the total body. Colour of body darkish or deep brown-reddish, with 4 broad, transverse, irregular, deeply dark bands, the 1st nucho-opercular, the 2nd dorso-ventral, the 3rd adipose-anal, the 4th caudal. All bands are joined by a cephalo-caudal, dark longitudinal, deep brown band running through them; fins deep brown-reddish, blackish-dark, with one or two broad bands.

B. 9 or 10. D. 1/7. P. 1/8. V. 1/5. A. 4/12 or 5/11. C. 1/15/1 and shorter ones alongside.

Syn. *Bagrus micropogon* Blkr, Bijdr. Ichth. Bilit. Nat. Tijdschr. Ned. Ind. III p. 94 (juvenile).
Bagrus poecilopterus Blkr, Zevende Bijdr. ichth. Born. Nat. T. Ned. Ind. V p. 445 (nec K.v.H., CV.).

Hab. Sumatra (Palembang, Lahat), in rivers.
Banka (Marawang), in rivers Biliton (Tjirutjup), in rivers.
Borneo (Sambas), in rivers.
Length of the 6 specimens 79‴ to 198‴.

Remark. My earlier description of this species is improved above after comparison with the true Bagrus poecilopterus K.v.H. Notwithstanding its great resemblance with the species discovered by van Hasselt, it clearly differs from it and is easily distinguished from it by its more slender body, its much longer head (which height fits two times in its length) and by the short supraoccipital crest, which is not or only slightly longer 144 than the eye and does not nearly reach the inter spinal bones.

I have not yet obtained this species from Java, just like I did not obtain the real Bagrus poecilopterus K.v.H. from any of the other Sunda islands apart from Java. Both species seem to reach approximately the same length.

Bagrus Blkr.
Quillfish

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth and vomero-palatine teeth small and acute, multiple-rowed, vomero-palatine teeth placed in a continuous crescent-shaped band, lower jaw teeth placed in a simple band. 8 Fleshy barbels. Eyes free. Branchiostegal membrane with 8 to 13 rays. Anterior nostrils tubular, posterior ones not tubular. Interbranchial membrane with a deep incision. No visible lower jaw pores. Caudal fin bilobed.

Remark. In the way the genus Bagrus is described here it still contains numerous species, which all belong to the eastern hemisphere.

This genus can be divided into natural groups, each represented by various species, which greatly resemble each other in habitus and build, but do not differ from the species of the other groups in characters which are strong enough to place them in proper genera.

One of those groups can be recognized by a much depressed head, which, measured across the gill covers, is broader or just as broad as the body depth, and by the equally flat and broad snout. The eyes are partly turned upwards, whereas the adipose fin is well developed and is longer or at least not or hardly shorter than the anal fin. To this group belong 5 species from my cabinet, e.g. Bagrus nemurus CV., Bagrus Hoevenii Blkr, Bagrus planiceps CV. and Bagrus Wyckii Blkr from the Indian archipelago and Bagrus aor CV. from Bengal. Moreover, I place in this group Bagrus aorinus Valenc., 145 Bagrus Lamarrii CV., Bagrus corsula CV., Bagrus halepensis CV. and although with less certainty, Bagrus oculatus CV. and Bagrus limbatus Richds.

A second group has the body and the head more compressed and the eyes placed laterally. The adipose fin is well developed and usually much longer, never shorter than the anal fin. Of this group I possess various species, e.g. Bagrus cavasius CV., Bagrus keletius CV. and Bagrus tenggara CV. from Bengal and Bagrus macronema Blkr, Bagrus micracanthus Blkr and Bagrus Wolffii Blkr from the Indian archipelago.

Moreover I place in this group Bagrus bayad CV., Bagrus docmac CV., Bagrus vittatus CV., Bagrus stenomus CV. and Bagrus batasio CV.

A third group at last a regarding the build of head and body is closest related to the foregoing and is principally distinguished from it as its adipose fin is little developed and shorter than the anal fin. To this group belong Bagrus gulio CV., which species I possess from Java and Bengal, as well as Bagrus birmannus CV., Bagrus trachacanthus CV., Bagrus laticeps Rüpp. and probably also Bagrus tengana [tenggara] CV.

Apart from the numerous abovementioned species, there is one other, which does not fit well in any of the described groups and maybe belongs to another type. I mean Bagrus calvarius Blkr, of which species a beautiful illustration is given under the name of Silurus calvarius in the Ichthyographica Chinae borealis of Mr Steph. Basilevski. This species to me seems to be closest related to the species from the group of Bagrus nemurus CV. However, its anal fin is remarkably shorter than the adipose fin, which itself is no shorter than the first dorsal fin.

Various writers have contributed to the knowledge of the species of Bagrus, which inhabit the Indian archipelago. In this archipelago this genus however is limited to the Sunda islands 146 and therefore one finds no species mentioned by the writers, which have dealt more especially with the species from the Moluccan archipelago like Valentyn, Ruysch, Renard.

Nieuhof was the first one who in his Gedenkwaardige Zee- en Lantreize made known a species of Bagrus from the Indian archipelago. From the illustration he gave of it and which belongs to his description of the quill fish, it is clear that he meant Bagrus gulio.

Bagrus gulio CV. for a long time remained the only species of the genus, which one knew of these regions and it was only after the arrival of Kuhl and van Hasselt on Java that the occurrence of various species of Bagrus in the Indian archipelago and especially on Java became known. In a drawing left by them I recognized Bagrus planiceps, however, also other species discovered by them have been sent to Europe and have been used in the compilation of the large work on fishes of the recent time.

In the 4th volume of the large Histoire naturelle des Poissons, Mr Valenciennes has mentioned 11 species of Bagrus from the Indian archipelago (all from Java). However, besides the fact that not all species are acceptable, three of them, Bagrus poecilopterus K.v.H., Bagrus sondaicus CV. and Bagrus javanensis CV. fall outside the genus Bagrus. The remaining 8 species would be.

1 Bagrus cavasius CV.
2 Bagrus keletius CV.
3 Bagrus nigriceps CV.
4 Bagrus stenomus CV.
5 Bagrus abbreviatus CV.
6 Bagrus planiceps CV.
7 Bagrus anisurus CV.
8 Bagrus nemurus CV.

After a detailed study I have come to the conclusion, that a number of these species have to be cancelled or belong to other ones.

Bagrus cavasius CV. a Bengal species, does not occur on Java. The specimens from Java, which were brought to this species by Mr Valenciennes, probably belong to my

species Bagrus macronema, which is closely related to Bagrus cavasius. I suspect that the same error was made with regard to Bagrus ketelius, which is 147 also a species from Bengal. It even seems to me that Bagrus nigriceps CV. is not a species that differs from Bagrus nigriceps CV. When my opinion regarding this is correct, the first three of the above mentioned 9 species, as far as they concern specimens from Java, have to be reduced to my Bagrus macronema. Bagrus abbreviatus CV. in my opinion is no other species than Bagrus gulio CV. and therefore falls together with it.

Furthermore it seems to me, that Bagrus anisurus CV. is the same species as Bagrus planiceps CV. so that these two species can be counted as one.

Therefore the 8 species of the large Histoire naturelle des Poissons might be reduced to the following,

1 Bagrus nemurus CV.
2 Bagrus planiceps CV. = Bagrus anisurus CV.
3 Bagrus macronema Blkr = Bagrus nigriceps CV. and Bagrus cavasius and keletius CV. (the specimens from Java)
4 Bagrus stenomus CV. unknown to me from nature.
5 Bagrus gulio CV. = Bagrus abbreviatus CV.

The observations of Mr Th. Cantor were made in the same time as those of mine. Although this deserving ichthyologist describes some nine Siluroïds from the Strait of Malakka, there is only one species of Bagrus amongst them, *i.e.* Bagrus gulio CV. is mentioned in his Catalogue of Malayan Fishes under the name Bagrus abbreviatus CV.

In my contribution on the Siluroïds of Batavia, written in 1846, I mentioned no less than 16 species of Bagrus as occurring in Batavia. I then did not possess any fishes of this family from other places besides Batavia. However, later on not all of these 16 species appeared to me to be tenable, as I, at the start of my research, attached to much value to characters, which a later comparison of numerous specimens taught me to consider as only individual variations. Moreover, I have removed some of these species, like Bagrus sondaicus Val., 148 Bagrus rhodonotus Blkr and Bagrus carcharoides Blkr, from Bagrus and brought them under different genera. Since that time I have reduced the 13 remaining species to only 6, *i.e.*

1 Bagrus nemurus CV. = Bagrus Sieboldii Blkr.
2 Bagrus Hoevenii Blkr.
3 Bagrus planiceps CV. = Bagrus flavus Blkr.
4 Bagrus macronema Blkr = Bagrus singaringan Blkr = Bagrus heterurus Blkr.
5 Bagrus micracanthus Blkr.
6 Bagrus gulio CV. = Bagrus guliodes Blkr = Bagrus melas Blkr = Bagrus Schlegelii Blkr = Bagrus rhodopterygius Blkr.

Later I received more than one of these species also from other localities on Java, as well as from other islands, from Sumatra, Banka and Borneo.

In 1851 I received another new species of Bagrus from the Indian archipelago, Bagrus Wolffii from Borneo, a species which I since then also received from Sumatra.

At last I got to know an eighth species of Bagrus of these regions during a boat trip I recently made in the Preanger Regency, where I discovered it in Parongkalong, in the Tjitarum river. This species is described below as Bagrus Wyckii.

I therefore possess at the moment 8 well characterized species of Bagrus, as this genus is defined by me at present, and those species in my opinion also contain all species mentioned by Valenciennes from this region, with the exception only of Bagrus stenomus CV., which till now I have not been able to rediscover.

In total I now know the following species of Bagrus from the Indian archipelago.

1	Bagrus nemurus CV.	from Java, Sumatra, Banka, Borneo.
2	Bagrus Hoevenii Blkr	from Java, Sumatra, Banka, Borneo.
3	Bagrus planiceps CV.	from Java, Sumatra.
4	Bagrus stenomus CV.	from Java.
5	Bagrus macronema Blkr	from Java, Sumatra, Borneo.
6	Bagrus Wolffii Blkr	from Sumatra, Borneo.
7	Bagrus micracanthus Blkr	from Java, Sumatra, Borneo.
8	Bagrus gulio CV.	from Java, Sumatra, Borneo.
9	Bagrus Wyckii Blkr	from Java.

149 It deserves to be remarked once more, that not a single species of Bagrus has become known more easterly than Java and Borneo. It now seems to be certain that not a simple freshwater siluroid occurs on the small Sunda islands, on Celebes or on the Molucan islands and it also deserves to be mentioned, that Bagrus gulio CV., which crosses river mouths and often goes far from there into the sea, neither seems to occur more eastwards than Java and Borneo.

The species of my collection can be characterized briefly in the following way.

I. Head and snout much depressed. Head anteriorly broader than deep. Adipose fin longer or not or hardly shorter than anal fin. Head shield nearly totally divided by a longitudinal groove. B. 10 to 13.
  a. Supraoccipital crest thin, hardly or not rough or granulated. Nuchal shield thin and glabrous.
    † Head shield rough or rough-grainy. No bands on body or fins. Adipose fin not or hardly longer than adipose fin.
      § Body depth contained about 5 times in its length without caudal fin. Head contained 3 to 3⅓ times in length of body without caudal fin.

Bagrus nemurus CV.

      § Body depth contained 5⅖ to 6 times in its length without caudal fin. Head contained 3 tot 3½ times in length of body without caudal fin.

Bagrus Hoevenii Blkr.

      § Body depth contained 6⅖ to 6¾ times in its length without caudal fin. Head contained 4 to 4¼ times in length of body without caudal fin.

Bagrus planiceps CV.

    † Head shield glabrous.
      § Body depth contained 5 times in its length without caudal fin. Head contained 3⅖ times in length of body without caudal fin. Eyes facing upwards, eye diameter contained 10 to 11 times in length of head. Body more or less violet to violet. Fins dark-violet. Upper and lower part of caudal fin, and anal fin anteriorly with broad yellow margin.

150 *Bagrus Wyckii* Blkr.

II. Head and body compressed, deeper than broad. Adipose fin longer or not shorter than anal fin. Head shield grainy. Supraoccipital crest grainy, longer than broad, reaching second interspinal bone. B. 8 or 9. Head without any bands.
   a. Head shield nearly totally divided by longitudinal groove.
      † Adipose fin more than four times as long as anal fin, touching rayed dorsal fin. Rayed dorsal fin acute, much higher to no higher than the body, spine contained 1⅕ to 1½ times in length of head, spine longer than pectoral spine.

Bagrus macronema Blkr.

      † Adipose fin hardly or not longer than anal fin, placed at a distance of its total length from the rayed dorsal.

Bagrus Wolffii Blkr.

   b. Head shield only for the anterior half divided by longitudinal groove.
      † Adipose fin not or slightly longer than the head.

Bagrus micracanthus Blkr.

III. Head and body about as broad as deep. Adipose fin short. Head shield grainy. B. 9 or 10.
   a. Head shield only for the first half divided by longitudinal groove.
      † Adipose fin about three times as short as the head. Head and fins without any bands. Supraoccipital crest grainy, not reaching the nuchal shield. Eyes contained 5 to 6½ times in length of head.

Bagrus gulio CV.

Bagrus nemurus CV.
Poiss. XIV p. 314, Blkr Silur. batav. Consp. p. 27. Atl. Silur. tab. XXI.
Siebold's quillfish

A Bagrus with an elongate body, anterior part broader than deep, posterior part compressed, body depth contained about 5 times in its length without, and more than 6 times in its length with caudal fin. Head depressed, very acute, contained 3 to 3⅓ times in length of body without caudal fin; depth of head contained nearly 2 to 1¾ times in its length, width 1⅖ times; eyes free, facing more sideways than upwards, eye diameter contained 6 to 8½ times in length of head, distance between the eyes 2 to about 2⅔ times 151 their diameter. Head shield in juveniles rough, in older fishes and adults rough-granulated, longitudinal groove nearly reaching the base of the supraoccipital crest, dividing the entire shield; supraoccipital crest very thin, largely subcutaneous, basal part naked, rough only in older fishes, triangular, longer than basal width; snout depressed, acute, in younger fishes about twice as long as the eye, in older fishes less than three times as long as the eye, rostral profile obtusely rounded; only anterior nostrils tubular, posterior nostrils placed 1 to 1½ times the diameter of the eye in front of the orbit, and at a distance of about half the eye diameter from the anterior nostrils; teeth multiple-rowed, small and equal, premaxillary teeth placed in a nearly crescent-shaped band, lower jaw teeth and vomerine-palatal teeth placed in a band which reminds of the form of a horseshoe; 8 barbels, nasal barbels reaching the eye, maxillary barbels always surpassing rayed dorsal fin and often overreaching anal fin, outer lower jaw barbels, much longer than inner ones, reaching or overreaching the base of the pectoral fins; mouth subinferior; gill cover with rugosities in the form of rays; scapular bone hardly or not, humeral shield very rough; axillary slime pore inconspicuous; anterior part of lateral line sloping downwards and slightly branched over a short distance, further straight and simple. Rayed dorsal fin slightly higher or slightly lower than the body, higher than the length of the fin base, some rays sometimes prolonged into

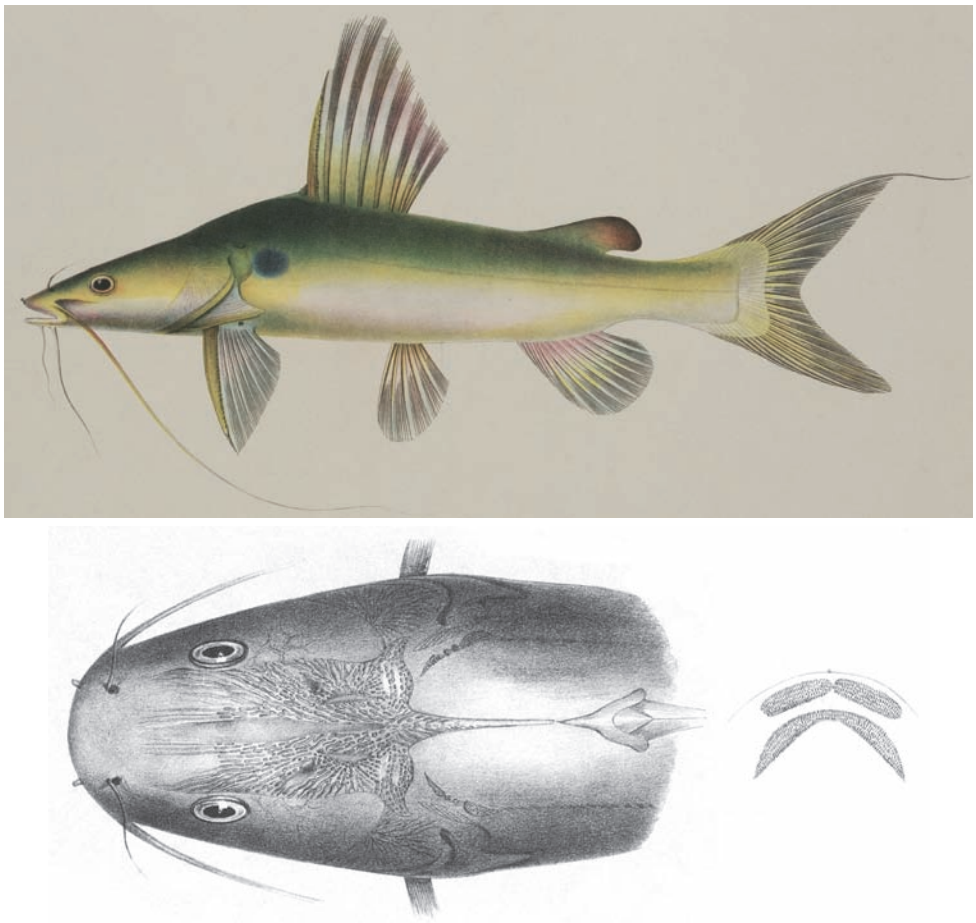

Fig. 28. *Bagrus nemurus* CV. [In Atlas as *Hemibagrus nemurus* Blkr. Head and dentition 75% of original size.]

filaments, the spine medium-sized, twice or more than twice as short as the head, anterior side granulated, spine laterally rough, posterior side serrated with conspicuous teeth; adipose dorsal fin generally placed at a distance of more than its length from the rayed dorsal, hardly more than twice as long as high posteriorly, the upper margin very oblique; pectoral fins acute, contained 1⅓ to 1½ times in length of head, the spine thick, longer than the dorsal spine, its anterior side granulated, spine laterally rough, posterior side serrated with very conspicuous teeth; ventral fins slightly obtusely rounded, more than twice as short as the head; anal fin lower than the body, slightly acutely rounded, not emarginate, slightly higher than the length of the fin base, only slightly shorter than adipose dorsal fin; caudal fin with a deep incision and acute lobes, the upper one longer than the lower one, generally prolonged into a filament, without filament contained 3½ to 4 times in length of body without caudal fin. Colour of upper part of the body olive-green, lower part rosy-whitish, lower area often with a darkish round spot; adipose fin olive-coloured, the upper part dark, posterior part with a yellowish margin, other fins with faintly violetish-green rays, membrane violetish-hyaline, in most fish with a violetish, round spot behind the gill cover under the lateral line.

B. 12 or 13. D. 1/7. P. 1/9 or 1/8. V. 1/5. A. 4/9 or 4/10 or 5/9 or 5/10. C. 1/15/1 and shorter ones alongside.

Syn. *Pimelodus nemurus* K.v.H. Mss.
Bagre à queue en fil CV. Poiss. XIV p. 314.
Bagrus Sieboldii Blkr, Verh. Bat. Gen. XXI Silur. bat. consp. p. 27.
Ikan Bawon Mal. Bat.
Singgal, Sengah Sundan.
Tageh Jav.

Hab. Java (Batavia, Decassi, Krawang, Tjibiliong, Surabaja, Gempol, Grati, Malang), in rivers and lakes.
Sumatra (Palembang, Moarakompeh, Padang, Solok, Meninju), in rivers and lakes.
Banka (Toboali), in rivers.
Borneo (Bandjermasin, Kahajan, Pontianak, Sambas), in rivers.

Length of the 32 specimens 105''' to 340'''.

152 Remark. Java possesses 3 species of Bagrus, that belong to one division of the genus with a depressed head, with adipose fin and anal fin of about equal length and a little developed supraoccipital crest that partly disappears under the skin. These species are Bagrus nemurus CV., Bagrus Hoevenii Blkr and Bagrus planiceps CV. These three species are very closely related and only distinguishable from each other by characters calculated from the relative lengths and heights of the body or of the head and fins. Bagrus planiceps CV. is the easiest species to be separated because of its conspicuous slender body and small head, but it is more difficult to separate Bagrus nemurus and Bagrus Hoevenii. However, if one compares specimens of both species of equal length, it is clear that Bagrus nemurus CV. has a less slender body and has the head relatively longer relative to length of body and moreover higher and broader and more wrinkly or grainly, whereas the adipose fin is longer and relatively less high.

In the drainages of western Java Bagrus nemurus CV. is a very common species and is much more numerous than Bagrus Hoeveni Blkr and Bagrus planiceps CV. The natives often catch it in lid baskets (boeboe), which are put into the water for that purpose. In these fish traps a piece of meat or chicken gut is hung as bait on a string attached to a kind of spring, which when it is moved closes the lid of the basket. In these baskets one catches in the rivers of Batavia only Bawon and no other fish species. The species in Batavia is generally known as Bawon and is consumed only by natives and Chinese people, altough it is in my opinion one of the most tasteful species of the Silurids of Java. It reaches a length of about 700 mm.

Buchanan in his work on the fishes of the Ganges, under the wrong name Mugil corsula, has given the figure (but not the description) of a species described in the large Histoire naturelle des Poissons as Bagrus corsula, which 153 is very closely related to Bagrus nemurus CV. and which I would be inclined to consider as the same species if not the nasal barbels were depicted shorter, the pectoral fin spine ring-like knobbed and the flanks had not been depicted with black spots. This species in every respect deserves to be traced.

Bagrus Hoevenii Blkr.
Verh. Bat. Gen. XXI, I, Silur. batav. consp. p. 26, Atl. Silur. tab. XXII.
Van der Hoeven's quillfish

A Bagrus with an elongate body, anterior part broader than deep, posterior part compressed, body depth contained 5⅔ to 6 times in its length without, and more than 7 times in its length with caudal

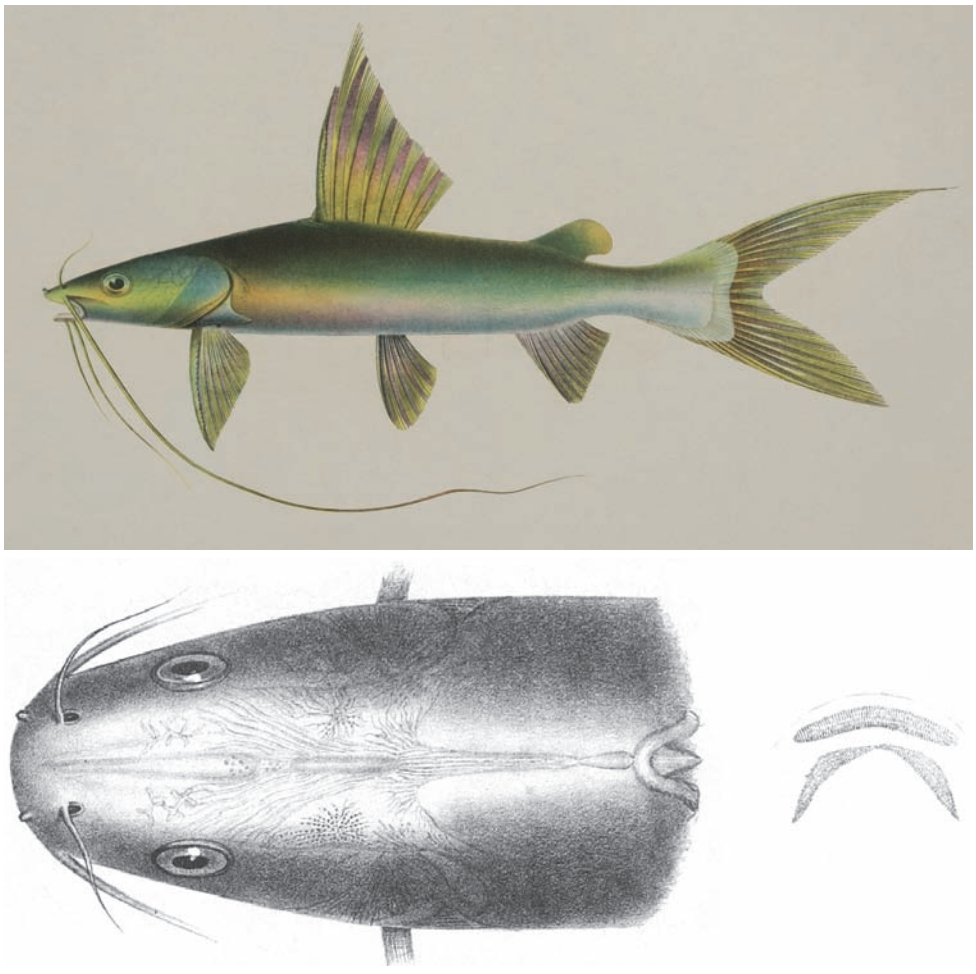

Fig. 29. *Bagrus Hoevenii* Blkr. [In Atlas as *Hemibagrus Hoevenii* Blkr.]

fin. Head depressed, very acute, contained 3⅓ to 3⅗ times in length of body without caudal fin; depth of head contained 2 to slightly more than 2 times in its length, width 1⅖ to 1⅗ times; eyes free, facing more sideways than upwards, eye diameter contained 5 to slightly more than 6 times in length of head, distance between the eyes about 1½ to 2 times their diameter. Head shield in juveniles rough, in older fishes rough and more or less granulated, longitudinal groove reaching or nearly reaching the base of the supraoccipital crest, dividing the head shield; supraoccipital crest very thin, for a larger or smaller part subcutaneous, basal part naked, in older fishes rough, triangular, longer than the basal width; snout depressed, acute, in younger fishes less than twice as long as the eye, in older fishes about twice as long as the eye, rostral profile obtusely rounded; only anterior nostrils tubular, posterior nostrils placed at a distance of about the diameter of the eye in front of the orbit, and about half the eye diameter from the anterior nostrils; teeth multiple-rowed, small and equal, the premaxillary teeth placed in a nearly crescent-shaped band, the lower jaw teeth and vomero-palatine teeth placed in a band which reminds of the form of a horseshoe; 8 barbels, nasal barbels reaching or overreaching the eye, maxillary barbels always overreaching the rayed dorsal fin and often surpassing the anal fin, outer lower jaw barbels longer than inner ones, reaching or overreaching the base of the pectoral fins;

mouth subinferior; gill cover rough in the form of rays; scapular bone hardly rough, humeral bone very acute and rough; anterior part of lateral line sloping downwards, almost single, further straight and single; axillary slime pore conspicuous. Rayed dorsal fin generally higher than the body, higher than the length of the fin base, some rays generally prolonged in the form of filaments, the spine medium-sized, about twice as short as the head, its anterior side smooth, spine laterally slightly rough, posterior side serrated with conspicuous teeth; adipose dorsal fin slightly or not shorter than the rayed dorsal fin, placed at a distance of about its length from the rayed dorsal, about twice as long as high, the upper margin very oblique; pectoral fins acute, contained 1⅓ to 1½ times in length of head, the spine thick, longer than the dorsal spine, its anterior side granulated, spine laterally rough, posterior side serrated with conspicuous teeth; ventral fins acutely or slightly acutely rounded, about twice as short as the head; anal fin slightly or not lower than the body, acute or slightly acute, higher than the length of the fin base, hardly or not shorter than the adipose dorsal fin; caudal fin with a deep incision and acute lobes, the upper lobe, longer than the lower one, often prolonged into a filament, without filament contained 3¾ to about 4 times in length of body without the caudal fin. Colour of upper part of the body olive-green, lower part rosy-whitish; adipose fin faintly olive-coloured, other fins with faintly violetish-green rays, the membrane violetish-hyaline.

154 B. 11 or 12. D. 1/1. P. 1/9 or 1/8. V. 1/5. A. 5/10 to 5/8. C. 1/15/1 and shorter ones alongside.

Syn. *Ikan Bawon* Mal. Batav.
Singal, Sengal Sundan.

Hab. Java in rivers Tjiliwong and Tjidani (Batavia, Buitenzorg) and Lesti (Pasuruan).
Sumatra (Palembang, Benculen), in rivers.
Banka (Marawang), in rivers.
Borneo (Prabukarta, Bandjermasin, Pontianak, Montrado), in rivers.

Length of the 10 specimens 126''' to 290'''.

Remark. Bagrus Hoevenii in relationship stands between Bagrus nemurus CV. and Bagrus planiceps CV., but still shows the most resemblance to Bagrus nemurus CV. It is principally distinguished from it by a slender body, relatively shorter head and larger eyes, differences that are only apparent when one compares specimens of equal size of both species.

In Batavia Bagrus Hoevenii is found as rarely as Bagrus nemurus CV. is found often. On Java it seems to be found more in the higher stretches of the drainages than in the plains, however it seems to be more rare there than on Sumatra and Borneo. It reaches about the same length as Bagrus nemurus CV.

Bagrus planiceps CV.
Poiss. XIV p. 312, Blkr Verh. Bat. Gen. XXI Silur. bat. consp. p. 26. Atl. Silur. tab. XXIII.
Flat-headed quillfish

A Bagrus with an elongate body, anterior part broader than deep, posterior part slightly compressed, body depth contained 6⅖ to 6¾ times in its length without, and more than 8 times in its length with caudal fin. Head depressed, very acute, contained nearly 4 to 4¼ times in length of body without caudal fin. Depth of the head contained about 2 times in its length of the head, width 1⅗ to 1⅓ times; eyes free, facing more sideways than upwards, eye diameter contained 5 to 6 times in length of head, distance between the eyes about 1⅔ to 2 times their diameter. Head shield slightly rough and not granulated, longitudinal groove reaching or nearly reaching the base of the supraoccipital crest, dividing the head shield; supraoccipital crest very thin, for a large part subcutaneous, the basal part naked, glabrous or hardly rough, triangular, generally longer than the basal width; snout depressed, acute, in younger fishes and adults less than twice as long as the eye, rostral profile obtusely rounded; only anterior nostrils tubular, posterior nostrils placed at a distance of an eye diameter or more than once the eye diameter in front of the orbit and placed at a distance of half the eye diameter or more than half the eye diameter from the anterior nostrils; teeth mul-

Fig. 30. *Bagrus planiceps* CV. [In Atlas as *Hemibagrus planiceps* Blkr. Head and dentition 75% of original size.]

tiple-rowed, small and equal, the premaxillary teeth 155 placed in a nearly crescent-shaped band, the lower jaw and vomero-palatine teeth placed in a band which reminds of the form of a horseshoe; 8 barbels, nasal barbels reaching or overreaching the eye, maxillary barbels sometimes not reaching the ventral fins, generally overreaching the ventral fins and rather frequently reaching the anal fin. Outer lower jaw barbels rather much longer than inner ones, reaching or slightly overreaching the base of the pectoral fins; mouth subinferior; gill cover in younger fishes glabrous, in older fishes ray-like rough; scapular bone smooth, humeral bone acute and rough-grainy; axillary slime pore inconconspuous or hardly visible; anterior part of lateral line sloping downwards, nearly single, further straight and single. Rayed dorsal fin slightly or not higher than the body, hardly higher than the length of the fin base, some rays sometimes prolonged into filaments, the spine thin, twice or more than twice as short as the head, slightly glabrous, posterior side not serrated or hardly serrated with small teeth; adipose dorsal fin not or hardly shorter than the rayed dorsal, placed at a distance of slightly more than its length from the rayed dorsal, more than twice as long as high posteriorly, the upper margin very oblique; pectoral fins acute, contained 1⅓ to 1½ times in length of head, the spine thick, longer than the dorsal spine, anterior side granulated, spine rough laterally, posterior side serrated with very conspicuous teeth; ventral fins slightly obtusely rounded, less than twice as short as the head; anal fin lower than the body, obtuse and rounded, slightly lower than the length of the fin base, hardly or not shorter than the adipose dorsal fin; caudal fin with a deep incision and acute lobes, the upper one longer than lower one, sometimes prolonged into a filament, without filament contained 4 to 3½ times in length of body without caudal fin. Colour of upper part of the body faintly olive-green or yellowish-olive-green, lower part rosy-whitish or whitish at ventral side, spot on scapular bone dark-violet, round, more or less conspicuous; fins faintly more or less olive-hyaline.

B. 11. D. 1/7. P. 1/9. V. 1/5. A. 5/9 or 5/10. C. 1/15/1 and shorter ones alongside.

Syn. *Pimeloclus planiceps* K.v.H.
Pimelodes anisurus K.v.H.
Bagre à tête plate CV. Poiss. XIV p. 312.
Bagrus anisrus CV. ib. p. 313.
Bagre à queue inégale CV., ibid. p. 313.
Bagrus flacus Blkr, Verh. Bat. Gen. XXI Silur. batav. consp. p. 28.
Ikan Bawon and *Bawon kuning* Mal. Batav.
Singal Sundanese.

Hab. Java (Batavia, Buitenzorg, Parongkalong, Garut), in rivers Tjiliwong, Tjitarum and Tjimanok.
Sumatra (Telokbetong, Pangabuang, Lahat, Trussan), in rivers.

Length of the 21 specimens 130‴ to 335‴.

Remark. Bagrus planiceps CV. and Bagrus anisurus CV., rather certainly are one and the same species, only differing in deviations of little importance that can be considered as individual variation and age differences. To the same species also belongs Bagrus flavus, which I described more than 10 years ago as a new species on the basis of a juvenile specimen.

156 Although many species of Bagrus are difficult to distinguish and can only be separated from each other after detailed research, the species under consideration, which is closely related to Bagrus nemurus CV., Bagrus Hoeveni Blkr and Bagrus Wyckii Blkr, can be separated from all these species by its more depressed head that is also much shorter than that of the related species.

For the branchiostegal rays the number of 11 is normal and not 12 as is indicated in the large Histoire naturelle des Poissons.

Bagrus Wyckii Blkr.
Atlas Silur. tab. XXIV.
Van der Wyck's quillfish

A Bagrus with an elongate body, anterior part broader than deep, posterior part compressed, body depth contained about 5 times in its length without, and more than 6 times in its length with caudal fin. Head depressed, very acute, contained 3⅖ to 3¼ times in length of body without, and 4½ to 4 times in length of body with caudal fin; depth of head contained about 1⅘ times in its length, width 1⅗ to 1½ times; eyes free, facing more upwards than sideways, eye diameter contained 10 to 11 times in length of head, distance between the eyes 3 to 3½ times their diameter. Head shield glabrous, not rough or granulated, the longitudinal groove nearly reaching the base of the supraoccipital crest, dividing the head shield; supraoccipital crest short, hardly longer than the eye, less than twice as long as the basal width, smooth, far from the glabrous interspinal bones; snout depressed, acute, more than three times as long as the eye, rostral profile very obtuse, nearly truncate; only anterior nostrils subtubular, posterior nostrils placed at a distance of about 1½ times the diameter of the eye in front of the orbit, and about 1½ times the eye diameter from the anterior nostrils; teeth multiple-rowed, small and equal, the premaxillary teeth placed in a feebly curved band, the lower jaw and vomero-palatine teeth placed in a band which reminds of the form of a horseshoe; 8 barbels, nasal barbels hardly or not reaching the eye, maxillary barbels hardly or not reaching the rayed dorsal fin, outer lower jaw barbels hardly or not reaching the base of the pectoral fins, inner lower jaw barbels hardly or not reaching the eye; mouth inferior; gill cover slightly ray-like veined; scapular bone smooth, humeral bone grainy and acute; axillary slime pore inconspicuous; anterior part of lateral line sloping and branched over a short distance, further straight and simple, curved upwards at the base of the caudal fin. Rayed dorsal fin not higher

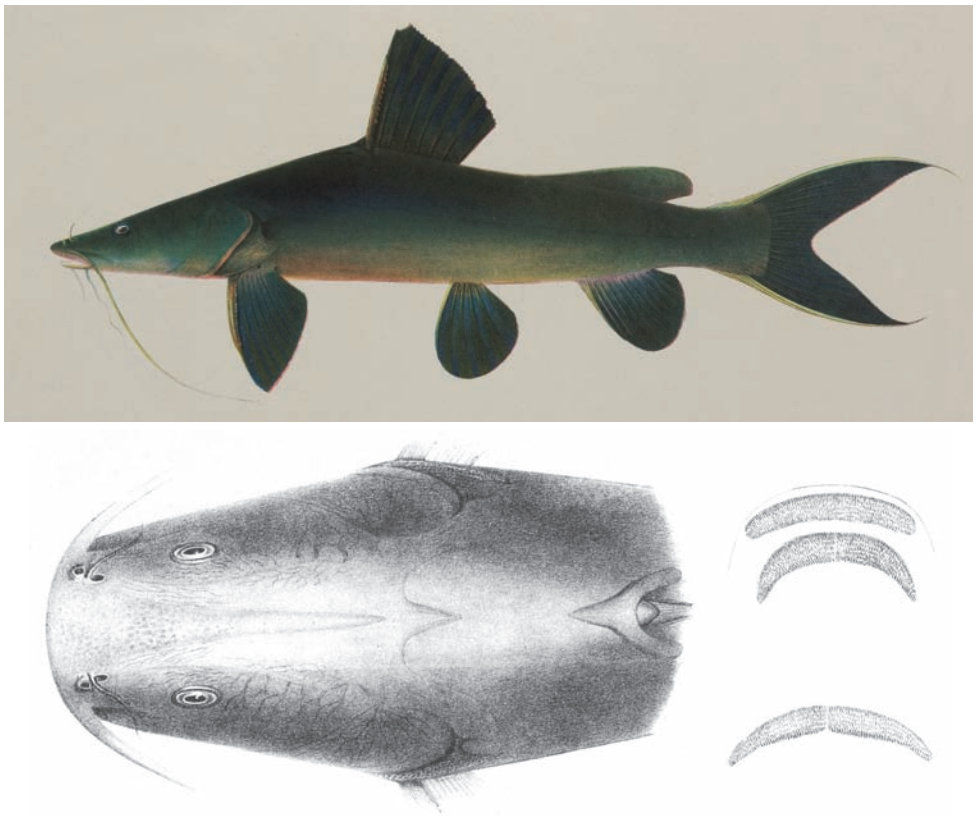

Fig. 31. *Bagrus Wijckii* Blkr. [In Atlas as *Hemibagrus Wijckii* Blkr. Head and dentition 75% of original size.]

than the body, higher than the length of the fin base, anterior part slightly acute, posterior part rounded, the spine medium-sized, about twice as short as the head, its anterior side granulated, spine laterally rough, posterior side serrated with conspicuous teeth; adipose dorsal fin much longer than rayed dorsal placed at a distance of about half its length from the rayed dorsal, about four times as long as high posteriorly, the upper margin very oblique at the upper margin; pectoral fins broad, acute, contained 1¾ to 1⅕ times in length of head, the spine thick, slightly shorter than the dorsal spine, its anterior side granulated, spine laterally rough, posterior side serrated with robust teeth; ventral fins obtuse and rounded, twice or less than twice as short as the head; anal fin lower than the body, slightly acutely rounded, not emarginate, 157 slightly higher than length of the fin base, length contained 1¾ to nearly twice in the length of the adipose dorsal fin; caudal fin with a deep incision and acute lobes, the upper one longer than the lower one, the outer ray prolonged into a filament, upper filament longer than lower filament, upper lobe without filament contained slightly more than 4 times in the body without caudal fin. Colour of upper part and flanks of the body violetish-olive, lower part rosy-whitish; fins darkish-violet, upper and lower part of caudal fin, anterior part of ventral fins and anal fin with beautifully deep brown-yellow margins.

B. 10. D. 1/7. P. 1/11. V. 1/5. A. 6/8 or 6/9. C. 1/15/1 and shorter ones alongside.

Syn. *Hinur* Sundanese.

Hab. Java, in river Tjitarum, Preanger province, near the village Parongkalong.

Length of the 2 specimens 320‴ and 440‴.

Remark. This species is related to Bagrus nemurus CV. Nevertheless it differs from that species in rather numerous characters. Thus in Bagrus nemurus CV. the eyes are larger and placed more laterally on the head, the head shield is rougher, the barbels are longer, the adipose fin shorter, the pectoral fin longer etc., whereas the coloration of body and fins are different, and the branchiostegal membrane has more and the pectoral fins less rays.

I thank this beautiful and extremely rare species to Squire Mr H.C. Van der Wijck, previously Resident of the Preanger Residency, nowadays Resident of Soerabaja.

Bagrus macronema Blkr.
Verh. Bat. Gen. XXI, I Silur. Batav. Consp. p. 22, Atl. Silur. tab. XXV.
Long-barbelled quillfish

A Bagrus with an elongate, compressed body, anterior part deeper than broad, body depth contained nearly 5 to 4¾ times in its length without, and more than 6 to 6 times in its length with caudal fin. Head

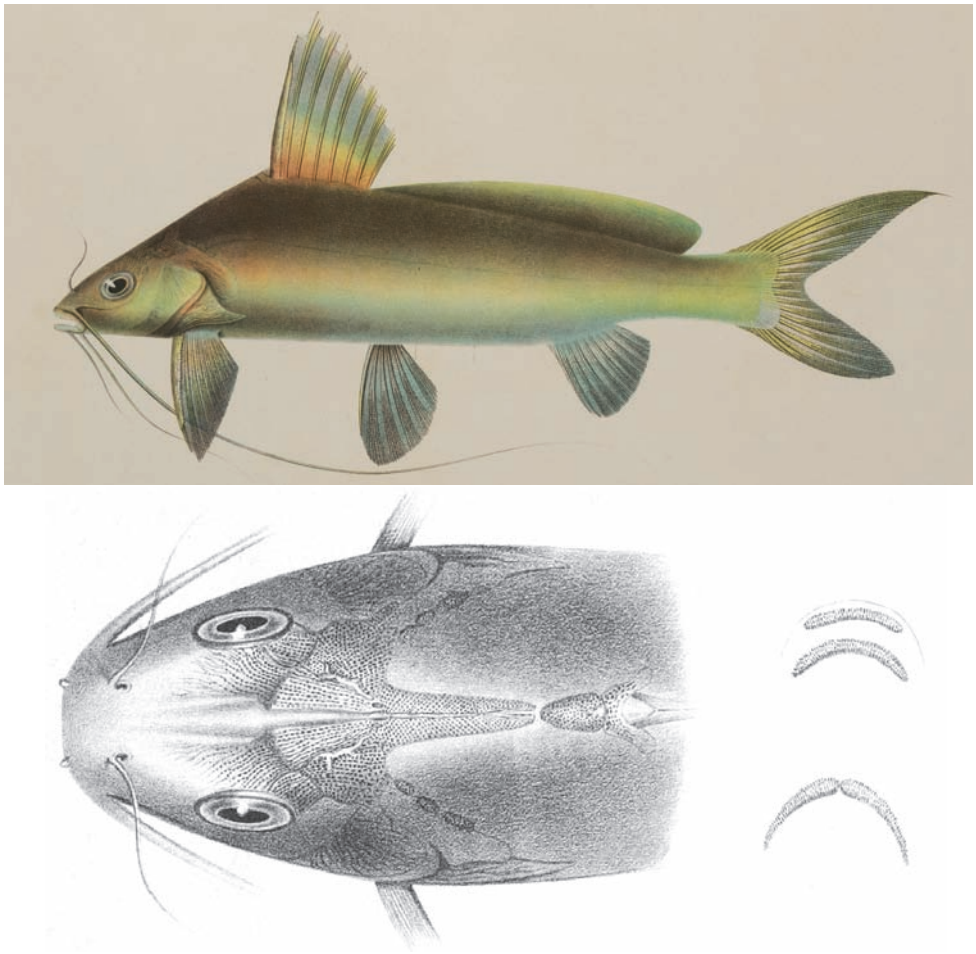

Fig. 32. *Bagrus macronema* Blkr. [In Atlas as *Hypselobagrus macronema* Blkr.]

slightly depressed, acute, contained 4¾ to 4⅝ times in length of body without, and more than 6 times in length of body with caudal fin; depth of head contained about 1⅔ times in its length of the head, width 1⅔ to 1⅓ times, rostro-dorsal profile strongly sloping, head slightly convex; eyes free, facing sideways, eye diameter contained 3 to 4 times in length of head, distance between the eyes nearly 1 to 1⅓ times their diameter. Head shield rough and granulated with dense irregularly placed granules, longitudinal groove entering the base of the supraoccipital crest, dividing the head shield; supraoccipital crest totally rough and granulated, tapering, totally visible, less than three times as long as the basal width, its top rounded, reaching or nearly reaching the rough or granulated, acutely rounded interspinal bone; snout convex, in younger fishes not or hardly longer than the eye, in older fishes much longer than the eye, rostral profile obtusely rounded; only anterior nostrils tubular, posterior nostrils placed at a distance of about the diameter of the eye in front of the orbit, and about half the eye diameter from the anterior nostrils; 158 teeth multiple-rowed, small and equal, the premaxillary teeth placed in a feebly curved band, the vomero-palatine teeth placed in a crescent-shaped band, the lower jaw teeth placed in a band which reminds of the form of a horseshoe; 8 barbels, nasal barbels reaching the postocular area or the gill covers, the maxillary barbels reaching the caudal part of the body or the caudal fin, outer lower jaw barbels reaching or overreaching the top of the pectoral fin, the inner lower jaw barbels reaching or overreaching the base of the pectoral fin; mouth subinferior; gill cover with rugosities in the form of rays; scapular bone and acute humeral bone rough; lateral line simple, more or less straight; axillary slime pore inconspicuous. Rayed dorsal fin acute, in younger fishes rather a lot, in older fishes not or hardly higher than the body, length contained 3 to 3¾ times in the length of the adipose dorsal fin, the spine thin, contained 1⅕ to 1½ times in length of head, its anterior side and lateral parts slightly rough, posterior side denticulate near the top; adipose dorsal fin nearly touching the rayed dorsal fin, about twice as long as the head, more than twice as short as length of body without the caudal fin, convex at the upper margin, five to six times as long as high; pectoral fins acute, slightly shorter than the head, the spine thick, generally slightly shorter than the dorsal spine, its anterior side granulated, spine slightly rough laterally, posterior side serrated with very conspicuous teeth; ventral fins acutely rounded, not or slightly shorter than the pectoral fins; anal fin angular, lower than the body, more than four times as short as the adipose dorsal fin; caudal fin has a deep incision and acute lobes, the upper one much longer than the lower one, contained 3¾ to slightly more than 4 times in the length of the total body. Colour of upper part of the body more or less olive-green, lower part pearly or white, more or less tinged with dark speckles; adipose fin faintly green-hyaline, other fins faintly violetish-hyaline, more or less with dark speckles.

B 9. D. 1/7. P. 1/9 to 1/11. V. 1/5. A. 3/8 or 4/8. C. 1/15/1 and shorter ones alongside.

Syn. *Bagrus nigriceps* CV. Poiss. XIV p. 305?
Bagre à tête noire CV. ibid. p. 305?
Bagrus singaringan Blkr, Verh. Bat. Gen. XXI, I Silur. batav. consp. p. 22.
Bagrus heterurus Blkr, ibid. p. 23.
Ikan Singaringan Mal. Batav.
Keting Javan. Banjumas, *Karbugeran* Javan. Surakart.

Hab. Java (Batavia, Tjikao, Banjumas, Samarang, Surakarta, Surabaja, Pasuruan, Grati), in rivers and lakes.
Sumatra (Palembang, Lematang-Enim, Lahat), in rivers.
Borneo (Bandjermasin, Pengarong, Kahajan, Sambas), in rivers.

Length of the more than 50 specimens 150‴ to 335‴.

Remark. Bagrus macronema was described by me as a proper species in the year 1845, when I began my ichthyological research. Although I then already mentioned the possibility that it might be a species that did not differ from Bagrus cavasius CV. I was not able to settle this point as I did not possess specimens of Pimelodus cavasius Buch. from Bengal. Mr Valenciennes in his description of Bagrus cavasius, (Poiss. XIV. p. 304) states this species was also sent from Java by Kuhl & Van Hasselt. 159 Probably however, Kuhl & Van Hasselt have sent my Bagrus macronema to the Netherlands and

both species were considered as one by Mr Valenciennes.

Since then, my friend Mr Cantor in Calcutta, by sending me some specimens of Pimelodus cavasius Buch. from Bengal, has given me the opportunity to compare both species and by this comparison I have been strengthened in my opinion that they are indeed different species.

The most fundamental differences lie herein that the head shield in Bagrus cavasius CV. is almost entirely smooth and in Bagrus macronema is very wrinkly and granular. Moreover, in Bagrus cavasius the body is more slender and also the supraoccipital crest is slender, the shoulder bones are smooth, the rayed dorsal fin is more pointed and higher and its spine is shorter. The mentioned differences are especially clear in equal sized specimens of both species.

In my opinion Bagrus cavasius CV. therefore must be removed from the list of Javanese fishes.

Bagrus macronema is not less closely related to Bagrus cavasius than to Bagrus keletius CV. from Bengal. Both species have nearly all characters in common, but in all my specimens of Bagrus keletius the 1st dorsal fin is remarkably more blunt and lower and the dorsal spine remarkably shorter, whereas the head shield and shoulder bones are more granulated, the head shield foramen is not extended upwards from the bases of the supraoccipital crest and the pectoral spine is more strongly developed and always considerably longer than the dorsal spine. This Bagrus keletius CV. just like Bagrus cavasius CV. was not found by me on Java and on the same basis as mentioned above I also believe that Bagrus keletius must be removd from the list of Javanese fishes.

Moreover are to be removed the two species I earlier separated from Bagrus macronema because of small differences in the lengths of the barbels and the fin shape and which I have briefly described under the names Bagrus singaran and Bagrus heterurus. Later those 160 differences to me seemed to have no larger value than individual [variation] and seemed to be partly related to the age.

In the large Histoire naturelle des Poissons moreover is mentioned and briefly described as a proper species Bagrus nigriceps CV. (Bagre à tête noire), which would have been sent from Java to Leiden by Kuhl & Van Hasselt. The characters of this species mentioned in the description appear to me, with regard to my Bagrus macronema to be only of individual significance, so that I also take this species to be only an individual variety of Bagrus macronema.

Bagrus macronema in the lower reaches of the rivers in northern Java is a rather common species and in West Java among the indigenous people is known by the name Singaringan. In Banjoemas it is called Keting and in Soerakarta Karboegeran. Its meat has little taste and is consumed only by the natives and Chinese people.

Bagrus Wolffii Blkr.
Vierde Bijdr. Ichth. Borneo in Nat. Tijdschr. Ned. Ind. II p. 205. Atl. Silur. tab. XXVI fig. 1.
Wolff's quillfish

A Bagrus with an elongate body, anterior part deeper than broad, compressed, body depth contained 4 to 4½ times in its length without, and more than 5 to 6 times in its length with caudal fin. Head slightly depressed, acute, contained 4 to 4½ times in length of body without, and more than 5 upwards from 6 times in length of body with caudal fin; depth of head contained 1¼ to 1⅓ times in its length, width 1¼ to 1⅕ times; rostro-dorsal profile sloping, more or less straight, the head slightly convex; eyes free, facing sideways, eye diameter contained 3 to 3½ times in length of head, distance between the eyes nearly 1 to 1¼ times their diameter. Head shield rough-granulated, with dense irregularly placed granules, longitudinal groove reaching or nearly reaching the base of the supraoccipital crest; supraoccipital crest rough and granulated, tapering, totally visible, two to three times as long as the basal width, its emarginate top reaching or nearly reaching the rough or grainy, acutely rounded interspinal bone; snout convex, in younger and older fishes shorter than the eye, rostral profile slightly obtusely rounded; only anterior nostrils tubular, posterior nostrils placed at a distance of about half the diameter of the eye in front of the orbit, and about half the eye diameter from the anterior nostrils; teeth

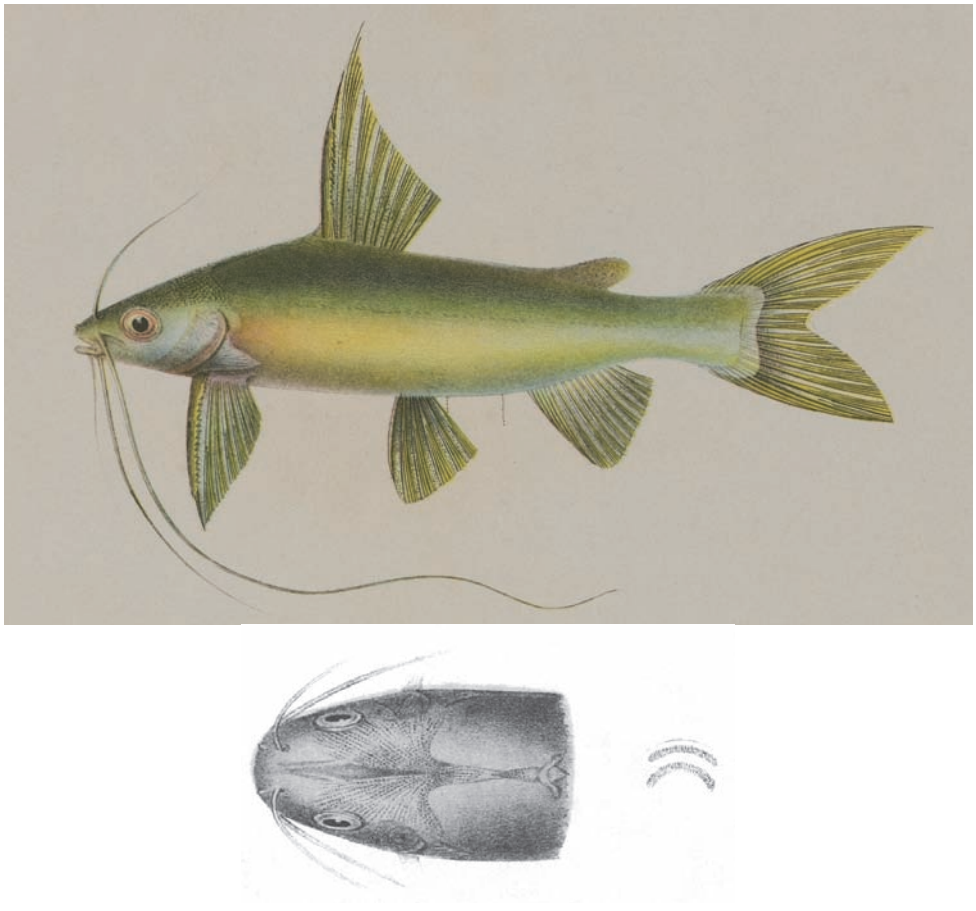

Fig. 33. *Bagrus Wolffii* Blkr. [In Atlas as *Hypselobagrus Wolffii* Blkr.]

multiple-rowed, small and equal, the upper jaw teeth placed in a feebly curved band, vomero-palatine 161 teeth placed in a crescent-shaped band, the lower jaw teeth placed in a band which reminds of the form of a horseshoe; 8 barbels, nasal barbels reaching the pectoral fin, maxillary barbels reaching the caudal fin, outer lower jaw barbels reaching the base of the ventral fins, inner lower jaw barbels overreaching the base of the pectoral fins; gill cover, scapular bone and acute humeral bone not or only feebly rough; lateral line simple, more or less straight; axilla slime pore inconspicuous or hardly visible. Rayed dorsal fin very acute, emarginate, rather much higher than the body, only slightly shorter than the adipose dorsal fin, the spine medium-sized, contained 1½ to 1¼ times in length of head, its anterior side granulated, spine rough laterally, posterior side serrated with very conspicuous teeth; adipose dorsal fin placed at a distance of nearly its total length from the rayed dorsal, much shorter than the head, six to seven times as short as the body without the caudal fin. It is oblique and convex at the upper margin and about twice as long as high; pectoral fins acute, not or hardly shorter than the head, the spine thick, longer than the dorsal spine, its anterior side granulated, spine rough laterally, posterior side serrated with very conspicuous teeth; ventral fins acute, shorter than the pectoral fins; anal fin angular, lower than the body, not or hardly shorter than the adipose dorsal fin; caudal fin with a deep incision and acute lobes, the upper one longer than the lower one, contained 3⅔ to about 4 times in the length of the total body. Colour of upper part of the body more or less olive-green, lower part pearly or whitish, more or less with dark speckles, fins: adipose fin faintly green, others faintly violetish-hyaline, more or less with dark speckles.

B. 8 or 9. D. 1/7. P. 1/3 or 1/9. V. 1/5. A. 4/10 or 4/11 or 5/10. C. 1/15/1 and shorter ones alongside.

Syn. *Singirian* Mal. Bandjermas.

Hab. Borneo (Bandjermasin, Pontianak), in rivers.
Sumatra (Palembang), in rivers.

Length of the 16 specimens 71‴ to 172‴.

Remark. This Bagrus also belongs to the group of Bagrus macronema Blkr and Bagrus micracanthus Blkr, as it has a similar build. However, it is distinguishable from all related species by its short adipose fin, which is not or hardly longer than the anal fin. Furthermore it is remarkable by its long nasal barbels and very acute and high rayed dorsal fin. In habitus it resembles most Bagrus micracanthus Blkr, of which however, except for the character already mentioned it distinctly differs by the elongation of the head shield groove till the base of the supraoccipital crest.

Bagrus micracanthus Blkr.
Verh. Bat. Gen. XXI, I Silur. batav. consp. p. 23. Atl. XXVI fig. 3.
Small-spined quillfish

A Bagrus with an elongate, compressed body, anterior part deeper than broad, body depth contained 4 to 5 times in its length without, and 5⅓ to more than 6 times in its length with caudal fin. Head slightly 162 depressed, acute, contained nearly 4 to 4⅓ times in length of body without, and more than 5 times in length of body with caudal fin; depth of head contained about 1½ to 1⅖ times in its length, width 1⅖ to 1¼ times; rostro-dorsal profile sloping, more or less straight, the head slightly convex; eyes free, facing sideways, eye diameter contained 3⅓ to 4 times in length of head., distance between the eyes 1⅓ to 1⅔ times their diameter. Head shield rough-granulated with irregularly placed dense granules, longitudinal groove only in anterior half, ending long before the base of the supraoccipital crest; supraoccipital crest rough-grainy, tapering, totally visible, about twice or more than twice as long as the basal width, its rounded top reaching or nearly reaching the rough and acutely rounded interspinal bone; snout convex, in younger and older fishes much less than twice as long as the eye, rostral profile obtusely rounded; only anterior nostrils tubular, posterior nostrils placed at a distance of less than the diameter of the eye in front of the orbit, and about half the eye diameter from the anterior nostrils; teeth

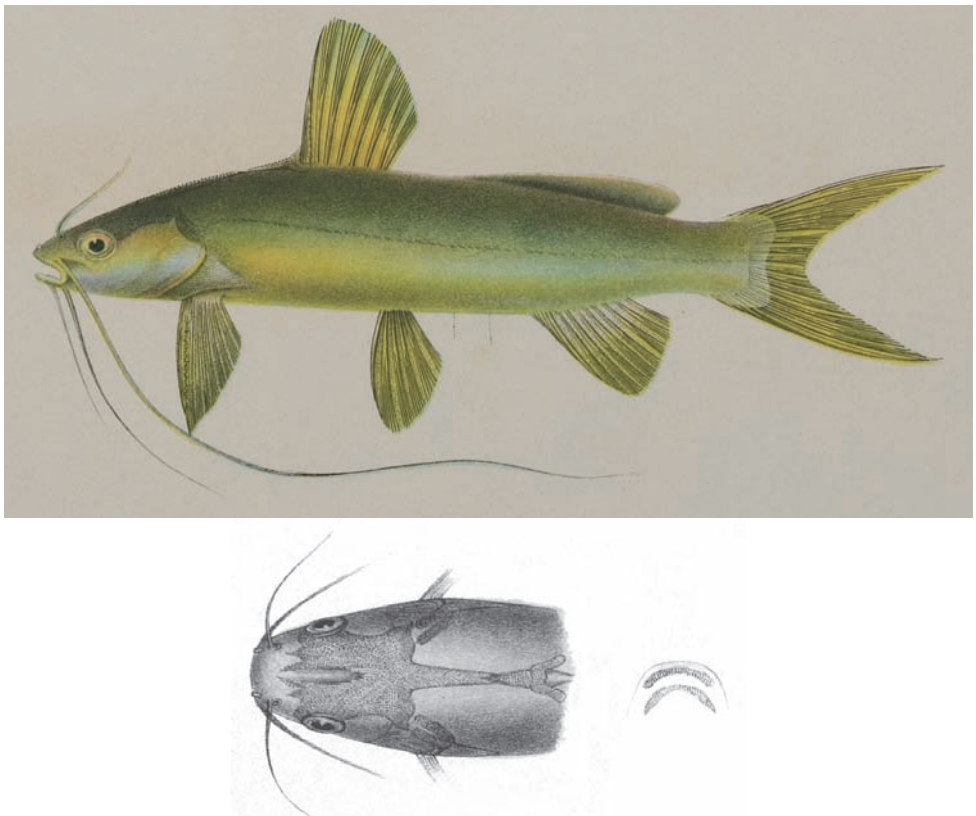

Fig. 34. *Bagrus micracanthus* Blkr. [In Atlas as *Hypselobagrus micracanthus* Blkr.]

multiple-rowed, small and equal, the premaxillary teeth placed in a feebly curved band, the vomero-palatine teeth placed in a crescent-shaped band, the lower jaw teeth placed in a band which reminds of the form of a horseshoe; 8 barbels, nasal barbels reaching the gill covers, maxillary barbels reaching the tail or the caudal fin, outer lower jaw barbels, longer than inner ones, reaching the belly or ventral fins; mouth nearly anterior; gill cover with rugosities in the form of rays; scapular bone and humeral bone acute and rough-grainy; axillary slime pore inconspicuous or hardly visible; lateral line sloping downwards, simple, more or less straight. Rayed dorsal fin slightly acutely rounded, not or only slightly higher than the body, twice or less than twice as short as the adipose dorsal fin, the spine thin, contained 1¾ to more than 2 times in length of body, the anterior and lateral side rough, posterior side serrated with conspicuous teeth; adipose dorsal fin placed at a distance of about a third to a fifth part of its length from the rayed dorsal. Its length is contained 3½ to 4 times in length of body without caudal fin, anterior part very low, posterior part four or five times as low as long; pectoral fins acute, slightly shorter than the head, the spine thick, much longer than the dorsal spine, anterior side granulated, the lateral side rough, posterior side serrated with very conspicuous teeth; ventral fins acute, shorter than the pectoral fins; anal fin angular-rounded, lower than the body, about twice as short as the adipose dorsal fin; caudal fin with a deep incision and acute lobes, the upper one, longer than the lower one, contained about 3¾ to 4⅕ times in the length of the total body. Colour of upper part of the body more or less olive-green, lower part pearly or whitish, more or less with dark speckles; adipose fin faintly green, others faintly violetish-hyaline, more or less with dark speckles, suprascapular area generally with a violetish round spot.

B. 9. D. 1/7. P. 1/8 or 1/9. V. 1/5. A. 4/8 or 4/9 or 4/10. C. 1/15/1 and shorter ones alongside.
Syn. *Singaringan* Mal. Batav.
Ririgi Indig. provinc. Bantam.
Sengat Indig. Bencul.
Hab. Java (Batavia, Tjiringin, Perdana, Ambarawa, Kediri, Surabaja, Pasuruan), in rivers.
Sumatra (Benculen, Padang, Priaman, Labat), in rivers.
Borneo (Prabukarta, Sambas), in rivers.
Length of the 32 specimens 101''' to 145'''.

Remark. Bagrus micracanthus is related to Bagrus macronema Blkr, Bagrus cavasius CV., Bagrus keletius CV. and Bagrus tenggara CV. 163 and built to the same type as these species. However, it is very easily to be distinguished from these, from the three first named species as only the anterior half of the head shield is divided by a longitudinal groove and the adipose fin is much shorter and not extended to the rayed dorsal fin, and from Bagrus tenggara CV. by the absence of vertical bars on the body, a smaller head, etc. Concerning the shape of the head shield, it shows a strong relationship with Bagrus gulio CV., but this species diverges from it in many other characters, primarily by its very short adipose fin and the wider but also much shorter supraoccipital crest.

Bagrus micracanthus occurs on the same islands as Bagrus macronema Blkr and lives also only in fresh water. In West Java it is much less common than Bagrus macronema and does not seem to grow by far as large as Bagrus macronema, because my largest specimen is not half the size of my largest specimen of Bagrus maconema.

Bagrus gulio CV.
Poiss. XIV p. 310, Blkr Verh. Bat. Gen. XXV Nal. Ichth. Beng. p. 116,
8e Bijdr. Ichth. Borneo. Atl. Silur. tab. XXVI fig. 2.
Short quillfish

A Bagrus with an nearly elongate or elongate body, anterior part about as deep as broad, posterior part compressed, body depth contained 4⅕ to 4¼ times in its length without, and 4⅔ to 5¾ times in its length with caudal fin. Head depressed, acute, contained 3½ to 3⅔ times in length of body without, and 4⅖ to 4¾ times in length of body with caudal fin; depth of head contained 1⅗ to 1⅖ times in its length, width 1¼ to 1⅕ times; rostro-dorsal profile sloping at the head, more or less straight or slightly convex; eyes free, facing more sideways than upwards, eye diameter contained 5 to 6½ times in length of head, distance between the eyes 2 to 3 times their diameter. Head shield granulated with dense irregularly placed granules, only for anterior part divided by the longitudinal groove; supraoccipital crest triangular, about twice as long as the basal width, the basal half granulated with dense granules, its glabrous top reaching or nearly reaching the granulated or glabrous interspinal bone; snout depressed and acute, in younger fishes less than twice as long, in adults more than twice as long as the eye, rostral profile obtusely rounded; only anterior nostrils slightly tubular, posterior nostrils placed at a distance of about the diameter of the eye in front of the orbit, and less than half eye diameter from the anterior nostrils; teeth multiple-rowed, small and equal, the premaxillary teeth placed in a feebly curved band, the vomero-palatine teeth and lower jaw teeth placed in a crescent-shaped band; 8 barbels, nasal barbels reaching postocular area, maxillary barbels reaching ventral fins or anal fin, outer lower jaw barbels reaching posterior part 164 of pectoral fin, inner lower jaw barbels not or nearly reaching the pectoral spine; mouth subinferior; gill cover rough-granulated in the form of rays; scapular bone smooth, humeral process acute and granulated; lateral line simple, lower part with pores, more or less straight; axillary slime pore generally well visible. Rayed dorsal fin acute, not or

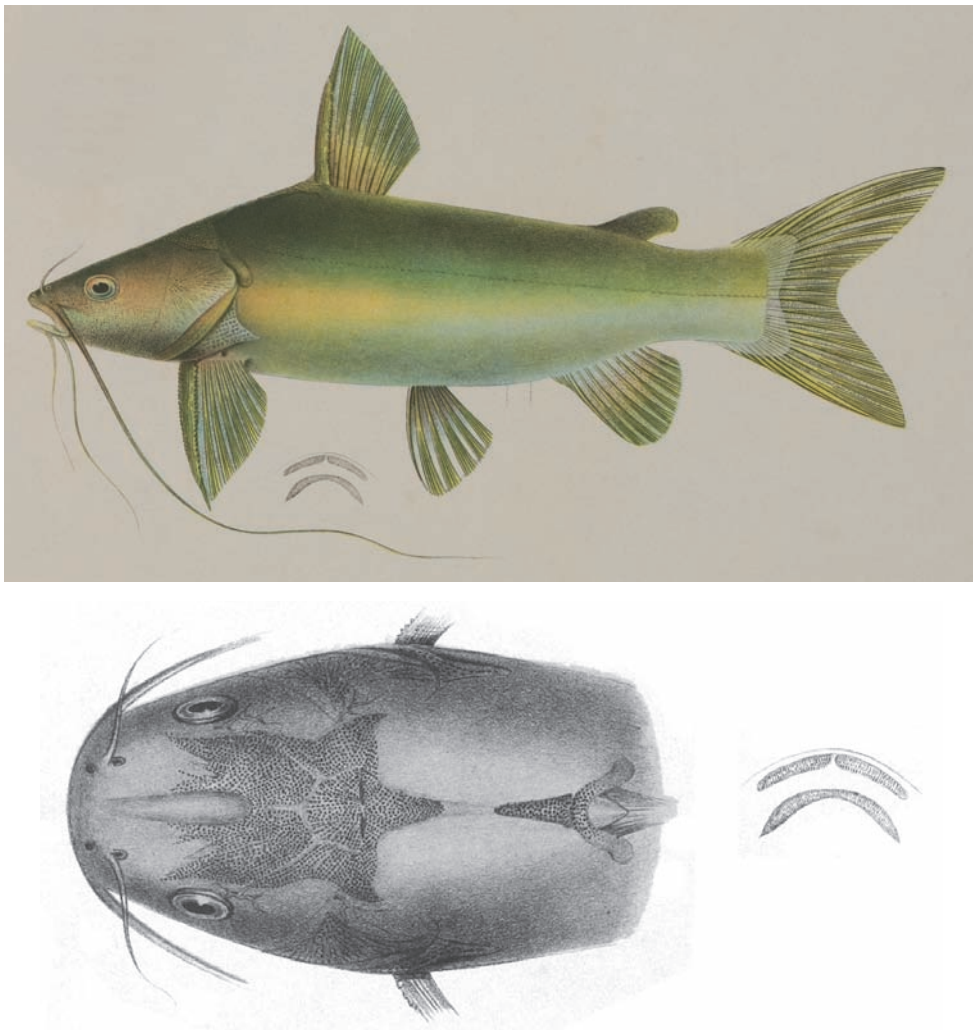

Fig. 35. *Bagrus gulio* CV. [In Atlas as *Aspidobagrus gulio* Blkr.]

hardly lower than the body, the spine robust, contained 1⅔ to 1¾ times in length of head, anterior side grainy, the lateral side rough, posterior side and anterior side at the top serrated with well visible teeth; adipose dorsal fin placed at a distance of more than twice its length from the rayed dorsal, about three times as short as the head, at the anterior upper margin oblique and convex; pectoral fins acute or rounded, contained 1⅕ to 1¼ times in length of head, the spine thick, longer than the dorsal spine, its anterior side granulated, the lateral side rough, posterior side serrated with 8 to 16 large teeth; ventral fins angular, nearly obliquely truncate or rounded, much shorter than the pectoral fins; anal fin angular, not emarginate, hardly or not higher than long, longer than the adipose dorsal fin; caudal fin has a deep incision and acute lobes, the upper one longer than the lower one, contained 4 to 5 times in the length of the total body. Colour of upper part of the body blackish or violetish-coloured or olive or shiny green, lower part pearly or yellowish, fins rosy-green, more or less with dark speckles or tinged with red.

B. 9 or 10. D. 1/7. P. 1/8 or 1/9. V. 1/5. A. 4/10 or 5/10 or 5/11 C. 1/15/1 and shorter ones alongside.

Syn. *Pennevisch* Nieuh. Gedenkw. Zee en Lantr. fig.
Pimelodusgulio Buch. Gang. Fisch. p. 201, 379 tab. 23 fig. 66
Bagre gulio CV. Poiss. XIV p. 310.
Pimelodus abbreviatus K.v.H. ap. CV. Poiss. XIV p. 311.
Bagrus abbreviatus CV. Poiss. XIV p. 311. Cant. Cal. Mal. Fisch. p. 254, Blkr many refs.
Bagre raccourci CV., Poiss. XIV p. 311.
Bagrus albilabris CV. ibid. p. 308.
Bagre à lèvres blanches CV. ibid. p. 308.
Bagrus fuscus CV., ibid. p. 309.
Bagre brun CV., ibid. p. 309.
Bagrus gulioides Blkr, Verh. Bat. Gen. XXI Silur. batav. consp. p. 24.
Bagrus melas Blkr, ibid. p. 24.
Bagrus schlegelii Blkr, ibid. p. 25.
Bagrus rhodopterygius Blkr, ibid. p. 25.
Tope-keleti Indig. Pontic.
Nonatora Bengal.
Gulio Bengal.
Lundu, Manjong lundu Mal. Bat.
Geting Javan.
Senkiran Madur.

Hab. Java (Batavia, Bantam, Cheribon, Surabaja, Pasuruan), in rivers and in brackish water.
Sumatra (Padimg, Palembang), in rivers and in brackish water.
Borneo (Bandjermasin), in rivers.

Length of more than 50 specimens 95‴ to 281‴.

165 Remark. The Loehoe of the Malayans without doubt is the same species that was already known to Nieuhof and also rather well recognisably depicted in his cited work under the name Pennevisch [quill fish]. It lives in large schools in river mouths and along the muddy shores of the north coast of Java. In Batavia the fish is often brought to the market by the thousands, but its taste is not so good and it is only eaten by the natives and the Chinese.

A specimen that was sent to me some years ago from Calcutta by Mr Th. Cantor, has proven to me that Bagrus gulio CV. is the same species as Bagrus abbreviatus CV. and I did not doubt to consider Bagrus albilabris CV. and Bagrus fuscus CV. to belong to the same species as well. The numerous variations found in the Loehoe with regard to shade of colour, body shape etc. induced me, at the start of my investigations of the fish fauna of the Indian archipelago, to consider these different forms as proper species. However, since then I was able to reduce all these species to their true significance.

Except from the above-mentioned islands and from Bengal, Bagrus gulio CV. has also become known from the sea and river mouths of the island Pinang, and also from Cananor, Pondichery and Ceylon.

Bagrus stenomus CV.
Poiss. XIV p. 307.
Small-mouthed quillfish

A Bagrus with a long adipose fin, the dorsal spine more or less edentate, the pectoral spine very dentate, the lobes of the caudal fin acute. Head contained nearly 7 times in the length of the total body. Humeral

bone acute, contained 1⅓ times in length of head. Outer maxillary and lower jaw barbels nearly equal to inner ones, hardly longer than the head. Colour of body dark, with black dots, dorsal and caudal fin with a blackish margin, anal fin blackish with a white margin.

D. 1/7. P. 1/6. V. 6. A. 12.

Syn. *Bagrus à épaule étroite* CV. Poiss. XIV p. 807.

Hab. Java.

Length 3 Parisian inches.

166 Remark. I know this species only from the cited description of Mr Valenciennes, concisely translated above. Mr Valenciennes brings it to the group of the genus, which he characterizes by 8 barbels, a long adipose fin and a short anal fin. In this group it is principally recognisable by its long shoulder bone and short barbels.

The description of Mr Valenciennes goes too little in details to enable me to place the species in my review of the Sundanic species of the genus. It seems to belong near Bagrus micracanthus Blkr.

Eutropius Müll. Trosch.
Hor. Ichth. III p. 6.
Eutropius

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth and vomerine teeth multiple-rowed and small, the vomerine teeth placed in a transverse band. Eight fleshy barbels. Branchiostegal membrane with 8 to 10 rays. Interbranchial membrane with a deep incision. Nostrils not tubular. Anal fin elongate, adipose fin very small. Snout not fleshy, acute. Eyes free, placed behind mouth corner or nearly above mouth corner.

Remark. I consider Eutropius as a genus and not as a subdivision of the genus Bagrus, like Misters Müller and Troschel would like to have it. If it is true, what these eminent ichthyologists maintain, that Mrs Agassiz and Valenciennes have eroneously erected some genera, which belong under the large genus Bagrus, one may equally wonder whether the interpretation of Bagrus as a genus by Misters Müll.er and Troschel has not been taken to broadly.

Indeed this concept to me seems much too wide. If one should restain oneself in dividing the genera of the large family of Siluroïds, because, as is said by Misters Müll. er and Troschel about their subdivisions of Bagrus, that the characters are imperceptably merging, which after all is not entirely true, then one could just as well reduce the entire genus Bagrus 167 Müll. Trosch., which in my view is a large group of the family, to the large genus Silurus of Linnaeus. Thus for example, the adipose fin and in certain species also the rayed dorsal fin sometimes occupies the larger part of the back and tail, gradually becoming smaller and smaller in other species and finally disappears entirely. It is the same with the dentition and also with the head shield.

However, when one investigates the hundreds of Siluroïd species in more deatail and considers the characters of the skull structure, the fin organisation and the dentition in connection with the entire build of the animal, that is, in connection with the natural relationship, then one comes to totally different results and comes to the discovery of characters, which, either by themselves or taken as a whole (complex), ap-

pear to characterize good and natural generic divisions. Led by this study, I have raised the genus Bagrus Müll. Trosch. to the group of the Ariodonts and placed therein the numerous genera, which have become known by my own investigations and research of others.

As is demonstrated above, the Ariodonts may be divided in the subgroups of the Pangasines and Bagrines. The Pangasines, with the exception only of the genus Davalla, all belong to the old world and are principally gathered together in South Asia and on the large Sunda islands. On these last mentioned live the genera Eutropius, Lais, Pangasius and Helicophagus; in South Asia, Eutropius, Pangasius and Silunda; whereas in Africa only the genus Eutropius is represented, and in Europe the Pangasines are completely lacking.

Among the Pangasines, Eutropius is well characterised by its 8 barbels, its flat snout, which does not protrude beyond the mouth slit, and the more or less caudally placed eyes. Because ichthyologists in general have paid little attention to the dentition, I am unable to determine whether there are differences regarding the teeth of the palate. Only for Eutropius schilbeides (Bagrus schilbeides CV.) I see it is mentioned that the vomerine-palatal teeth are placed in a band of four parts, and Buchanan says of his Pimelodus vacha "In both (jaws) 168 numerous small teeth are crowded of which there are none on the palate." In Eutropius exodon (Bagrus exodon), the only extra-archipelagic species that I have been able to examine, these teeth are placed in a slender, undivided semi-crescent shaped band (Nalezing, Ichthyol. Bengal. en Hindost. p. 111) and in Eutropius brachypopterus that little band has the shape of a widely opened letter V with the foot [base] directed forward. It therefore seems that also in Eutropius one will find in the peculiarities of the dental characters sufficient to separate the various species from each other.

Those species are rather numerous and according to the present knowledge they are Eutropius schilbeides (Bagrus schilbeides CV.) from the Nile; eutropius depressirostris Peters (only known to me by name) from Mosambique; eutropius Adansonii (Bagrus Adansonii CV.) from the Senegal; eutropius vacha CV. (Bagrus vacha CV.), Eutropius murius (Bagrus murius CV.), Eutropius angius (Bagrus angius CV.) Eutropius Buchanani (Bagrus Buchanani CV.), Eutropius taakree (Hypophthalmus taakree Sykes), Eutropius exodon (Bagrus exodon CV.), Eutropius urua (Bagrus urua CV.) and Etropius atherinoides (Bagrus atherinoides CV.) from Bengal and Hindostan, and maybe Bagrus bouderius Richds. from China. Possibly more detailed research will show that some of these species will have to be dropped. Bagrus vacha CV. because of the passage from Buchanan's work on the fishes from the Ganges cited above, deserves to be examined in more detail regarding the dentition, after which, in connection with the proper habitus of this species, brought about by the wide mouth slit that reaches till beneath the eyes, it can be determined whether this species can be retained in the genus Eutropius. The same holds for Bagrus bouderius, which is said to be related to Bagrus vacha CV., as well as for Bagrus vachellii Richds. Indeed the species of Eutropius differ from each other by different relations of length of the body, head, anal fin and barbels. The only species from he Indian archipelago, which I discovered only very recently, 169 mainly differs from all other species by the following character.

I. Anal fin contained 3⅔ to 3¾ times in the length of the total body, with rays 4/23 or 4/24.

Eutropius brachypopterus Blkr.

Eutropius brachypopterus Blkr.
Atl. Silur. tab. XXVII fig. 1.
Short-finned Eutropius

An Eutropius with an elongate, compressed body, in anterior part width contained about 1½ times in its depth, body depth contained slightly more than 4 times in its length without, and slightly more than 5 times in its length with caudal fin. Head depressed and acute, contained slightly more than 4 times in length of body without, and slightly more than 5 times in length of body with caudal fin. Depth and width of the head contained about 1½ times in its length; rostro-dorsal profile sloping, more or less straight, at the forehead slightly concave. Head shield smooth, slightly rough only posteriorly, median longitudinal groove ending in front of the base of the supraoccipital crest, shield for the most part divided, a small oval fossa between the groove and the base of its crest; supraoccipital crest thin, glabrous, five to six times as long as the base and broad in the middle, longitudinal groove running through total crest, concave, its top with incision, embracing the triangular, acute and glabrous first interspinal bone; eyes placed no more inferior than superior, distance between eyes not more than once the eye diameter, diameter contained about 3 times in length of head; anterior nostrils round, wide open, close to the edge of the snout, posterior nostrils placed behind the base of the nasal

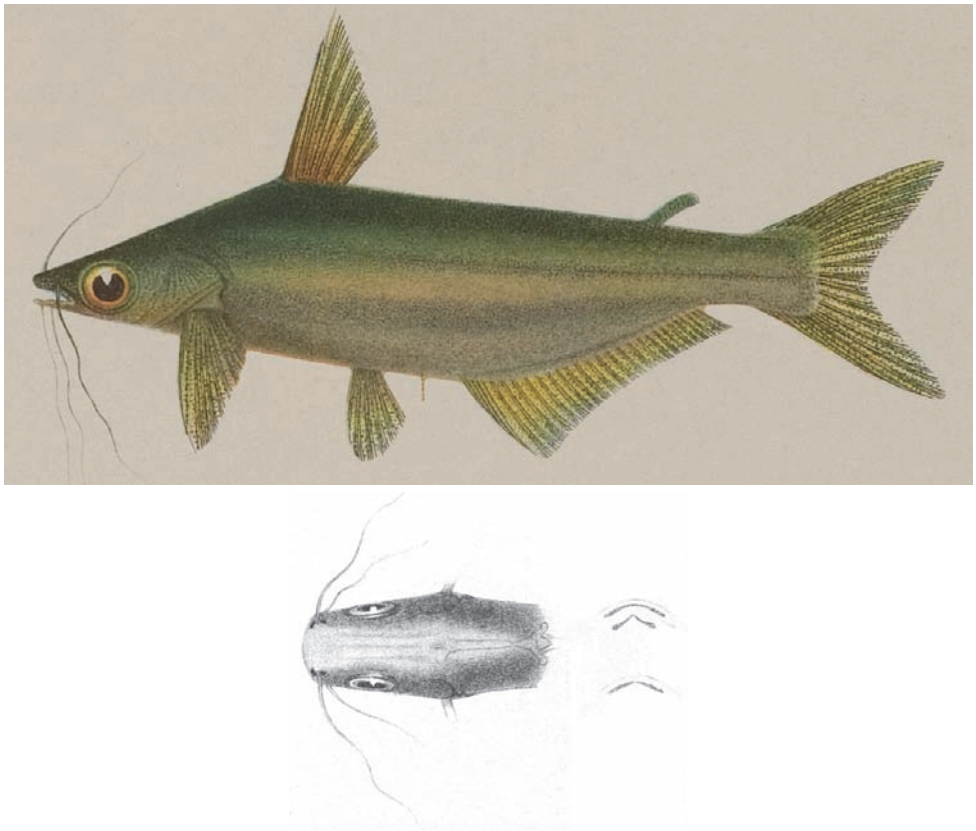

Fig. 36. *Eutropius brachypopterus* Blkr. [In Atlas as *Pseudeutropius brachypopterus* Blkr.]

barbels, with valves, less distant from each other than the anterior nostrils; snout shorter than the eye, acute, its anterior part slightly convex, not protruding beyond the mouth opening, rostral profile obtusely rounded; nasal, maxillary and and outer lower jaw barbels nearly equal, nearly reaching the top of the pectoral fin, inner lower jaw barbels not much shorter than the others; lower jaw slightly shorter and thinner than upper jaw; teeth very small, hardly visible, the premaxillary teeth placed in a very thin, little curved band, the lower jaw teeth placed in thin nearly crescent-shaped band, the vomerine teeth placed in a very thin ^ formed band; gill cover with rugosities in the form of rays; humeral bone smooth and acute; lateral line straight, characterized by simple tubules, touching each other; axillary slime pore conspicuous. Rayed dorsal fin acute, hardly lower than the body, more than twice as high as the length of the fin base, the spine thin, contained 1⅓ to 1¼ times in length of head, the anterior, superior and posterior side over the total length conspicuously serrated; adipose dorsal fin oblong-oval, more than twice as high as the length of the fin base, thinner at the base than in the middle, at the base about three times as short as the rayed dorsal, placed opposite the posterior fourth part of the anal fin; pectoral fins not or slightly shorter than the head, the spine thin, slightly longer than the dorsal spine, only posterior side conspicuously serrated; ventral fins slightly acutely rounded, angular, about twice as short as the head; anal fin contained about 3 times in length of body without, and 2⅔ tot 3¾ times in length of body with caudal fin, less than three times as long as high anteriorly, slightly acute, hardly emarginate; caudal fin with a deep incision, the lobes contained 5 to 5⅓ times in the length of the total body (upper lobe partly broken off). Colour of upper part of the body more or less 170 olive, the flanks and lower part pearly or silvery; 3 dark, diffuse cephalo-caudal bands, the upper one nucho-caudal, the middle one operculo-caudal, the lower one axillo-caudal; fins yellowish-hyaline, more or less with dark speckles, barbels whitish, darkening near the base.

B. 10. D. 1/6. P. 1/8. V. 1/5. A. 4/23 or 4/24. C. 1/15/1 and shorter ones alongside.

Hab. Sumatra (Palembang), in rivers.

Lenght of the only specimen 115‘‘‘.

Remark. This till now only known archipelagic species of Eutropius differs from all its Asiatic and African generic relatives by a remarkably shorter anal fin, which has only 27 or 28 rays and which more than any other species hints at the relationship of Eutropius with Pangasius. In all remaining species the anal fin, as far as I can acertain, has from 30 to 60 rays and occupies a remarkably larger part of the body length (⅓ or more than ⅓ of the total length). Indeed the species in question is most closely related to Eutropius angius (Pimelodus angius Buch.), which shows a great resemblance in habitus and is likewise characterized by three dark longitudinal bands. Eutropius angius however, has the anal fin much longer, with 42 rays, a dark spot on the basis of the caudal fin, the ventral most longitudinal band rostrally bipartite, etc.

Laïs Blkr.
Maypole

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth and vomerine teeth multiple-rowed and small, vomerine teeth placed in two distant groups in the anterior part of the palate. Six fleshy barbels. Branchiostegal membrane with 8 or 9 rays. Interbranchial membrane with a deep incision. Nostrils not tubular. Anal fin elongate. Adipose fin very small. Snout fleshy, broad and convex. Eyes free and posterior.

Remark. I erect the genus Laïs after the species that I described in 1852 under the name Pangasius hexanema, when I was of the opinion that I could not erect a genus based only on a diverging number of barbels. However, I then had 171 already noticed

the peculiar arrangement of the vomerine teeth and on this character, combined with the 6 flat tape-like barbels I could have based a proper genus. A more detailed investigation of the Siluroïds has brought me to my new opinion and indeed my earlier Pangasius hexanema forms a well characterized genus among Pangasius, Eutropius and Silundia. Remarkably in Laïs is also the more or less prismatic head shape, which is tapering ventrally as a result of which the eyes are directed obliquely downwards and are much closer together on the ventral side than on the upper side.

Laïs hexanema Blkr.
Atl. Silur. tab. XXVII fig. 2.
Six-barbelled maypole

A Laïs with an elongate, compressed body, anterior part much higher than broad, body depth above the beginning of the anal fin contained 4⅖ to 4⅗ times in its length without, and 5½ to 5¾ times in its length with caudal fin. Head nearly prism-formed, contained 5¼ to 5⅓ times in length of body without, and 6⅔ to slightly more than 7 times in length of body with caudal fin; depth of head contained slightly more than once to 1¼ times in its length, width 1½ to 1⅘ times; rostro-dorsal profile with a slightly convex snout and crown, and a slightly concave forehead. Head shield smooth, longitudinal groove reaching the base of supraoccipital crest, dividing the entire head shield; supraoccipital crest very thin, more than four times as long as basal width, smooth, no thinner near the top than at the base, reaching the elongate and acute first interspinal bone; eyes for a large part covered by cephalic skin, placed behind the mouth corner, eye diameter contained 2¼ to 2⅓ times in length of head, distance between the eyes at top nearly 1 to 1⅓ times their diameter, at the bottom much less than one diameter; anterior and posterior nostrils much less than half the eye diameter apart. The posterior nostrils in the form of a fissure, transverse, near middle line of snout, anterior ones are round, placed in the fleshy part of the snout; snout shorter than the eye, convex, protruding slightly beyond mouth opening, rostral profile obtusely rounded; barbels compressed, maxillary barbels reaching the ventral fins or the anal fin, outer and inner lower jaw barbels nearly equal, reaching the base of pectoral fin; teeth multiple-rowed, small and acute, upper jaw teeth placed in a crescent-shaped band, lower jaw teeth in a band reminding of the form of a horse shoe; vomerine teeth placed in two thin oblong, transverse, sometimes touching groups; gill cover and humeral bone smooth, humeral bone short and obtuse; axillary slime pore not visible; lateral line branched, with small, generally inconspicuous, simple branches. Rayed dorsal fin acute, lower than body, more than twice as high as length of fin base, the spine thin, contained 1½ to 1¼ times in length of head, posterior side serrated with small teeth; adipose dorsal fin very small, hardly or not larger than the posterior nostrils; pectoral fins acute, in length equal to the head or slightly longer than the head, the spine thin longer than the dorsal spine, posterior side serrated with small, conspicuous teeth; ventral fins acute, about twice as short as the pectoral fins; anal fin angular, feebly emarginate, length contained 2¾ to 2⅖ times in length of body without caudal fin, more than three times as long as high; caudal fin has a deep incision and acute lobes, 172 lower one slightly longer than upper one, contained nearly 4¾ to nearly 5 times in length of total body. Colour of upper part of body faintly golden-green, lower part pearly or whitish; fins hyaline or yellowish-hyaline, sometimes with dark speckles.

B. 8 or 9. D. 1/7. P. 1/9 or 1/10. V. 1/5. A. 4/36 to 4/39. C. 1/15/1 and shorter ones alongside.

Syn. *Pangasius hexanema* Blkr, Diagn. Beschr. Vischs. Sumatr. Tient. I-IV. Nat. Tijdschr. Ned. Ind. III p. 589.
Laïs Sundanese.

Hab. Java (Batavia, Tjikao, Parongkalong), in rivers.
Sumatra (Palembang, Lahat, Lematang-Enim), in rivers.
Borneo (Pontianak), in rivers.

Length of the 18 specimens 98‴ to 165‴.

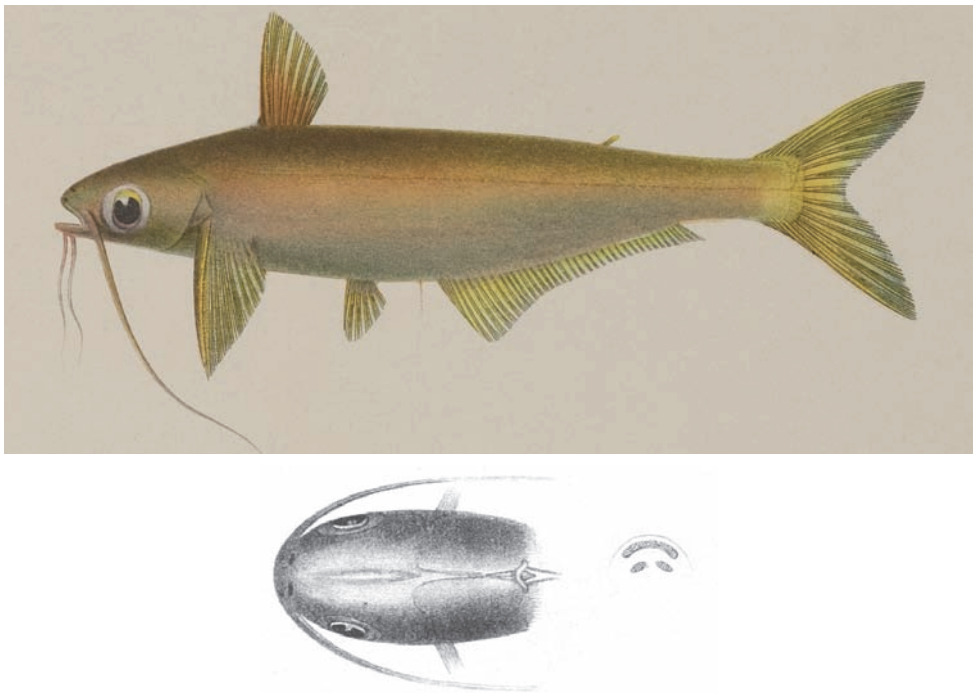

Fig. 37. *Lais hexanema* Blkr.

Remark. I discovered this species already in 1850 in Batavia and described it in 1852 in the above mentioned paper on the only two specimens then in my possession. Since then I received various specimens from Borneo and Sumatra and I myself observed a large number of specimens in Parangkolong, in the Preanger Regencies, where the Tjitarum river, while it was poisoned with akar toemba during a fishing party, threw many hundreds of specimens on the badodong[1]. The Sundanese call this

[1] In Java the badodong is made of bamboo. It is a fence in the shape of a letter V the ends of which reach to the riverbanks, whereas the point of the V is directed downstream and ends in the middle of the river in a sloping plane which rises from the bottom of the river till above the water surface where usually a tent is erected for guests who attend the fishing party. The tent is connected to both riverbanks by a bamboo bridge. The whole therefore has the shape of V placed on a vertical line: V. The stunned fishes floating down the river, along the fence are thrown on the sloping plane where they are caught. In Parongkalong I attended a large fishing party, which was given by the Regent of Tjandjioer and for which I was invited by Jhr Mr H.C. van der Wijck, then still Regent of the Preanger Regencies, nowadays Resident of Soerabaja. Nearly all prominent native Heads of the Regency with their families were represented during that fishing party and thousands of kampong inhabitants also had come to Parongkalong, partly to preperate the akar toeba and throwing it in the river, partly to get a part of the catch. Hundreds of natives in small proahs are moving above the badodong site to ladle the surfacing and stunned fishes out of the water, however the large mass, especially the larger fishes like the Djambal (Pangasius Djambal Blkr), lika (Bagarius Buchanani Blkr), remang (Rohita chrysophekadion Blkr), lehat (Lobocheilos falcifer Blkr), etc., fishes with a length of three feet and more, strayed the river in all directions, jumping out of the water from time to time, but always ending by downstream being thrown on the badowong and there being caught with cudgels and landing nets.

fish Laïs, a 173 name which in the Palembang area is given to one of the species of Pangasius. It does not seem to become larger than my largest specimen, which was the largest one caught during the fishing party with akar toemboe. The taste is like that of the Djambal.

Helicophagus Blkr.

Acta Soc. Scient. Ind. Neerl. III Zesde Bijdr. Vischfaun. Sumatra p. 49.

Snail-eater

Two dorsal fins, the anterior one rayed, the posterior one adipose. Anal fin elongate. Adipose fin very small. Jaw teeth multiple-rowed, setaceous and equal. Vomerine teeth placed in 2 distant groups. No palatine teeth. Eyes placed above mouth corner and free. 4 Barbels, maxillary and lower jaw barbels. Branchiostegal membrane with 9 rays. Interbranchial membrane slightly emarginate. Ventral fin with rays 1/4 or 1/5. Dorsal fin and pectoral fin spines with teeth. Swim bladder with chambers.

Remark. This genus as far as relationship is concerned stands between Laïs and Pangasius and has in habitus of the body and the shape of the head shield much of the genus Pangasius, even as far as the shape of the lateral line, which in both genera at the caudal fin base is split in two parts, which in a wide curve bend upwards and downwards. However, Pangasius apart from the presence of groups of palatine teeth beside a group or groups of vomerine teeth, differs by a fleshy bulging snout and caudally placed eyes, which gives it an own aspect, that make it possible to distinguish Pangasius immediately both from Helicophagus as from other Siluroïd genera.

With regard to the dentition Helicophagus is most closely related to the genus Laïs, in which the vomerine teeth are also placed in two separate groups anteriorly in the palate, and the groups of palatine teeth are lacking. Laïs however, has a different habitus, caudally placed eyes and six barbels and therefore cannot be confused with Helicophagus.

I discovered the genus Helicophagus in October 1856 and erected 174 it on the basis of the only known species known to me from a single specimen, which I named Helicophagus typus. I then already pointed at the relationship with Pangasius, but also at that with Pimelodus, because of the absence of teeth on the palate. A second species, which very recently came in my possession, appeared to me to be very remarkable because I found it had two admittedly small, but well developed and separate groups of vomerine teeth, and this induced me to examine my specimen of Helicophagus typus in more detail. I discovered that there similar groups of teeth are also present in a normal situation, since on the left side some closely together standing small teeth, readily observable with a lens, are present at the same position where in Helicophagus Waandersii the group of vomerine teeth of the left side is placed. Therefore it seems probable to me, that regarding this the dentition both species do not differ essentially and that the vomerine teeth in Helicophagus fall out early (like also happens in species of the genus Ariodes), or develop only at a later stage.

Both species have a similar habitus, which made me think of a proper genus, and that similarity is even so large, that at first glance I considered my specimen of Helicophagus Waandersii to be the same species as Helicophagus typus. However, both

species differ in numerous respects, as will be apparent from their descriptions. Here below I will only give a few characters by which both species can easily be recognized.

I. Humeral bone obtuse and rounded. Premaxillary teeth placed in 2 nearly rectangular groups, about as broad as long. A. 4/33 or 4/34.

Helicophagus Waandersii Blkr.

II. Humeral bone acute. Premaxillary teeth placed in curved band which is more than four times as long as broad. A. 4/25 or 4/26.

Helicophagus typus Blkr.

175 *Helicophagus Waandersii* Blkr.
Atl. Silur. tab. XXXII.
Waanders' Snail-eater

A Helicophagus with an elongate, compressed body, body depth contained about 5 times in its length without, and about 6 times in its length with caudal fin, largest body width contained about 1½ times in body depth. Head nearly conical and convex, contained 5⅓ to 5¼ times in length of body without, and 6⅓ to 6½ times in length of body with caudal fin; depth of head contained about 1⅖ times in its length, width 1¾ to 1⅘ times; eyes free placed above the mouth corner, eye diameter contained about 4¼ times in length of head, distance between the eyes about 1⅗ times their diameter; rostro-dorsal

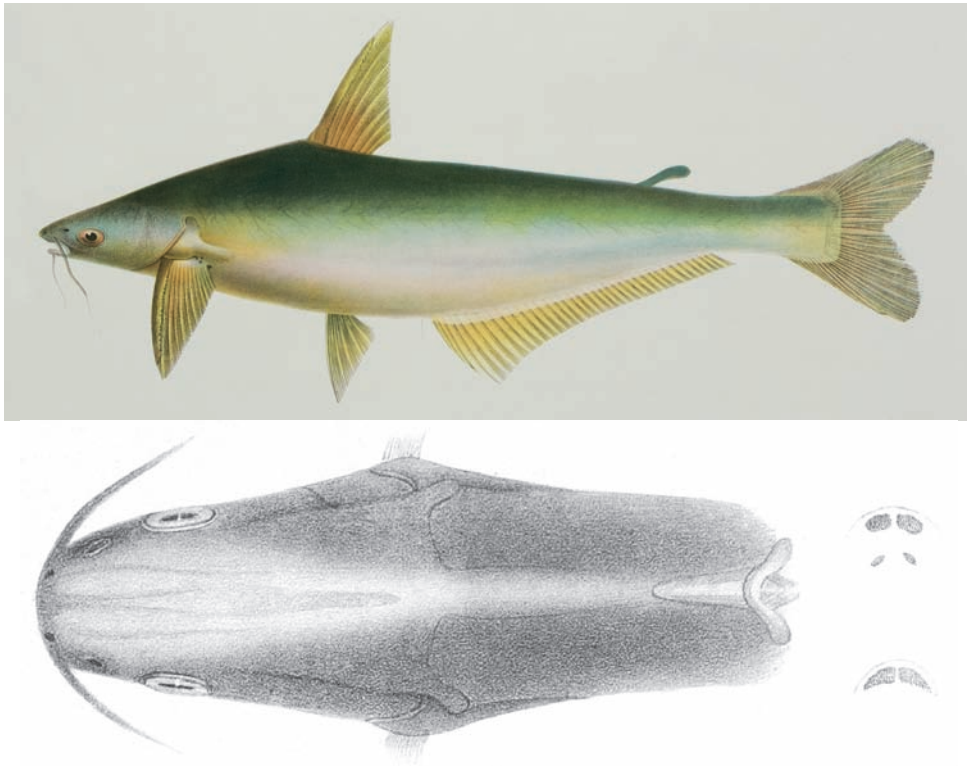

Fig. 38. *Helicophagus Waandersii* Blkr.

profile sloping, nearly straight, only at the snout convex. Head shield totally glabrous, not rough or granulated, longitudinal median groove nearly reaching the base of the supraoccipital crest, dividing nearly the entire head shield; supraoccipital crest more than three times as long as the basal width, not rough or grainy, hardly tapering, its top very obtuse and truncate, reaching the first thin, elongate, glabrous interspinal bone; snout convex, slightly longer than the eye, protruding slightly beyond the mouth opening, rostral profile slightly obtusely rounded; nostrils placed apart, anterior nostrils round and placed close to the tip of the snout, the posterior nostrils oblong and placed nearer to the eye than to tip of the snout, they can be closed by means of a small valve; lips fleshy; maxillary barbels overreaching the eye, lower jaw barbels longer than the eye (broken off); teeth acute and small, the upper jaw teeth multiple-rowed, placed in 2 oval-slightly rectangular groups, no longer than broad, placed close to each other; lower jaw teeth multiple-rowed, placed in two triangular, feebly curved bands, about twice as long as broad, placed close to each other at the base; vomerine teeth placed in 3 to 4 rows in 2 small groups, thin, seperate from each other, very much diverging posteriorly; mouth width contained 3 tot 3½ times in length of head; gill cover feebly striped, ray-like; visible part of humeral bone more than twice as short as the head, posterior part obtuse and rounded; lateral line straight, slightly veined, forked at the base of the caudal fin, the curved branches bending backwards at the top and the bottom; axilla with a slimy pit which is perforated by 3 or 4 well visible mucus secreting pores. Rayed dorsal fin acute, not or hardly lower than the body, more than twice as high as the length of the fin base, the spine thick, only slightly shorter than the head, spine laterally rough, its anterior side glabrous, posterior side serrated with rather large teeth; adipose dorsal fin placed opposite the beginning of the posterior third part of the anal fin, slender, more than twice as high as the length of the fin base, its base more than three times as short as the rayed dorsal; pectoral fins acute, hardly shorter than the head, the spine thick, hardly or not shorter than the dorsal spine, spine laterally rough, its anterior side smooth, posterior side armed with rather large teeth; ventral fins starting under the posterior dorsal rays, fins not or not much shorter than the head (broken off); anal fin length contained about 2⅘ times in length of body without, and about 3⅓ times in length of body with caudal fin. It is more than three times as long as the height of anterior part and emarginate; caudal fin has a deep incision (lobes partly broken off). Colour of upper part of the body bluish-green, lower part pearly or silvery; fins yellowish-hyaline, more or less with dark speckles, adipose fin more or less olive-coloured, densely with dark speckles.

B. 9. D. 1/7. P. I/11. V. 1/5. A. 4/33 or 4/34. C. 1/15/1 and numerous shorter rays.

Hab. Sumatra (Palembang), in rivers.

Length of the only specimen 340‴.

176 Remark. Although the general shape of Helicophagus Waandersii is very similar to that of Helicophagus typus, it undoubtedly is a unique and very sharply defined species. I will not talk here about the vomerine teeth, which maybe also in Helicophagus typus of a certain age do not differ markedly from those of the species under consideration, but the premaxillary teeth here have the peculiarity that they are placed in square groups with rounded corners. Moreover, Helicophagus Waandersii differs by its smooth head shield, its smooth and more slender supraoccipital crest, its bluntly rounded shoulder bone, its longer anal fin with more finrays, an adipose fin, which has a more fatty base, etc.

My sole object as far as the body is concerned is in an excellent state of preservation, the caudal fin lobes, the pelvic fins and the barbels however, are only partly present, so that I could not determine their lengths precisely.

I have named the species in honour of Mr J.F. van Bloemen Waanders[(1)], major of the artillery in the Dutch East Indian army, to whom we owe its discovery.

Helicophagus typus Blkr.
Acta Soc. Scient. Ind. Neerl. III Zesde Bijdr. Vischfaun. Sumatra p. 46,
Atl. Silur. tab. XXXI fig. 2, [fig. 1]
Common Snail-eater

A Helicophagus with an elongate, compressed body, anterior part deeper than broad, body depth contained 4½ to 4⅗ times in its length without, and 5⅔ to 6 times in its length with caudal fin. Head nearly conical, convex, contained 4⅔ times in length of body without, and slightly more than 6 times in length of body with caudal fin. Depth and width of the head contained about 1⅔ times in its length; eyes nearly superior, free, eye diameter contained about 5 times in length of head, distance between the eyes more than 2 times the eye diameter; 177 rostro-dorsal profile sloping, with a convex forehead and snout. Head shield longitudinally rough, not granulated, median longitudinal groove nearly reaching the base of the supraoccipital crest, dividing nearly the entire head shield; supraoccipital crest more than twice as long as the basal width, longitudinally rough, not granulated, its top tapering and emarginate, reaching the oblong-triangular and rough first interspinal bone; snout convex, less than twice as long as the eye, hardly protruding beyond the mouth opening, rostral profile obtusely rounded; nostrils placed apart, anterior nostrils round and placed close to the tip of the snout, posterior nostrils oblong and placed nearer to the eye than to the tip of the snout, they can be closed by means of an elevated small valve; lips fleshy; barbels slender, maxillary barbels bony at the base, nearly reaching posterior part of the pectoral fin, lower jaw barbels nearly reaching the gill covers; teeth in both jaws multiple-rowed, medium-sized and equal, placed in a slightly curved band, more than four times as long as broad, bipartite. In the left side of the vomer some small teeth placed in a very small, roundish group; Mouth width contained about 2 times in length of head; gill cover with crests rays-like; visible part of the humeral bone about twice as short as the head, very acute, slightly glabrous; anterior part of lateral line slightly sloping downwards, posterior part straight and slightly veined, forked at the base of the caudal fin, the curved branches bending back at the top and bottom; 4 or 5 very conspicuous axillary slime pores. Rayed dorsal fin acute, slightly lower than the body, more than twice as high as the length of the fin base, the spine thick, contained about 1⅓ times in length of head, spine laterally rough, its anterior side feebly granulated, posterior side serrated with rather large teeth; adipose dorsal fin placed opposite the beginning of the posterior half of the anal fin, thin, obliquely rounded, but at base hardly shorter than the base of the rayed dorsal; pectoral fins acute, slightly shorter than the head, the spine thick, slightly longer than the dorsal spine, spine laterally rough, its anterior side feebly grainy, posterior side armed with rather large teeth; ventral fins slightly obtuse, placed totally behind the rayed dorsal, about twice as short as the head; anal fin length contained about 3⅕ times in length of body without, and about 3⅝ times in length of body with caudal fin, about three times as long as high anteriorly, emarginate, anterior part slightly obtuse; caudal fin with a deep incision and acute, nearly equal lobes, contained about 4⅔ times in the length of the total body. Colour of upper part of the body bluish-green, lower part pearly or silvery; fins yellowish, rayed dorsal fin and pectoral fins nearly totally, and caudal fin at the posterior margin with dark speckles, adipose fin slightly olive-coloured.

B. 9. D. 1/7. P. 1/13. V. 1/4 or 1/5. A. 4/25 or 4/26. C. 1/15/1 and shorter ones alongside.

Hab. Sumatra (Palembang), in rivers.

Length of the only specimen 220‴.

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(1) I have found occasion to stamp various species from different families with the name Waandersii. Three brothers, Misters J.T Van Bloemen Waanders mentioned above, P.L. Van Bloemen Waanders, at present Assistant Resident at Boleling, and H.L. Van Bloemen Waanders, Administrator at the governmental tin mines in Banka, by their shipments of fishes and reptiles from Sumatra, Banka and Bali, have contributed very much to the extension of the knowledge of the Fauna of these islands.

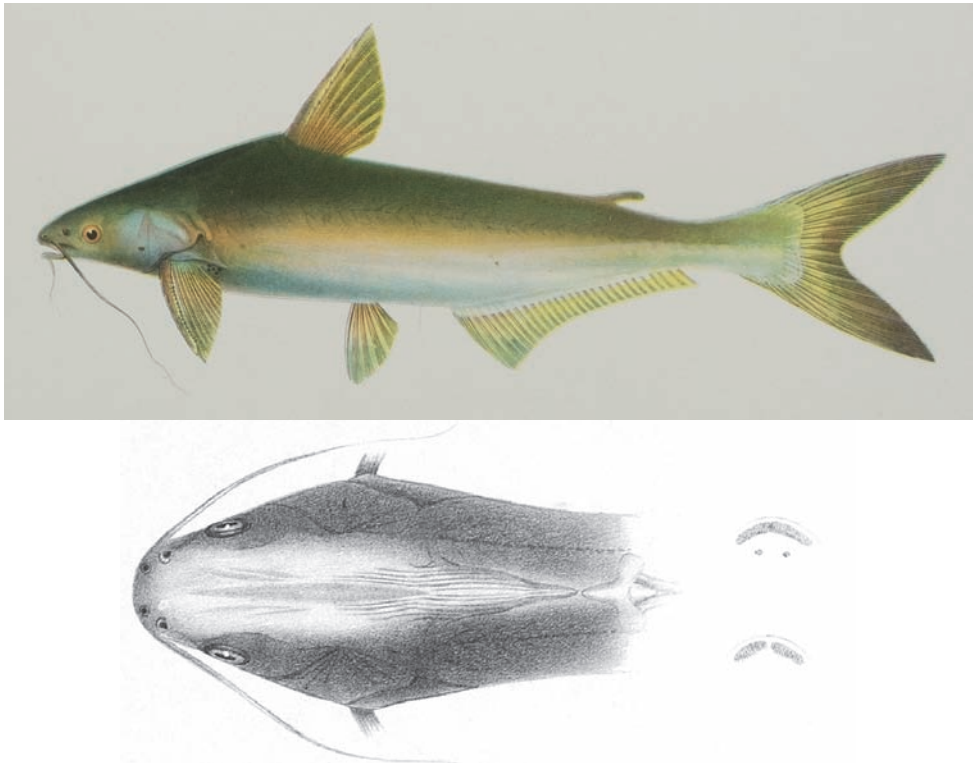

Fig. 39. *Helicophagus typus* Blkr.

Remark. The species in question is only known to me from the specimen described above. It feeds on small gastropods, of which I found a large number in the stomach. The swimbladder is elongated ovoid shaped, very thick walled and divided into many chambers. The number of pelvic fin rays on the left side is 1/5 on the right side 1/4, so that I cannot determine which is the normal number. In the remarks concerning the generic characters of Helicophagus I have already mentioned the irregular 178 development of the vomerine teeth of this species and the value that can probably be attached to this character.

Pangasius CV.
Djambal

Two dorsal fins, the anterior one rayed, the posterior one adipose. Jaw teeth and vomero-palatine teeth multiple-rowed and small. Vomerine teeth placed in a single or bipartite group, palatine teeth placed at the sides of the vomerine group in an oblong group. Four fleshy barbels. Branchiostegal membrane with 7 to 11 rays. Interbranchial membrane with a deep incision. Nostrils not tubular. Anal fin elongate. Adipose fin very small. Snout obtuse, fleshy, broad and convex. Eyes free, placed behind the mouth corner.

Remark. Amongst the Ariodontes, pre-eminently a specious group, if there is any, is a group of natural genera, which have this in common, that their adipose fin is only to be considered rudimentary and that on the contrary their anal fin is extremely developed. In these genera the head is small, the eyes are not covered by the skin of the head, although the skin forms more or less large eyelids, the branchiostegal membrane is deeply split, and the anterior nasal openings, at least in three of the species, are only simple openings of the skin without tubes. These genera are Silunda, Pangasias, Laïs, Eutropius. They form the link between the Silurichthyoïds (Schilbe and Cetopsis) and the genera Bagrus, Arius etc. and are on the other side related to the Pimelodonts by their large relation in shape, with the remarkable West Indian genus Euanemus J. Mull., that differs quite considerably from them by the absence of the vomerine and palatal teeth, covered eyes and relatively very small gill opening.

Of all four genera mentioned above, I possess representatives in my cabinet. Bagrus exodon CV. from Bengal and Eutropius brachypopterus from Sumatra are representatives of Eutropius, a genus erected by Misters J. Muller & Troschel only as a subdivision of the genus Bagrus. The 179 Bengal species, on the basis of which Mr Valenciennes has proposed his genera Pangasius and Silunda, are also present in my collection as well as 5 Sundanic species of Pangasius, discovered by myself. My previous Pangasius hexanema, a species with six barbels, is the type of the fourth genus, whereas the fifth genus was already erected by me last year, under the name of Helicophagus.

The genera in question are very easy to distinguish from each other. Silundia, has only 2 barbels, Pangasius and Helicophagus 4, Laïs 6 and Eutropius 8. Except by these numbers of barbels the aforementioned genera are recognisable by their teeth as follows: Silundia by the sharp, double rowed teeth in both jaws and by the horse shoe shaped band of vomerine-palatal teeth, and Laïs by the many rowed jaw teeth and the two small groups of vomerine teeth which are placed in the anterior part of the palate, while real palatal teeth are lacking. Pangasius and Eutropius are less easy to separate from each other by their dentition. Both species have many rows of vomerine and palatal teeth. In Eutropius like in Pangasius, the tooth band seems to be separated in 4 groups that stand close together. And although I do not know an example of any species of Eutropius in which the vomerine teeth form a separate massive square group, the last named dentition in Pangasius is not at all stable. Moreover, in all species of Eutropius, the anterior nasal openings seem to be simple openings without tubes and the only difference between Pangasius and Eutropius, apart from the barbels, would be the round, bulging fleshy snout of Pangasius. Helicophagus differs from Pangasius, mostly by the absence of palatine teeth, as it has only two small, widely separated groups of vomerine teeth. In Pangasius, Laïs and Silundia, the eyes are always placed behind the slit of the mouth. As a rule this is also the case in Eutropius, but some species, judging from existing figures, e.g. Eutropius vacha (Pimelodus vacha Buch.), seem to form an exception. In Helicophagus the eyes are placed 180 more dorsally in the head and could be considered to be placed superior rather than posterior.

My species of Pangasius, all originate from Java, Borneo and Sumatra. It is remarkable that I never received any species, neither of Pangasius, nor of Laïs nor of

Helicophagus from the smaller closeby lying islands, like Bintang, Banka, Biliton, Bali, from which I nevertheless have received many freshwater species. The genus Silundïa does not seem to occur in the Indian archipelago.

The species of Pangasius from the Sunda Islands can be keyed out as follows:

I. Head shield rough.
   a. Supraoccipital crest tapering towards the top. Dorsal spines shorter than the head. Maxillary barbels touching the gill covers or the humeral bone. Anal fin with 4/26 to 4/29 rays and contained 3½ to 3¾ times, head contained 4½ to 4¾ times in length of body without caudal fin.

Pangasius djambal Blkr.

II. Head shield smooth-skinned.
   a. Vomerine teeth placed in 2 oblong groups.
      † Barbels longer than the head.
         § Anal fin contained about 3 times, head contained 4⅖ to 5 times in length of body without caudal fin. A. 4/27 to 4/30. P. 1/12.

Pangasius macronema Blkr.

      † Barbels more than twice as short as the head.
         § Anal fin contained 3⅔ to 3⅗ times, head 4⅘ to 5 times in length of body without caudal fin. A. 4/29 or 4/30. P. 1 1/13 or 1 1/14. Dorsal spine contained 1½ times in length of head.

Pangasius rios Blkr.

         § Anal fin contained 3⅘ to 4 times, head contained slightly more than 5 times to 5½ times in length of body without caudal fin. A. 4/25 or 4/26. P. 1/11 or 1/12. Dorsal spine contained 1⅓ to 1⅕ times in length of head.

181 *Pangasius micronema* Blkr.

   b. Vomerine teeth placed in one, large, square group.
      † Barbels shorter than the head.
         § Anal fin about 3 times, head contained 5⅕ to 6⅖ times in length of body without caudal fin. A. 4/31 to 4/36. P. 1/14 or 1/13. Dorsal spine contained once to 1¼ times in length of head.

Pangasius polyuranodon Blkr.

Pangasius djambal Blkr.

Silur. batav. spec. nup. detect. in Natuur- en Geneesk. Archief voor Ned. Ind. III p. 290, Verh. Bat. Gen. XXI, I Silur. batav. Consp. p. 21. Atl. Silur. tab. XXVIII

Javanese Djambal

A Pangasius with an elongate body, anterior part not or only slightly deeper than broad, posterior part compressed, body depth above the beginning of anal fin contained 5 to 4⅔ times in its length without, and 6⅓ to slightly more than 6 times in its length with caudal fin. Head contained 4½ to 4¾ times in

length of body without, width 5½ to 6 times in length of body with caudal fin; depth of head contained 1½ to 1⅓ (?) times in its length, width 1⅕ to 1⅓ times; rostro-dorsal profile with a slightly convex forehead and nape. Head shield, the upper part rough, longitudinal groove not reaching the base of the supraoccipital crest, dividing nearly the entire head shield; supraoccipital crest more than twice as long as the basal width, rough, its top much thinner than the base, reaching the triangular, acute, glabrous or rough first interspinal bone; eye diameter contained 4 to 6 times in length of head, distance between the eyes 2⅓ to 4 times their diameter; anterior and posterior nostrils placed at a distance of less than half the eye diameter; snout in younger fishes slightly longer than, in older fishes about twice as long as the eye, protruding beyond the mouth opening, rostral profile obtusely rounded; barbels thin, maxillary barbels reaching humeral bone or gill covers, lower jaw barbels reaching the gill cover or the eye. Jaw teeth multiple-rowed, small and acute or slightly acute, the upper jaw teeth placed in a crescent-shaped band, the lower jaw teeth in a form reminding of a horseshoe, vomerine teeth small, slightly acute or slightly obtuse, in younger fishes placed in 2 close oblong-round or more or less rectangular groups, in older fishes generally in a simple oblong-rectangular group, most than twice as broad as long, palatine teeth small, slightly acute or slightly obtuse, placed at both sides in an oblong group placed next to the vomerine tooth groups or group; gill cover smooth; humeral bone acute, generally slightly rough; axillary slime pores very conspicuous; lateral line branched, branches elongate and generally simple. Rayed dorsal fin acute, slightly or not lower than the body, twice or more than twice as high as length of fin base, spine robust, in younger fishes contained 1⅖ to 1½ times, in older

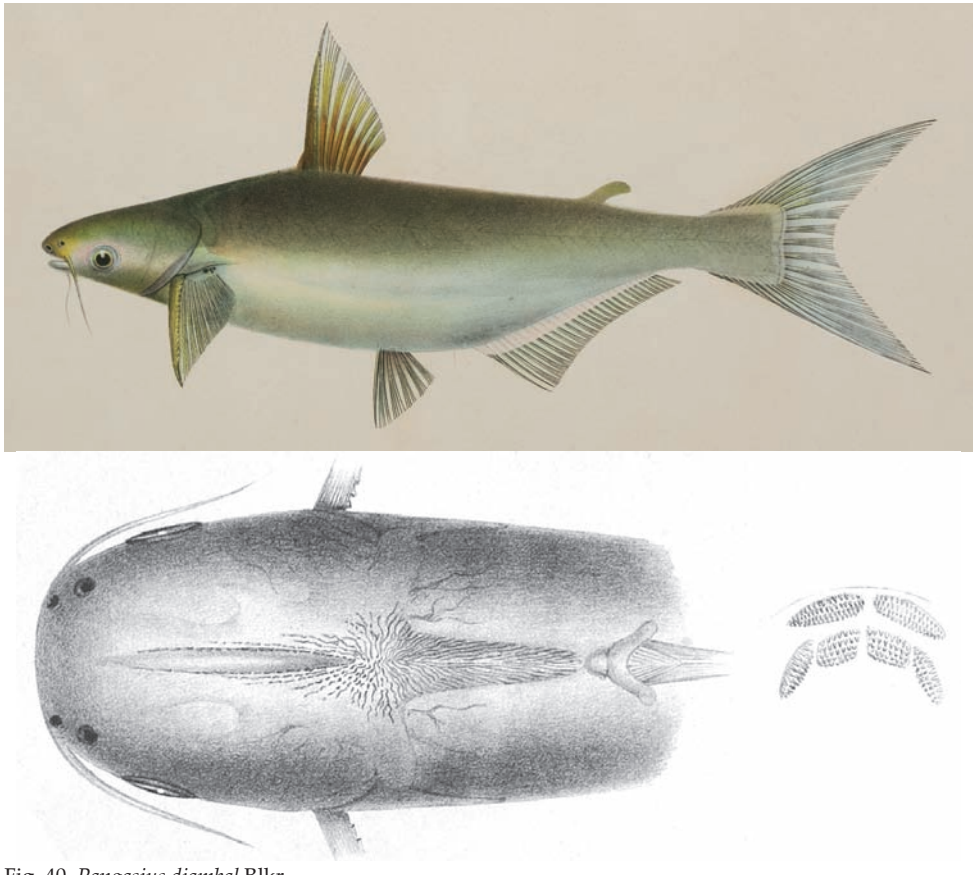

Fig. 40. *Pangasius djambal* Blkr.

fishes contained 1⅓ to 1⅕ times in length of head, spine striped, its anterior and lower part granulated, the upper part often feebly serrated, posterior side totally serrated with conspicuous teeth; adipose dorsal fin very slender, 182 more than twice as high as the length of the fin base; pectoral fins acute, not much shorter than the head, the spine robust, equal to the dorsal spine or slightly longer or shorter than this, spine striped, its anterior side granulated near the base, often feebly serrated near the top, posterior side totally serrated with conspicuous teeth; ventral fins acute, shorter than pectoral fins; anal fin angular, feebly emarginate, length contained 3¾ to nearly 3½ times in length of body without caudal fin, less than three times as long as high; caudal fin with a deep incision and acute, nearly equal lobes, contained 4⅖ to 5 times in the length of the total body. Colour of upper part of the body bluish-green and pearly, lower part whitish or silvery; fins yellowish-hyaline or rosy-hyaline, frequently more or less with dark speckles.

B. 9. D. 1/7. P. 1/12 or 1/13. V. 1/5. A. 4/26 to 4/29. C. 1/15/1 and shorter ones alongside.

Syn. *Djambal* Mal. and Sundanese.

Hab. Java (Batavia, Krawang, Tjikao, Parongkalong), in rivers.

Length of the 16 specimens 144‴ to 640‴.

Remark. Pangasius Djambal certainly is the species, which is most closely related to that of Bengal, which until my investigations was the only known species of the genus.

The species from Bengal, Pangasius Buchanani CV., is also present in my collection, in juvenile specimens of 156 to 196 mm [Total]. Length and has been described by me in my Nalezingen op de ichthyologische fauna van Bengalen en Hindostan. I compared these specimens with specimens of Pangasius Djambal of the same size. From this comparison, I found that in the species from Bengal the head shield and the supraoccipital crest are broader and much more rough, and the dorsal and pectoral fin spines are much more developed, whereas the anal fin is relatively longer. Moreover, the supraoccipital crest in Pangasius Buchanani at the end is of equal width as at the base, whereas in Pangasius Djambal this crest is tapering and at the tip is hardly or just half as broad as at the base. Other small differences appear to me of two little value for a clear recognition of both species.

Pangasius Djambal is a very common species in the large rivers of the western part of Java. It can reach twice the size of my largest specimen. From time to time, numerous specimens from two to three feet in length, are brought to market in Batavia. These are usually caught in the delta of the river Tjitarum, however, the Djambal also occurs in the higher parts of the rivers. During a large 183 fishing party of local fishermen in Parongkalong, a large part of the catch consisted of Djambal. There I saw specimens of more than 3 feet long. The meat of specimens, which live in the delta's or near the river mouths is much less palatable than that of specimens from the higher parts of the rivers, where they feed less on molluscs. And whereas in Batavia the Djambal is regarded as a common fish, which is only eaten by the natives and the Chinese, in the Preanger district I heard people praise it as one of the most palatable fishes. However, I could not confirm this, but it can be explained by the fact that people from the higher areas of Java are hardly used to eat appetizing species of fish.

Pangasius macronema Blkr.
Bijdr. Ichth. Borneo, Nat. Tijdschr. Ned. I. p. 11, Atl. Silur tab XXVII fig. 3.
Long-barbelled Djambal

A Pangasius with an elongate, compressed body, anterior part much deeper than broad, body depth above the beginning of the anal fin contained 4⅖ to 4 times in its length without, and 5½ to 5 times in its length with caudal fin. Head contained 4⅖ to 5 times in length of body without, and 5 to 6 times in length of body with caudal fin; depth of head contained 1¼ times to hardly more than once in its length, width 1½ to 1⅖ times; rostro-dorsal profile slightly concave at the crown. Head shield glabrous, longitudinal groove nearly reaching the base of the supraoccipital crest, dividing nearly the entire head shield; supraoccipital crest about twice as long as the basal width, covered with glabrous skin, its top reaching the glabrous, triangular, acute and short first interspinal bone; eye diameter contained 2½ to 3 times in length of head, distance between the eyes 1 to 1½ times the eye diameter; anterior and posterior nostrils less than half the eye diameter apart; snout shorter than the eye, hardly protruding beyond the mouth opening, rostral profile slightly obtusely rounded; maxillary barbels reaching or overreaching the top of the pectoral fin, lower jaw barbels overreaching the base of the pectoral fin. Jaw teeth multiple-rowed, small and acute, the upper jaw teeth placed in a crescent-shaped band, the lower jaw teeth placed in a form reminding of a horseshoe; vomerine-palatine teeth small, conical and slightly acute, placed in 4 small oblong groups, placed apart, forming a nearly crescent-shaped bow, palatine groups larger than vomerine groups; gill cover and acute humeral bone smooth; axillary slime pores very conspicuous; lateral line branched, branches generally simple. Rayed dorsal fin acute, lower than the body, more than twice as high as the length of the fin base, the spine medium-sized, contained 1⅓ to 1⅕ times in length of head, the anterior and lower part granulated, spine serrated near the top, posterior side totally serrated with conspicuous teeth; adipose dor-

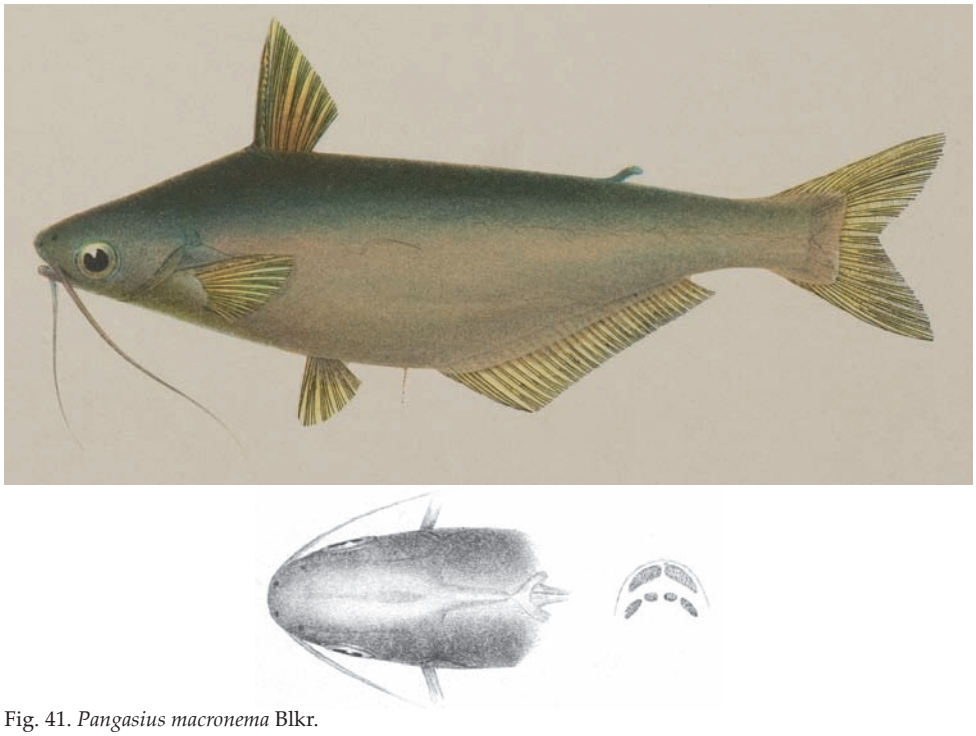

Fig. 41. *Pangasius macronema* Blkr.

sal fin very thin, more than twice as high as the length of the fin base; pectoral fins acute, hardly shorter than the head, the spine medium-sized, not or hardly longer than the dorsal spine, anterior part granulated near the base, posterior side totally serrated with conspicuous teeth; ventral fins acute, less than twice as short as the pectoral fins; anal fin angular, hardly 184 emarginate, length contained about 3 times in length of body without caudal fin, about three times as long as high; caudal fin has a deep incision and acute lobes, contained 5⅓ to 5 times in the length of the total body. Colour of upper part of the body more or less faintly olive-coloured, lower part pearly or silvery; fins yellowish-hyaline.

B. 10 to 11. D. 1/7. P. 1/12. V. 1/5. A. 4/27 to 4/30. C. 1/15/1 and shorter ones alongside.

Syn. *Rios* Mal. Bandjerm.

Hab. Borneo (Bandjermasin) in rivers.

Length of the 16 specimens 92‴ to 148‴.

Remark. This species appears to be very common in the river of Banjermasin, the capital of South east Borneo, but it does not seem to reach the size of the other species of this genus. It is easy to recognize by its thick-set shape and long barbels, which are longer than those of any other species.

Pangasius rios Blkr.
Vierde Bijdr. Ichth. Borneo, Nat. Tijdschr. Ned. Ind. II p. 205.
Atl. Silur. tab. XXXI fig. 1. [fig. 2]
Bornean Djambal

A Pangasius with an elongate body, anterior part about as broad as deep, posterior part compressed, body depth above the beginning of the anal fin contained nearly 5 to 4¼ times in its length without, and 6 to about 6⅓ times in its length with caudal fin. Head contained 4⅘ to 5 times in length without, 5½ to 6½ times in length with caudal fin; depth of head contained about 1⅓ times in its length, width 1¼ to 1⅕ times; rostro-dorsal profile slightly convex at the top. Head shield glabrous, longitudinal groove not reaching the base of the supraoccipital crest, dividing nearly the entire head shield; supraoccipital crest more than twice as long as the basal width, covered with glabrous skin, its top reaching the thin, glabrous, triangular, acute first interspinal bone; eye diameter contained 3 to 3⅓ times in length of head, distance between the eyes 2 to 2½ times their diameter; anterior and posterior nostrils less than half the eye diameter apart; snout shorter than the eye, hardly protruding beyond the mouth opening, rostral profile very obtusely rounded; barbels slender, maxillary barbels hardly reaching or not reaching the postocular area, lower jaw barbels hardly or not reaching the eye. Jaw teeth multiple-rowed, small and acute, the upper jaw teeth placed in a transverse band with obtuse corners, nearly crescent-shaped, the lower jaw teeth placed in a form reminding of a horseshoe; vomerine-palatine teeth small and acute, placed in 4 oblong, more or less equal groups, forming a nearly crescent-shaped bow; gill cover and acute humeral bone smooth; axillary slime pores very conspicuous; lateral line branched, branches elongate, generally simple. Rayed dorsal fin acute, lower than the body, more than twice as high as the length of the fin base, the spine medium-sized, contained about once in length of head, its anterior side totally glabrous, posterior side serrated with conspicuous teeth; adipose dorsal fin very slender, more than twice as high as the length of the fin base; pectoral fins acute, hardly shorter than the head, the spine medium-sized, slightly longer than dorsal spine, its anterior side near the top, posterior side totally serrated with conspicuous teeth; ventral fins acute, 185 less than twice as short as the pectoral fins; anal fin acute, emarginate, length contained 3⅗ to 3⅔ times in length of body without caudal fin, about three times as long as high; caudal fin has a deep incision and broad lobes, acute at the tip, contained about 4¼ times in the length of the total body. Colour of upper part of the body bluish-green, lower part silvery or pearly; fins pearly or yellowish-hyaline, anal fin yellow.

B. 9. D. 1/7. P. 1/13 or 1/14. V. 1/5. A. 4/29 or 4/30. C. 1/15/1 and shorter ones alongside.

Syn. *Rios-tjoring* Mal. Bandjermas.

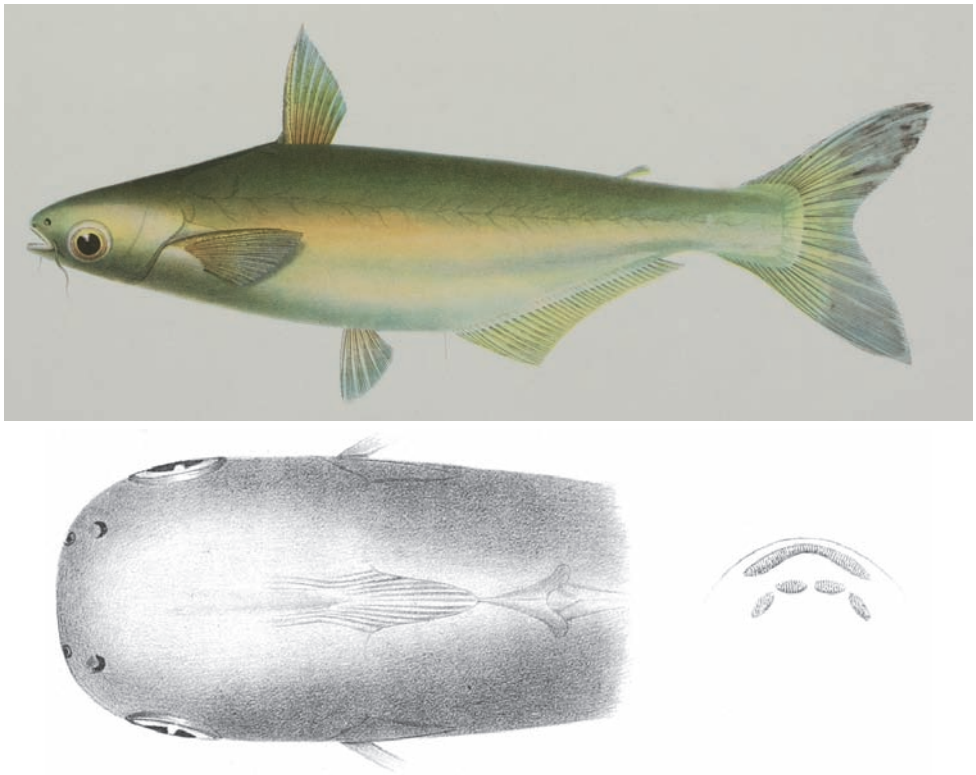

Fig. 42. *Pangasius rios* Blkr.

Hab. South Borneo (Bandjermasin, Pengaron), in rivers.
Length of the 2 specimens 115‴ and 254‴.

Remark. When I described this species for the first time in May 1851, I possessed only one specimen that was in a very bad state of preservation. A specimen that I received later, more than twice the length of the first one, has enabled me to give a more sufficient description of the species. It is very closely related to Pangasius micronema Blkr from Java. The differences, except those of the fin ray numbers, are quite apparent when specimens of equal length are compared.

Pangasius micronema Blkr.
Verh. Bat. Gen. XXI Nieuwe Bijdr. Siluroid. Java p. 8, Atl. Silur. tab. XXIX. [fig. 2]
Short-barbelled Djambal

A Pangasius with an elongate body, anterior part nearly as broad as deep, posterior part compressed, body depth above the beginning of the anal fin contained nearly 5 to 4¾ times in its length without, and 6½ to 6 times in its length with caudal fin. Head contained slightly more than 5 times to 5½ times in length of body without, and 6½ to 7 times in length of body with caudal fin, depth and width of the head contained 1⅓ to 1¼ times in its length; rostro-dorsal profile with a slightly convex crown. Head shield glabrous, longitudinal groove not reaching the basal of the supraoccipital crest, dividing nearly the en-

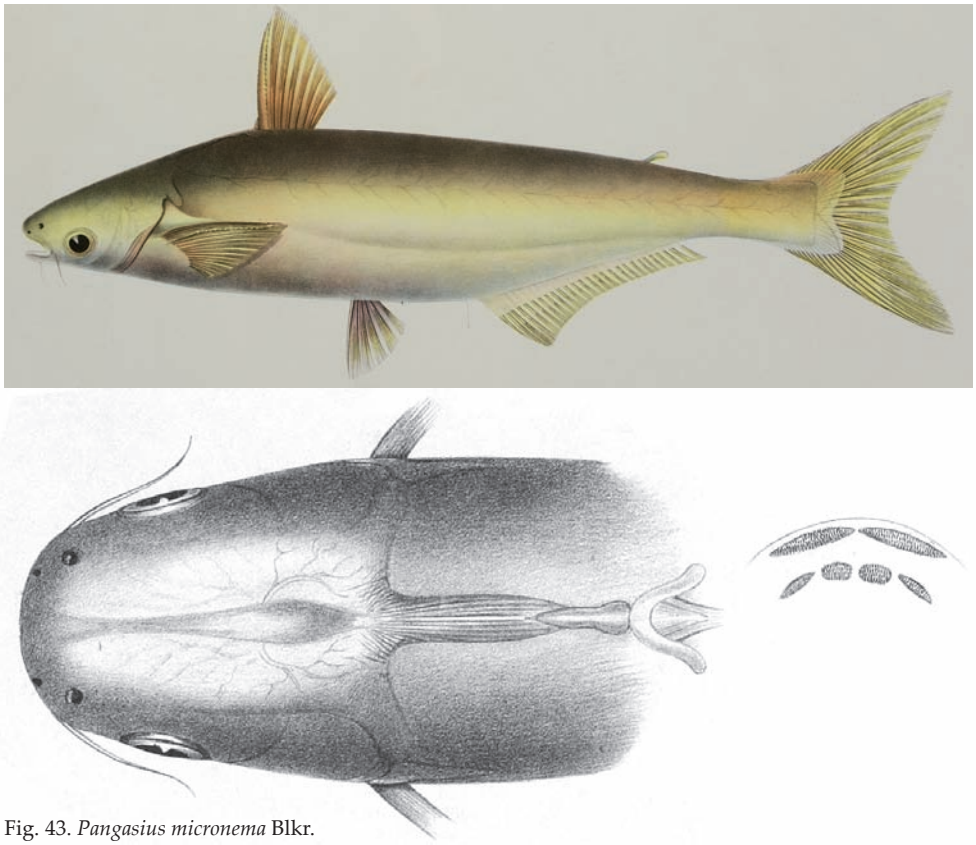

Fig. 43. *Pangasius micronema* Blkr.

tire head shield; supraoccipital crest more than twice as long as the basal width, covered with glabrous or longitudinally rough skin, its top reaching the thin, glabrous, triangular and acute first interspinal bone; eye diameter contained 3½ to 4 times in length of head, distance between the eyes 2 to 2⅓ times the eye diameter; anterior and posterior nostrils less than half the eye diameter apart; snout shorter than the eye, not protruding beyond the mouth opening, rostral profile obtusely rounded; barbels slender, maxillary barbels reaching the postocular area or the gill covers, lower jaw barbels not or hardly reaching the eye. Jaw teeth multiple-rowed, small and acute, the upper jaw teeth placed in a crescent-shaped band, the lower jaw teeth in a band reminding of the form of a horseshoe, vomerine-palatine teeth small and acute, placed in 4 oblong groups, forming a nearly crescent-shaped bow; gill cover and humeral bone acute, smooth; axillary slime pores very conspicuous; lateral line branched, branches elongate, generally simple. Rayed dorsal fin acute, lower than the body, twice or more than twice as high as the length of the fin base, the spine robust, contained 1⅓ to 1⅕ times in length of head, spine striped, 186 its anterior side granulated near the base, feebly serrated near the top, posterior side totally serrated with conspicuous teeth; adipose dorsal fin very thin, more than twice as high as the length of the fin base; pectoral fins acute, not or slightly shorter than the head, the spine robust, longer than the dorsal spine, spine striped, its anterior side granulated near the base and feebly serrated near the top, posterior side totally serrated with conspicuous teeth; ventral fins acute, less than twice as short as the pectoral fins; anal fin acute, emarginate, length contained 4 to 3⅘ times in length of the body without caudal fin, less than three times as long as high; caudal fin has a deep incision, and acute lobes, nearly equal, contained nearly 5 to 5¾ times in the length of the total body. Colour of upper part of the body faintly slightly olive, lower part whitish or silvery; fins yellowish-hyaline.

B. 9. D. 1/7. P. 1/11 ve1 1/12. V. 1/5. A. 4/25 or 4/26. C. 1/17/1 and shorter ones alongside.
Syn. *Pangasius micronema* Blkr cited above.
Wakkal central Jav.
Hab. Java (Surakarta, Wonogiri, Kediri, Gempol, Surabaja), in rivers.
Length of the 6 specimens 120‴ to 520‴.

Remark. The description given above was based on 5 of my 6 specimens, measuring 120‴ through 310‴ [mm TL]. Of my largest specimen I have only the head, skin and fins, the flesh, bones and intestines having been removed.

Pangasius micronema is most closely related to Pangasius rios from Borneo, although it differs from it in many ways. In Pangasius micronema the body is more slender, the head smaller, the eyes are smaller and the anal fin shorter, however, the spines of the dorsal and pectoral fins are remarkably stronger developed. In Pangasius rios moreover the rays in the pectoral and anal fin are more numerous.

Pangasius polyuranodon Blkr.
Zesde Bijdr. Ichthyol. Borneo, Nat Tijdschr. v. Ned. Ind. III p. 425. Atl. Silur. tab. XXX.
Many-teethed Djambal

A Pangasius with an elongate body, anterior part slightly deeper than broad, posterior part compressed, body depth above the beginning of the anal fin contained nearly 5 to 5⅓ times in its length without, and 5¾ to 6¼ times in its length with caudal fin. Head contained 5⅕ times to 6⅖ times in length of body without, and 6⅓ to 7½ times in length of body with caudal fin; depth of head contained 1⅓ to 1¼ times in its length, width 1¼ to 1⅕ times; rostro-dorsal profile sloping at the nape and crown, more or less straight. Head shield glabrous, anteriorly and posteriorly divided by the longitudinal groove nearly to the base of the supraoccipital crest; supraoccipital crest smooth or feebly rough, more than twice as long as the basal width, tapering towards the top, its top reaching the triangular, short, rough or smooth first interspinal bone; eyes only for lower part posterior, diameter contained 3½ to 4 times in length of head, distance between the eyes 2 to 2½ times their diameter; anterior 187 and posterior nostrils less than half the eye diameter apart; snout not or hardly longer than the eye, protruding slightly beyond the mouth opening, rostral profile obtusely rounded; barbels thin, maxillary barbels reaching the humeral bone, lower jaw barbels hardly longer or shorter than the eye. Jaw teeth small and acute, the upper jaw teeth in more than one row, placed in a nearly crescent-shaped band, the lower jaw teeth multiple-rowed, placed in a band slightly reminding of the form of a horseshoe; vomerine teeth small and obtuse, conical-granulated, placed in a large rectangular group, slightly broader than long, palatine teeth small, conical and slightly obtuse, placed at both sides in an oblong-elongate group next to the vomerine tooth group; gill cover and acute humeral bone smooth; lateral line branched, branches elongate, generally simple; axillary slime pores very conspicuous. Rayed dorsal fin acute, lower than the body, more than twice as high as the length of the fin base, the spine medium-sized, contained 1¼ times to slightly more than once in length of head, spine striped, the anterior side granulated on the lower part, the upper part feebly, not or hardly serrated, the posterior side over the total length serrated with very conspicuous teeth; adipose dorsal fin very thin, more than twice as high as length of the fin base; pectoral fins acute, not or slightly shorter than the head, the spine medium-sized, slightly longer than dorsal spine, spine striped, its anterior side granulated near the base, not or feebly serrated near the top, posterior side over the total length serrated with conspicuous teeth; ventral fins acute, shorter than the pectoral fins; anal fin slightly acute, feebly emarginate, length contained 3 times or hardly more than 3 times in length of body without caudal fin, less than three times as long as high; caudal fin with a deep incision and acute, nearly equal lobes, contained nearly 5 times in the length of the total body. Colour of upper part of the body bluish-green, lower part pearly or silvery; fins yellowish-hyaline or whitish-hyaline, more or less with dark speckles.

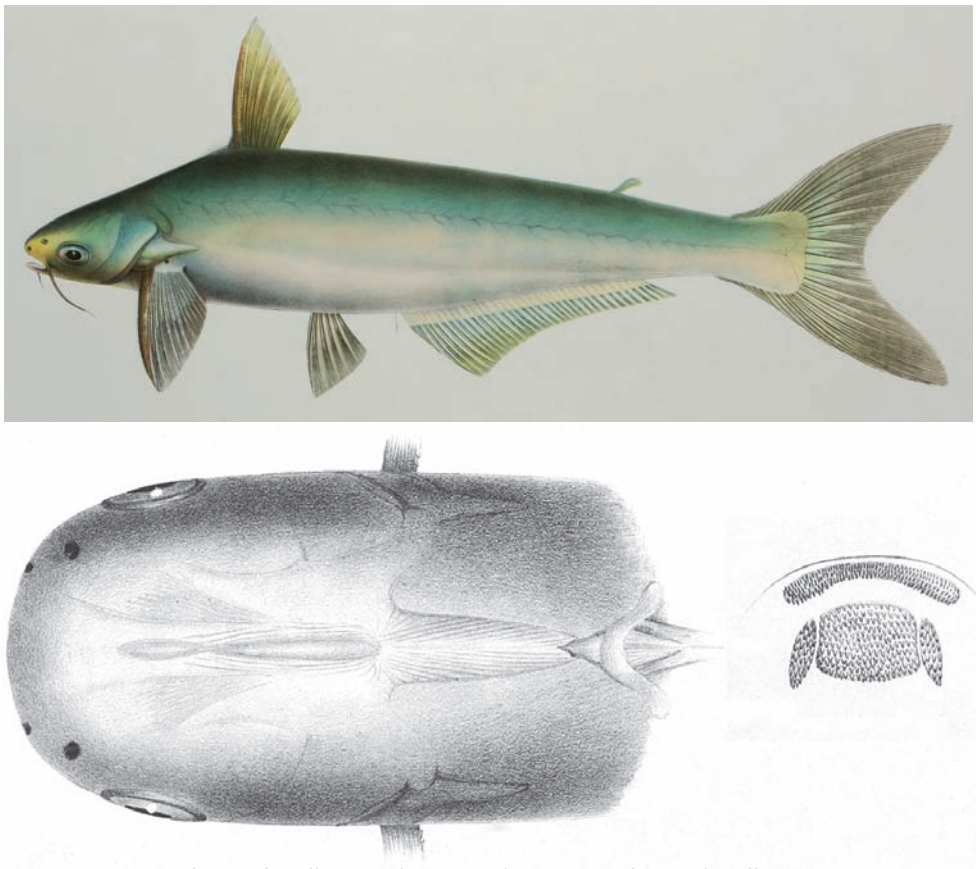

Fig. 44. *Pangasius polyuranodon* Blkr. [In Atlas as *Pseudopangasius polyuranodon* Blkr.]

B. 7 to 9. D. 1/7. P. 1/12 or 1/13. V. 1/5. A. 4/31 to 4/36. C. 1/15/1 and shorter ones alongside.

Syn. *Pangasius juaro* Blkr, Diagn. beschrijv. Vischs. Sumatr. Tient. I to V Nat. Tijdschr. Ned. Ind. III p. 589.
Juaro Palembangens.

Hab. East Sumatra in the river Mussi near Palembang.
Borneo, in rivers near Bandjermasin, Koetei and Pontianak.

Length of the 10 specimens 145‴ to 346‴.

Remark. A few years ago I knew only two specimens of Pangasias polyuranodon, one from Borneo and one from Sumatra. At the time I believed the specimen from Sumatra was a separate species. However, after having received a few better preserved specimens, I was able to study this species in more detail and I have reached the conclusion, that the specimens of both islands, notwithstanding a few differences, cannot be regarded as different species, especially with regard to the length of the barbels and the number of fin rays. For this species I have retained my first given name, which also more or less expresses its character, the simple 188 square group of vomerine teeth. In one of my smallest specimens, where as a matter of fact this group of teeth is also sim-

ple, one can by little incisions in the middle, both at the anterior and the posterior margin, still recognise traces that that group has grown together from two lateral halves, just as it takes place at an advanced age in Pangasius Djambal. The vomerine teeth group of Pangasius polyuranodon however differs constantly from those of Pangasius Djambal, as it is more massive and not broader than long, whereas in Pangasius Djambal when it is simple it is more than two and three times as broad as long.

Phalanx II.
Pimelodontes

Premaxillary and lower jaw teeth, or lower jaw teeth only. No vomerine-palatine teeth.

Already by the fact that the palate in all species of this group is without teeth, it is to be expected that one will not encounter such a large diversity in dentition as in the Ariodonts. Nevertheless to this group belong still so numerous species and these species offer so numerous differences in their organisation, that the necessity to bring them under various genera has been clear for a long time.

Mr Valenciennes in his large Histoire naturelle des Poissons has described only 5 genera that belong to the Pimelodonts i.e. Pimelodus CV., Auchenipterus CV., Ageneiosus Lac., Synodontis CV. and Arges CV.

Mr MacClelland added to these his genera Glyptosternon and Olyra.

Misters J. Müller and Troschel increased this series with the genera Euanemus, Callophysus and Erethistes.

Mr Duméril thought it necessary to raise Pimelodus conirostris CV. to 189 a genus of its own under the name Conostomus.

My own investigations led me to the proposal of the genera Ketengus and Bagarius.

In the group of the Pimelodonts two similar large types recur as the ones within the Ariodonts indicated with the names Pangasini and Bagrini.

In some genera [of the Ariodonts] the anal fin is extremely developed whereas the adipose fin is rudimentary or remains reduced to a very small size.

To these belong the genera Euanemus Müll. Trosch. and Ageneiosus Lac.

One could label this subgroup with the name *Euanimi*.

These genera, both American, for the rest still differ considerably from each other.

Thus Euanemus is characterised by a narrow gill slit, a many-rayed ventral fin (V. 14 to 15), caudally placed eyes covered with head skin, 6 barbels and 5 to 7 brachiostegal rays.

In Ageneiosus Lac. the gill slit is wide and extended to the ventral side of the head. The barbels are restricted to 2. They belong to the upper jaw and sometimes take the shape of erected serrated spines, whereas the spine of he dorsal fin is strongly developed and anteriorly covered with a double row of teeth. The ventral fin has 7 rays (V. 1/6) and the branchial membrane 11.

In the dentition, apart from the relatively large size of the teeth, there seem to be no differences of any importance.

In the second subgroup of the Pimelodonts one sees again all those differences in

build that one observes in the Bagrini of the Ariodonts. The anal fin never reaches an extraordinary length, but the adipose fin varies from shorter than the anal fin to a length, which takes up the entire length of the back upwards from the rayed dorsal fin.

This subgroup to which all the other genera of the Pimelodonts 190 belong, could be labelled with the name *Pimelodini*.

In this subgroup differences in the dentition begin to appear. These special features in the dentition gave me reason to erect the genera Ketengus and Bagarius, as well as the genera Synodontis, Callophysus and Argus.

In some genera the teeth are brush-like, small, of equal length and in each jaw placed in a band which is only divided at the symphysis.

To this group belong Pimelodus Valenc., Glyptosternon McCl., Olyra McCl. and Erethistes Müll. Trosch.

Two of these, i.e. Glyptosternon and Olyra possess 8 barbels. They [these genera] were formed at the cost of the genus Pimelodus Val.

In Glyptosternon the ventral side of anterior part of the body is covered by a kind of peculiarly formed sucking plate no trace of which is present in Pimelodus and Olyra. In this genus moreover the mouth slit is inferior, the adipose fin moderately developed, the caudal fin bilobed and the anal fin short.

Olyra is recognisable by the absence of a true dorsal fin spine. The caudal fin is undivided, the mouth slit terminal and the adipose fin and anal fin much developed (A. 15 to 23). Mr MacClelland confers to this genus 6 or 8 barbels, but as both species, the only ones known, in the figures clearly have 8 barbels, the most probable number seems to be 8.

Erethistus also has nearly all characters in common with Pimelodus Valenc., but the ventral fins are placed under the first dorsal just as in Olyra and Glyptosternum, and there appear to be no more than 2 barbels, which belong to the upper jaw. The caudal most processes of the head shield and shoulder bone in this genus are extraordinarily developed and the branchial membrane has 6 rays.

There is yet another genus of Pimelodines in which the teeth are small, thin, of equal size and placed in several rows, but these teeth are only present in the lower jaw. The upper jaw is entirely without teeth. This genus is formed by Pimelodus conirostris 191 CV. and is named Conostomus by Mr C. Duméril, although he based it only on the cone-shaped snout, the small terminal mouth and the small adipose fin of this species. Because however the name Conostomus (Conostoma Hodgs. and Conostomum Swartz) has already been given to a genus of birds and of Bryaceans, one could change it to Conorhynchos. There are only 6 barbels.

When one has separated from the genus Pimelodus Valenc. the genera Glyptosternum, Olyra, Conorhynchos, Ketengus, Callophysus and Bagarius, it is still far from the objective that the remaining species would belong to a simple genus.

It seems as if nature among the Siluroïds has played with a small number of characters as with the letters of the alphabet to accomplish the most multiple variation with limited means. One surely does not know by far the number of Pimelodonts occurring in the old and the new world, but what is known more and more indicates that they, like in the Ariodonts, can be brought to many genera. And if it is so that the dentition of the Ariodonts sooner fails to provide characters for these genera, then still there are numerous characters of a different nature whose generic value, either considered indi-

vidually or in connection with each other, cannot be open to question by the naturalist who has long been involved with the research of numerous species.

The genera Glyptosternon, Olyra and Erethistus have been separated from Pimelodus on grounds not derived from the dentition.

The remaining species of Pimelodus Val., in so far as they do not belong to the genera Bagarias, Callophysus and Conorhynchos, can be divided in two groups, those with 8 and those with 6 barbels. The species with 6 barbels are not numerous and largely belong to one genus, for which the name Pimelodus could be retained and which could be characterized as follows.

Pimelodus Blkr. Two dorsal fins, the anterior one rayed, the posterior one adipose. Anal fin medium-sized. Jaw teeth multiple-rowed, small, 192 equal and acute, placed in a simple or bipartite band. No vomerine or palatine teeth. Eight fleshy barbels, lower jaw barbels close to the mouth opening. Branchiostegal membrane with 8 to 12 rays. Gill opening caudally prolonged past the top of the gill cover. Interbranchial membrane emarginate. Dorsal and pectoral fins with bony spines. Head shield not visible, as it is covered by skin. Posterior nostrils cirrate, anterior ones open or tubular. Caudal fin entire or emarginate. Thoracal-postgular area without any sucking cup. Skin on body smooth. Swim bladder present. Ventral fin with 8 or 9 rays. (1/7 or 1/8).

To the genus Pimelodus, as characterised above, belong only the American species, which I cannot investigate from nature i. e. Pimelodus catus CV., Pimelodus coenosus Richds., Pimelodus borealis Richds,. Pimelodus albidus Les., Pimelodus nigricans Les., Pimelodus punctulatus CV., Pimelodus aeneus Les., Pimelodus furcatus Les., Pimelodus furcifer CV., Pimelodus lemniscatus CV., Pimelodus pullus De Kay, Pimelodus atrarius De Kay and Pimelodus felis Ag. I therefore cannot determine the character of the genus clearer and even not determine if the mentioned species indeed belong to only one genus. In this genus the number of dorsal and anal fin rays constantly seems to be larger than the closely related genera from the old world.

I exclude from the genus Pimelodus those species with 8 barbels, which in the large Histoire naturelle des Poissons are indicated with the names Pimelodus cous CV., Pimelodus cantonensis CV., Pimelodus guttatus Lac. (both last mentioned described only after figures) and Pimelodus platypogon K.v.H.

With the existing superficial data it is not possible to give Pimelodus cantonensis CV. and Pimelodus guttatus CV. a proper place in the system, but Pimelodus platypogon K.v.H. surely and Pimelodus cous CV. not without probability belong to the genus Glyptosternon McCl.

The large Sunda islands nourish several species, which according 193 to the broad conception of Mr Valenciennes would belong to the species of Pimelodus with eight barbels and which have been described as species of Pimelodus by myself. Those species, nowadays ten in number, are present in my collection, however a more detailed examination has revealed to me that they can be brought to several very good characterized natural genera.

Already years ago I have described one of those genera under the name Bagarius. To this genus belongs Pimelodus bagarius Buch.

Another of those genera was made known by Mr MacClelland under the name Glyptosternon. To this [genus] besides Pimelodus platypogon K.v.H., can be brought my Pimelodus platypogonides.

A third of those genera I name Acrodonichthys. It is remarkable by its inferior gill slit, its outer lower jaw barbels implanted far posterior to the mouth corner and its knob-like skin warts or glands. To this genus I bring my former Pimelodus zonatus, Pimelodus pleurostigma, Pimelodus rugosa and Pimelodus melanogaster, and moreover two new species, which I have named Acrochordonichthys isschnosoma and Acrochordonichthys platycephalus.

A fourth genus at last is represented by a species that I have already briefly described eleven years ago under the name Pimelodus variegatus. Indeed it approaches very much the genus Pimelodus as described above and judging from the existing data, it primarily differs from it by the absence of a swimbladder, its branchiostegal rays, which are only 6 in number, and its pelvic fin rays, of which there are likewise only 6 (1/5), whereas the skin is scrofulous and the caudal fin bilobed. I have named this genus Akysis, a name referring to the absence of a swimbladder, which indeed also is laking in the genera with 8 barbels Bagarius, Glyptosternon and Acrochordonichthys.

In the rivers of Bengal some species with eight barbels of the genus Pimelodus Val. occur made known by Mr Buchanan in his "Account of the Fishes found in the Ganges", which cannot be 194 referred to any of the described genera. I rate to these species Pimelodus telchitta Buch., Pimelodus cavia Buch., Pimelodus botius Buch., Pimelodus nangra Buch., Pimelodus gagata Buch., Pimelodus mangois Buch., Pimelodus menoda Buch., Pimelodus conta Buch. and Pimelodus hara Buch. Only the two last mentioned species are inserted in the large Histoire narurelle des Poissons and I would dare to give a place in the genus Glyptosternum only one species Pimelodus nangra Buch., while it does not seem improbable to me that Pimelodus cavia belongs to the genus Akysis.

The remaining species of Buchanan, mentioned above, might provisionally be gathered under the name Gagata, although I do not doubt that that this genus Gagata, when more becomes known about the mentioned species, will prove to be divisible in various genera. At least it seems to me that among them are some types which remind one more or less of the genera Hemipimelodus, Akysis and Acrochordonichthys. However, the descriptions of Buchanan are not detailed enough to determine those types with any certainty or sharpness. It is certain that none of those species answers to the American species of Pimelodus Blkr.

Mr Sykes in his "Fishes of the Dukhun" under the name of Bagrus loah has mentioned a fish which cannot be identified sufficiently as the description of it is almost restricted to announcing the numbers of barbels and finrays. It might just as well be a Pimelodont or an Ariodont, just like his Bagrus Yarrelli is also the same species as Bagarius Buchanani Blkr and therefore no Ariodont. In no way the genus can be determined from the description.

Mr McClelland among the fishes of Afghanistan has found a pair of species with eight barbels, which he described in the 2nd volume of the Calcutta Journal of Natural History under the names Pimelodus anisurus and Pimelodus indicus, but again so briefly and insufficiently that it is not possible to place them in a certain genus.

195 Pimelodus pussilus Ranzani is only known to me by name.

Pimelodus ? fulvidraco at last, described by Richardson from an illustration, rather

seems to belong to Bagarius than to any of the genera in question.

From all this it appears how much the knowledge of the Asian species of Pimelodus leaves to be desired and one may suspect that more detailed investigations in the south Asiatic rivers will lead to numerous discoveries.

A larger diversty still than among the Pimelodus species with eight barbels according the definition of Mr Valenciennes exists among the also more numerous species with six barbels.

Of these species with six barbels, I possess only two, which are peculiar because of their Arius-like habitus, and which belong to a genus that I have named Hemipimelodus and have decribed more extensively below. A genus remarkable by its naked head shield and naked fin spines, a small number of branchiostegal rays, a forked end of the lateral line, etc. Among these species is one that I have already described years ago under the name of Pimelodus borneënsis, while a second new species is made known below under the name Hemipimelodus macrocephalus.

When one isolates from the large genus Pimelodus as it is understood in the large Histoire naturelle des Poissons, the species which possess many rowed small jaw teeth and six barbels, than one still perceives amongst these species such a variety in habitus and in certain aspects of the organisation, that one is led to the opinion that it is impossible that all these species belong to one genus.

Those species however, are insufficiently known to bring them all under sharply defined genera, but this task will be easy for the ichthyologist who can investigate the richness of all large musea.

Restricted as I am to my own cabinet, that task for the time being cannot be mine, but the discovery of two Bornean species with six 196 barbels belonging to Pimelodus Valenc. has given me cause to the erection of the genus Hemipimelodus (to which also Pimelodus Perroni CV. etc. belong) and to the selection with the means available to me of some characters within the six barbelled species, which may serve to its grouping in natural genera.

One of those genera I name Pseudopimelodus and can be characterized as follows.

Pseudopimelodus Blkr. Two dorsal fins, the anterior one rayed, the posterior one adipose. Anal fin medium-sized. Jaw teeth multiple-rowed, setaceous, equal, placed in a bipartite band. 6 Barbels. Dorsal and pectoral fins with a bony spine. Nostrils tubular. Branchiostegal membrane with 9-10 rays. Interbranchial membrane emarginate. Head covered by smooth skin. Caudal fin entire or emarginate. Adipose fin medium-sized.

One could bring under Pseudopimelodus the species in which the head is covered with a smooth skin, the nostrils are tube-like and with 9-10 brachiostegal rays. To this genus would belong, partly for sure, partly with probability, Pimelodus raninus CV., Pimelodus bufonius CV., Pimelodus mangurus Val., and Pimelodus charus CV.

Pimelodus zungaro Humb., does seem to differ generically from these species because of the absence of true fin spines, 4 branchiostegal rays and 10 ventral fin rays, but some of these characters need confirmation before one could elevate this species to a proper genus. This then could be named *Zungaro*.

Another generic type maybe is to be found in Pimelodus mustelinus Val., depicted in d'Orbigny's "Voyage dans l'Amérique méridonale", a work which is not available in this country. It has various characters in common with Pseudopimelodus, but the dorsal spine has been reduced to a ray that is only hardened [ossified] at its base; the nasal openings, which stand apart, are provided with a valve, 197 while the large adipose fin is confluent with the caudal fin, characters which are accompanied by a peculiar habitus, caused by the small, flat, smooth head and very slender body. One could name and charaterize this genus as follows.

Heptapterus Blkr. Two dorsal fins, the anterior one rayed, the posterior one adipose. Anal fin medium-sized. Jaw teeth multiple-rowed, setaceous and equal, no teeth in vomer and palate. 6 Barbels. Branchiostegal membrane with 9 rays. Interbranchial membrane emarginate. No true dorsal spine. Head shield smooth. Nostrils all apart from each other, with valves. Adipose fin long, confluent with the entire caudal fin.

Heptapterus in America seems to replace the related but eight barbelled genus Olyra of South Asia.

Still another type apparently is represented by the species described by Mr Valenciennes under the name Pimelodus Sebae. This type for that matter is related to Heptapterus, from which it differs because its adipose fin is not confluent with the caudal, which is bilobed, while the head shield is clearly distinguishable. When this type deserves a generic status, one could give it the generic name Rhamdia, under which name the species seems to have been known to Marcgrav.

Rhamdia Blkr. Two dorsal fins, the anterior one rayed, the posterior one adipose. Anal fin medium-sized. Jaw teeth multiple-rowed, setaceous and equal, no teeth on vomer and palate. 6 Barbels. Branchiostegal membrane with 7 to 9 rays. Dorsal spine very thin. Head shield conspicuous. Nostrils not tubular or with valves. Adipose fin long, free; caudal fin bilobed. V. 6.

Besides Pimelodus Sebae CV. can be brought to Rhamdia also Pimelodus pati CV., Pimelodus sapo Valenc., Pimelodus Hilarii CV., Pimelodus gracilis Valenc., Pimelodus Pentlandii CV., etc. and maybe also Pimelodus javus K.v.H.

198 Pimelodus pinirampu Ag. likewise might be considered the type of a new genus, which, apart from other, partly still to be discoverd characters, is remarkable because it has the 6 long barbels membraneously broadened at the base. The anterior nasal openings are tube-shaped the posterior ones are not. The neck shield here already begins to become more developed. When this species can be raised to a proper genus, one might name it and tentatively characterize it as follows.

Pinirampus Blkr. Two dorsal fins, the anterior one rayed, the posterior one adipose. Anal fin medium-sized. Jaw teeth multiple-rowed, setaceous and equal, no teeth on vomer and palate. 6 Barbels, membraneous, ribbon-like. Dorsal spine very thin. Head shield conspicuous, reaching the nuchal shield. Anterior nostrils tubular, posterior ones open. Adipose fin long, free, caudal fin bilobed. Branchiostegal membrane with ?? rays. P. 6.

Closely related to Pinirampus, but still more to some species of the complex genus Auchenipterus Valenc., are two north African species i.e. Pimelodus biscutatus Geoffr. and Pimelodus occidentalis CV.

The broad head shield is separated from the broad neck shield by a transverse seam; the dorsal- and anal fin spines are strongly developed; the barbels are round and not membraneous, the upper jaw teeth reduced to 2 very small groups, the band of lower jaw teeth three times concave, the nasal openings not tube-like, etc. These species likewise can be raised to a proper genus, which I propose to name

Auchenaspis Blkr. Two dorsal fins, the anterior rayed, the posterior one adipose. Anal fin medium-sized. Jaw teeth multiple-rowed, setaceous and equal, the upper jaw teeth placed in 2 very small groups, the lower jaw teeth placed in a three-fold emarginate band, no teeth in vomer and palate. Six fleshy barbels. Dorsal and pectoral spines very thick. Head shield very broad, grainy, joined with the humeral bone, separated from the broad nuchal shield by a transverse suture. Nostrils open, the anterior ones round, the posterior ones in the shape of a fissure, with a double membraneous margin. Adipose fin long and free; caudal fin with two lobes. Branchiostegal membrane with 9 rays. V. 6?

199 Although the opinion of Mr Valenciennes that Hypophthalmus nuchalis Spix cannot belong to his genus Hypophthalmus, and can be brought to a genus of its own, is very correct, he has not composed this genus very well because he included fishes that differ greatly. The genus Auchenipterus cannot be maintained, unless one changes the diagnosis and only includes the mentioned species of Spix, as well as Auchenipterus dentatus CV. But as Misters Müller and Troschel already have described the genus to which both these species belong very well under the name Euanemus, it seems preferable to retain the name Euanemus. The remaining species of Mr Valenciennes' Auchenipterus then could be brought back to the species of his genus Pimelodus with 6 barbels. But, as is shown above, those species contain the types of various genera and thus it appears to me that the species of Auchenipterus in question partly represent types of proper genera. Thus for instance Silurus nodus Bl. (Auchenipterus furcatus CV.) is one of those types, which one could keep in the genus Auchenipterus. This genus might be characterized as follows.

Auchenipterus Blkr (Valenciennes in part). Two dorsal fins, the anterior one rayed, the posterior one adipose. Anal fin medium-sized. Jaw teeth multiple-rowed, setaceous and equal, no teeth on vomer and palate. Six fleshy barbels. Dorsal and pectoral fins with a thick spine. Head shield grainy, joined with the broad nuchal shield by a transverse suture. Anterior nostrils tubular, posterior ones wide open. Adipose fin small, much shorter than the anal fin, caudal fin bilobed. Branchiostegal membrane with 9 rays. V. 8.

This genus, characterised in this way, would be very similar to Hemipimelodus and primarily distinguish itself from it 200 by the nasal tubes and the shape of the head- and neck shield, differences which get a higher importance by a more slender habitus of the body, almost posterior placed eyes and in relation to the very small adipose fin.

Many of the proportions of Auchenipterus, as described above, one finds back in Auchenipterus trachycorystes CV., but one can also perceive this speciality that head and neck shield are soldered to one broad bony plate, which, without being divided by a transverse groove, broadly elongates itself upwards from anteriorly on the snout. Moreover, the lower jaw is longer than the upper jaw, the caudal fin seems to be truncated, and the very small nasal openings seem to be open, while the pelvic fins have 9 or 10 rays. This species most probably is the type of a natural genus, which one could name with the name already given to the species by Mr Valenciennes i.e.

Trachycorystes Blkr. Two dorsal fins, the anterior one rayed, the posterior one adipose. Anal fin medium-sized. Jaw teeth multiple-rowed, setaceous and equal, no teeth on vomer and palate. Six fleshy barbels. Dorsal and pectoral fin with a thick spine. Head shield joined with nuchal shield, not divided by longitudinal groove, in front with broad process protruding over the snout. Nostrils very small, wide open. Adipose fin much shorter than anal fin, caudal fin entire. Branchiostegal membrane with 7 rays.

Maybe Auchenipterus maculosus CV., Auchenipterus immaculatus CV. and Auchenipterus punctatus CV. also belong to Trachycorystes, however, the remarkable difference in the number of ventral fin rays, which in the typical species is 9 or 10 and for example in Auchenipterus maculosus CV. (Silurus galeatus L.) is said to be only 6, gives the idea that there may be other differences of a higher than specific meaning.

Having thus brought to its true generic meaning the species with six barbels of Pimelodus Valenc., as well as the species of Auchenipterus Val., for as much as the data permit me, 201 there are numerous remaining species that were described by earlier and later writers and that were not included in the large Histore naturelle des Poissons.

Four of those species are found in Buchanan's work on the fishes of the Ganges, i.e. Pimelodus rama, Pimelodus viridescens, Pimelodus cenia, and Pimelodus jatius. Of Pimelodus rama it first has to be ascertained whether it indeed belongs to the Pimelodonts, as it is not clear whether the palate was checked for the dentition. If the palate would be without teeth, so that it is a Pimelodus, and if the little that is described and the figure are right, than it still possesses the peculiarity that of the 6 barbels 2 are nasal barbels, while 2 of the lower jaw barbels are lacking. We saw the same thing in the genus Rita Blkr, however in none of the above mentioned types of the Pimelodonts. I stamp this type provisionally with the name

Rama Blkr. 6 Barbels, nasal, and maxillary.

According to the illustration in Pimelodus viridiscens and Pimelodus cenia Buch., the 6 barbels are placed in the ordinary way and those of the upper jaw are membraneous near the basis. It appears to me that both these species can be brought to Hemipimelodus. Maybe Pimelodus jatius Buch. also belongs to the same genus.

Phractocephalus kuturnee Sykes apparently is a species of Rita, and therefore belongs to the Ariodonts.

Pimelodus asperus McCl. from China is difficult to bring under one of the genera characterized above. In the shape of the head shield and spines this species approaches the genus Erethistes. It indeed has 7 branchiostegal rays, a pelvic fin with six rays, a moderately developed adippose fin, a short anal fin and a bilobed caudal. Its description and illustration offer no characters of enough weight, to raise it to a genus of its own, reason why I provisionally classify it under Hemipimelodus.

Pimelodus mong from China, described by Mr Richardson 202 from a figure, I similarly could not give any other place based on that description than under Hemipimelodus.

In the first volume of the "Fishes of Guiana" descriptions and figures are given of some species of six barbelled Pimelodonts, which need to be studied more carefully to become known better and in more detail. One of those species, Arius oncina Schomb. seems to me to belong to Trachycorystes. Arius? obesus Schomb. because of its extremely long anal fin and 6 barbels seems to belong to Euanema. Pimelodus (Bagrus) masculatus Schomb. can be brought to Rhamdia, just like Schomburgk's Laukidi, his Pimelodus arekaima, Pimelodus insignis and perhaps also his Pimelodus notatus.

Pimelodus exsudans Jen. most probably is a Rhamdia.

Mr A. Von Humboldt mentions in the 2nd part of his Recueil d'Observations de Zoölogie etc., apart from his Pimelodus zungaro and Pimelodus cyclopum, which have been inserted in the large Histoire naturelle des Poissons, some other six barbelled species, which he has named Pimelodus argentinus, Pimelodus velifer, Pimelodus barbancho and Pimelodus grunniens. From the short notes of Mr Von Humboldt it is not possible to determine these species in more detail. Pimelodus argenteus is defined too little to place it in one of the above mentioned genera. Pimelodus velifer apparently is a Rhamdia, just like Pimelodus barbancho, whereas Pimelodus grunniens perhaps represents a species of Auchenipterus mihi.

Not less than 8 new six barbelled species of Pimelodus Valenc. are described in the third volume of the Horae ichthyologicae of Misters J. Müller and Troschel, i.e. Pimelodus Sellonis, Pimelodus Stegelichii, Pimelodus Deppei, Pimelodus lateristrigus, Pimelodus cristatus, Pimelodus foina and Pimelodus eques. All of them seem to me to belong to my genus Rhamdia or at least to be closely related to this genus.

In other genera of the Pimelodonts the dentition has a more complicated nature, as the jaws are 203 armed with teeth of different shapes, whereas the most simple dentition is found in a genus discovered by me, which I have described already 11 years ago under the name Ketengus.

Indeed, in the genus Ketengus the teeth in both jaws are placed closely together in a simple row and have the shape of incisors. There are only 6 barbels and 5 branchiostegal rays and the lateral line, because of its bifurcation at the base of the caudal fin, reminds one of some Ariodont genera. The adipose fin is little developed and shorter than the anal fin and the caudal fin is bilobed.

Misters J. Müll.er and Troschel have based their genus Callophysus on Pimelodus macropterus Lichtenstein and Pimelodus ctenodus Ag. The teeth are, either in the upper jaw, or in the lower jaw, placed in two rows and the teeth in the inner row are smaller than the teeth of the outer row. Apart from that there are also only 6 barbels, but on the contrary 7 branchiostegal rays and the adipose fin is longer than the anal fin. The caudal fin bilobed.

Another modification in the dentition is found in the genus Bagarius. The premaxillary teeth are brush-like and placed in several rows in a broad band, consisting of four groups that lay next to each other. The lower jaw teeth on the contrary, are placed in two rows and only near the symphysis placed in several rows, and the teeth of the inner row are partly piercer-like and much longer than those of the outer row. Apart from these peculiarities of the dentition this genus has 8 barbels, 12 branchiostegal rays, a bilobed caudal fin and the adipose fin moderately developed.

Still another modification once more in the dentition is found in the genera Synodontis Val. and Arges Val.

In Synodontis the jaws are little developed and the upper jaw lined with a band of brush-like teeth, but anteriorly in the lower jaw a sheaf of flexible, shafted and hook-like teeth is found resembling the labial teeth of Bagrus. Like Bagrus, Synodontis also has forked barbels, 7 branchiostegal 204 rays and a very large adipose fin. But the inter spinal bones are developed into a large shield, and the nasal barbels are lacking so that only 6 barbels are present. The caudal fin is bilobed.

Arges Val. has this peculiarity, that the teeth, which in both jaws are placed in several rows, all or partly end bifurcated in two cusps, while the number of barbels is reduced to 2 (which belong to the upper jaw) and the number of branchiostagal rays to 4.

The genera characterized above are briefly reviewed in the following synopsis.

Euanemini

Euanemus Müll. Trosch. 6 Barbels.
Ageneiosus Lac. 2 Barbels.

Pimelodini.

a. Upper and lower jaw teeth multiple-rowed, small and equal.

8 Barbels.

Pimelodus Blkr. Ventral fin with 8 or 9 rays. Branchiostegal membrane with 8 to 12 rays. Swim bladder present.

Akysis Blkr. V. 1/5. B. 6. No swim bladder. Anterior nostrils tubular.

Glyptosternon McCl. Thoraco-postgular area with sucking cup.

Olyra McCl. No dorsal spine.

Acrochordonichthys Blkr. Gill opening inferior. Outer lower jaw barbels inserted behind the corner of the mouth. Body verrucose.

Gagata Blkr. Not a natural genus, composed, provisory. Contains specimens of the genus Pimelodus Valenc. equipped with 8 barbels, which cannot be placed in the described genera.

6 Barbels

Pseudopimelodus Blkr. Nostrils tubular. V. 6 (1/5). B. 9 to 10. Head covered with smooth skin.

Zungaro Blkr. No true spines in fins. B. 4. V. 10 (1/9).

Heptapterus Blkr. Adipose fin confluent with caudal fin.

Rhamdia Blkr. Nostrils open, not tubular or with valves. B. 7 to 9.

205 *Pinirampus* Blkr. Anterior nostrils tubular, posterior nostrils wide open. Barbels membraneous, ribbon-like.

Auchenaspis Blkr. Head and nuchal shield separated by a very broad, transverse suture. Nostrils wide open. B. 9. V. 6? Adipose fin elongate.

Auchenipterus Blkr. Head and nuchal shield separated by a broad, transverse suture. Anterior nostrils tubular, posterior nostrils wide open. B. 6. V. 8. Adipose fin small.

Trachycorystes Blkr. Head and nuchal shield grown into one over the total width, not divided, cephalic part protruding over the snout. Nostrils wide open. B. 7? Adipose fin small.

Hemipimelodus Blkr. Head shield grainy. Nuchal shield very small. Nostrils wide open, posterior ones with valves. B. 5. V. 6 (1/5) Lateral line forked at the base of the caudal fin.

Rama Blkr. Nasal barbels.

2? Barbels

Erethistes Müll. Trosch

b. Teeth only in lower jaw, multiple-rowed, small and equal.

Conorhynchos Blkr = *Conostomus* C. Dum. 6 Barbels.

c. Jaw with a simple row of equal teeth.

Ketengus Blkr. 6 Barbels.

d. Jaw teeth diverse in form and size.

Callophysus Müll. Trosch. Teeth in upper or lower jaw in two rows, teeth in outer row longer than in inner row. 6 Barbels.

Bagarius Blkr. Teeth in upper jaw multiple-rowed, placed in a quadripartite band, the lower jaw teeth placed in two rows, teeth in inner row elongate, subulate. 8 Barbels.

Synodontis Val. Teeth in lower jaw placed in a band, movable, with small stalks, hooked at the tip, in upper jaw multiple-rowed, small and setaceous. 6 Barbels.

Arges Val. Jaw teeth multiple-rowed, all or partly bifid at the top. 2 Barbels.

206 *Euanemini.*

Euanemus	colymbetes Müll. Trosch.	Hab.	Surinam.
"	obesus Blkr = Arius? obesus Schomb.	"	Guyana.
"	nuchalis Blkr = Auchenipterus nuchalis CV. = Hypophthalmus nuchalis Spix Ag.	"	Brasil.
"	dentatus Blkr = Auchenipterus dentatus CV.	"	Guyana.
Ageneiosus	militaris CV. = Ceratorhynchus militaris Agass. = Silurus militaris Bl. (nec. L.)	"	Brasil.
"	inermis Lac = Silurus inermis Bl.	"	Surinam.
"	brevifilis CV.	"	Guyana.

Pimelodini.

Pimelodus	catus CV. = Pimelodus nebulosus Les. = Silurus catus L	"	U.S.A.
"	coenosus Richds	"	Lac. Huro
"	borealis Richds.	"	Pine-isl. 50º S.W.
"	albidus Les.	"	U.S.A.
"	nigricans Les. = Pimelodus nigrescens Richds	"	U.S.A.
"	punctulatus CV.	"	U.S.A.
"	aeneus Les.	"	U.S.A.
"	furcatus Les. = Pimelodus cauda-furcatus Les.	"	U.S.A.
"	furcifer CV.	"	Surinam
"	lemniscatus Les.	"	U.S.A.
"	atrarius De Kay.	"	U.S.A.
"	pullus De Kay.	"	U.S.A.
"	felis Agass.	"	U.S.A.
"	? cantonensis CV.	"	China
"	? guttatus Lac.	"	China
"	Cranchii Brit. Mus. Griff.	"	?
Gagata	telchitta Blkr = Pimelodus telchitta Buch.	"	Bengal.
"	botius Blkr = Pimelodus botius Buch.	"	Bengal.
"	gagata Blkr = Pimelodus gagata Buch.	"	Bengal.
"	mangois Blkr = Pimelodus Pauchois Buch.	"	Bengal.
"	? menoda Blkr = Pimelodus menoda Buch.	"	Bengal.
"	? lona Blkr = Bagrus lonah Syk.	"	Dekkan
"	? pusillus Blkr = Pimelodus pusillus Ranzani.	"	?
"	? anisurus Blkr = Pimelodns anisarus McCl.	"	Loodianah.
"	? indicus Blkr = Pirnelodus indicus McCl.	"	Loodianah.
207 "	conta Blkr = Pimelodus conta Buch.	"	Mahananda riv.
"	hara Blkr = Pimelodus hara Buch.	"	Kosi riv.
Glyptosternon	nangra Blkr = Pimelodus nangra Buch.	"	Begal.
"	reticulatus McCl.	"	Kabul riv.
"	sulcatus McCl.	"	Mount Kasyah.
"	striatus McCI.	"	Mount Kasyah.
"	pectinopterus McCl.	"	Mount Simla.
"	labiatus McCl.	"	Mount Mishmee
"	platypogon Blkr = Pimelodus platypogon K.v.H.	"	Java, Hind.
"	platypogonides Blkr = Pimelodus platypogonides Blkr.	"	Sumatra.
Olyra	longicaudatus McCl.	"	Mount Kasyah.
"	laticeps .McCl.	"	Mount Kasyah.
Erethistes	pusillus Müll. Trosch.	"	Assam.
Pseudopimelodus	bufonius Blkr = Pimelodus bufonius CV.	"	Guyana.
"	mangurus Blkr = Pimelodus mangurus Val.	"	S. Am.
"	raninus Blkr = Pimelodus raninus CV.	"	S. Am.
"	charus Blkr = Pimelodus charus CV.	"	S. Am.
Zungaro	Humboldtii Blkr = Pimelodus zungaro Humb.	"	S. Am.
Hemipimelodus	borneensis Blkr = Pimelodus borneensis Blkr.	"	Borneo.
"	macrocephalus Blkr.	"	Borneo.
"	Peronii Blkr = Pimelodus Peronii CV.	"	?
"	nella = Pimelodus? nella CV. = Nalla-jellah Russ.	"	Coromand.
"	tachisurus = Pimelodus tachisurus CV. = Tachisurus chinensis Lac.	"	China.
"	quadrimaculatus = Pimelodus quadrimaculatus CV. = Silurus quadrimaculatus Bl.	"	Americ.
"	? viridescens Blkr = Pimelodus viridescens Buch.	"	Bengal.

	"	cenia Blkr = Pimelodus cenia Buch.	" Bengal.
	"	? asper Blkr = Pimelodus asperus McCl.	" China
	"	? mong Blkr = Pimelodus mong Richds.	" China
	"	? jatius Blkr = Pimelodus jatius Buch.	" Bengal.
Rhamdia		Sebae Blkr = Pimelodus Sebae CV. = Pimélode Quélen QG. = Heterobranchus sextentaculatus Spix.	" S. Am.
	"	pati Blkr = Pimelodus pati CV.	" S. Am.
	"	sapo Blkr = Pimelodus sapo CV.	" S. Am.
	"	Hilarii Blkr = Pimelodus Hilarii CV.	" S. Am.
	"	gracilis Blkr = Pimelodus gracilis Val.	" S. Am.
	"	Pentlandii Blkr = Pimelodus Pentlandii CV.	" S. Am.
	"	? javanica = Pimelodus javus K. v. H.	" Java.
208	"	barbancho Blkr = Pimelodus barbancho Humb.	" S. Am.
	"	maculatus =Pimelodus maculatus Lac.	" S. Am.
	"	velifer. Blkr = Pimelodus velifer Humb.	" S. Am.
	"	Schomburgkii Blkr = Pimelodus (Bagrus) maculatus Schomb.	" S. Am.
	"	laukidi Blkr = Pimelodus (Bagrus) laukidi Schomb.	" S. Am.
	"	arekaima Blkr = Pimelodus arekaima Schomb.	" S. Am.
	"	insignis Blkr = Pimelodus insignis Schomb.	" S. Am.
	"	? notatus Blkr = Pimelodus notatus Schomb.	" S. Am.
	"	exsudans Blkr = Pimelodus exsudans Jen.	" Brasil.
	"	Sellonis Blkr = Pimelodus Sellonis Müll. Trosch.	" Brasil.
	"	Stegelichii Blkr = Pimelodus Stegelichii Müll. Trosch.	" Surinam.
	"	Deppei Blkr = Pimelodus Deppei Müll. Trosch.	" Sanbwich Isl.
	"	? lateristrigus Blkr = Pimelodus lateristrigus Müll. Trosch.	" Brasil.
	"	? musculus Blkr = Pimelodus musculus Müll. Trosch.	" Americ.
	"	? cristata Blkr = Pimelodus cristatus Müll. Trosch.	" Guyan.
	"	? foina Blkr = Pimelodus foina Müll. Trosch.	" Guyan.
	"	eques Blkr = Pimelodus eques Müll. Trosch	" Guyan.
	"	argentina Blkr = Pimelodus argentinus Humb.	" S. Am.
	"	(an Ariodes??) manillensis = Pimelodus manillensis CV. [1]	" Luçon
Heptapterus		mustelinus Blkr = Pimelodus mustelinus CV.	" S. Am.
Pinirampus		pinirampus = Pimelodus pinirampus Ag.	" S. Am.
Rama		Buchanani Blkr = Pimelodus rama Buch.	" Bengal.
Auchenaspis		biscutatus = Pimelodus biscutatus Geoffr. st. Hil.	" Nile riv.
	"	occidentalis = Pimelodus occidentalis CV.	" Senegal.
Auchenipterus		nodosus Müll. Trosch. = Silurus nodosus BI. = Arius nodosus CV. = Auchenipterus furcatus CV.	" S. Am.
	"	grunniens Blkr = Pimelodus grunniens Humb.	" S. Am.
	"	? Heckelii Filippi.	" S.. Am.
Trachycorystes		trachycorystes Blkr = Auchenipterus trachycorystes CV.	" S. Am.
	"	oncina Blkr = Arius oncina Schomb.	" Guyana.
	"	? galeatus Blkr = Silurus galeatus L. = Auchenipterus maculosus CV.	" S. Am.
	"	? immaculatus Blkr = Auchenipterus immaculatus CV. (the same species as the preceeding one.?)	" S. Am.
	"	? punctatus CV. = Auchenipterus punctatus CV.	" S. Am.

[1] This species is said to be closely related to Pimelodus Blochii CV., which is the same species as Ariodes clarias Müll. Trosch.

209 Akysis	variegatus Blkr = Pimelodus variegatus Blkr.	"	Java
"	? cavia Blkr = Pimelodus cavia Buch.	"	Beng.
Acrochordonichthys	platycephalus Blkr.	"	Sumatra.
"	zonatus Blkr = Pimelodus zonatus Blkr.	"	Java.
"	pleurostigma Blkr = Pimelodus pleurostigma Blkr.	"	Java.
"	rugosus Blkr = Pimelodus rugosus Blkr.	"	Java.
"	melanogaster Blkr = Pimelodus melanogaster Blkr.	"	Sumatra.
"	ischnosoma Blkr.	"	Java.
Conorhynchos	conirostris Blkr = Conostonus conirostris C. Dum. = Pimelodus conirostris CV.	"	Brasil.
Ketengus	typus Blkr = Pimelodus pectinidens Cant.	"	Java, Madur., Born., Pinang.
Callophysus	macropterus Müll. Troseh. = Pimelodus macropterus Licht.	"	S. Am.
"	ctenodus Müll. Trosch. = Pimelodus ctenodus Agass.	"	Brasil.
Bagarius	Buchanani Blkr = Pimelodus bagarius Buch. = Bagrus Yarrelli Syk.	"	Beng. Hind. Java.
"	? fulvidraco Blkr = Pimelodus? fulvidraco Richds.	"	China.
Synodontis	macrodon Is. Geoffr. Hil. = Pimelodus synodontis E. Geoffr. St. Hil.	"	riv. Nile
"	membranacens Js. Geoffr. St Hil. = Pimelodus membranacens E. Geoffr. St Hil.	"	riv. Nile.
"	schal Blkr = Silurus schal Bl. Schn. = Pimelodus clarias Geoffr. St Hil. = Synodontis arabi CV.	"	riv. Nile.
"	serratus Rüpp.	"	riv. Nile.
"	humeratus CV.	"	riv. Nile.
"	maculosus Rüpp.	"	riv. Nile.
"	nigrita CV.	"	Senegal.
"	batensoda Rüpp.	"	riv. Nile.
"	zambesensis Peters.	"	Mossamb.
"	nebulosus Peters.	"	Mossamb.
Arges	sabalo CV.	"	Peru.
"	? cyclopum CV. = Pimelodus cyclopum Humb.	"	Peru.

As mentioned above the many species brought to the genera Pimelodus, Pseudopimelodus etc., are far from sufficiently known, and as that knowledge will be expanded, several species will turn out to be only nominal species and will have to be brought under already known species.

210 As I am restricted to the investigation of my own collection, that more detailed research has to be done by other students of ichthyology. Of several species I see in the expedients available to me, nothing or hardly anything else mentioned than the names, making it even impossible for me to decide whether they belong in genera with eight or six barbels. To these species belong

Pimelodus	cuprens Kirtl.	Hab.	Ohio.
"	pallidus Kirtl.	"	Ohio.
"	nebulosus Kirtl.	"	Ohio.
"	xanthocaphalus Kirtl.	"	Ohio.
"	flavus Kirtl.	"	Ohio.
"	coerulescens Raf.	"	Ohio, Tennesee.
"	affinis Baird Gir.	"	Texas.
"	marmoratus Holbr.	"	South Amer.

I have to mention here also a very peculiar species, described and figured a few years ago by Mr R. Kner under the name

Clarotes Heuglini Hab. Khartoum, northern East Africa

The genus Clarotes, erected by Mr Kner on the basis of this species, without doubt belongs to the Bagrichthyoïds and is easily recognisable and peculiar by the abarrant adipose fin that is armed with a spine, and the head shield, which is angular and almost vertically downward bent above the eye. However, I am unable to determine whether this genus has to be arranged under the Ariodonts or under the Pimelodonts as the exsistence of teeth on the palate in the descriptions of Mr Kner is neither confirmed, nor denied.

Bagarius Blkr.
Verh. B. G. XXV Nalez. Ichth. Beng. p. 121.
Lika

Two dorsal fins, the anterior one rayed, the posterior one adipose. Anal fin mediumsized. Teeth acute, in the upper jaw multiple-rowed, placed in a curved, quadripartite band, in the lower jaw placed in two rows, only multiple-rowed towards the symphysis, in the inner row canine, partly subulate. No vomerine or palatine teeth. Eyes covered with 211 head skin. 8 barbels, ribbon-like, the maxillary barbels supported by a very long bony rod, the lower jaw barbels all close to the mouth. Branchiostegal membrane with 12 rays. Gill opening prolonged beyond the tip of the gill cover. Interbranchial membrane with a deep incision. Dorsal and pectoral spines bony and nearly naked. Head shield conspicuous. Nostrils touching, wide open, not tubular. Caudal fin bilobed. Thoraco-postgular area without sucking a disk. No swimbladder. Lateral line forked at the base of the caudal fin.

Remark. I erected this genus in the year 1853 based on the species discovered by Buchanan and described and figured under the name Pimelodus bagarius. In the first place it is remarkable by its dentition. The teeth themselves are already remarkable by their inequal size in both jaws and by their inequal arrangement, being placed in many rows in the upper jaw, and in the lower jaw except near the symphysis in only two rows. But apart from this, Bagarius has this exceptionality that each premaxilla consists of four plate-like parts, which are placed next to each other in a horseshoe shape of which the lateral parts are elongate triangular with the tip pointing backwards. Other special features offered by this genus, deserve to be mentioned as well. To these belong the tape-like barbels, the long bony shaft of the upper jaw barbels, the elongations of the dorsal- and pectoral fin spines and of the caudal fin lobes, the 12 brachiostegal rays and the lateral line which is bifurcated at the caudal fin base.

Till now only one species of Bagarius is known, i.e. Pimelodus bagarius Buch. Bagrus Yarrelli Sykes could form a second species, if it indeed, as is mentioned by Sykes, differed from Pimelodus bagarius Buch., which in my opinion is not the case.

In China lives one species described by Richardson from a figure from the Reeves collection under the name of Pimelodus? fulvi-draco, which also seems to belong to

the genus Bagarius and 212 even might not be considered different from Bagarius Buchanani, if not the extensions of the various fins were lacking in the figure and the nasal barbels were not represented as almost as large as half the head length.

Bagarius Buchanani Blkr.
Verh. Bat. Gen. XXV Nalez. Ichth. Beng. p. 121. Atl Silur. tab XXXIII.
Buchanan's Lika

A Bagarius with an elongate, depressed body, anterior part broader than deep, posterior part slightly compressed, body depth contained about 6 to 7 times in its length without, and about 9 to 10 times in its length with caudal fin. Head acute, depressed, contained 3½ to 3⅓ times in length of body without, and 5½ to 4½ times in length of body with caudal fin; depth of head contained 2 to 2⅓ times in its length, width 1¼ to 1⅔ times; eyes placed at the beginning of the posterior half of the head, superior, facing obliquely upwards, eye diameter contained 11 to 14 times in length of head, distance between the eyes 3 to 4½ times their diameter; dorsal head profile sloping downwards, more or less straight, only slightly convex at the nape. Head shield rough-grainy, only divided in the middle by a longitudinal groove (median fontanel), entire far before and after the groove. No lateral fontanels, median or posterior. The posterior part of the shield ends in 5 processes, the middle process formed by the supraoccipital crest, triangular, twice or more than twice as long as basal width, tapering at the top, acute, not reaching the second interspinal bone; second interspinal bone (the nuchal shield) small, glabrous, triangular in the middle, its top rounded,the wings thin, more than 3 times as long as broad; snout depressed, more than 4 times to more than 5 times as long as the eye, protruding beyond the mouth, rostral profile slightly acutely rounded; nostrils much nearer to the tip of the snout than the eye, nearly touching each other, open, posterior nostrils can be nearly closed by a barbel that is membranaceous at the base and surrounds the opening; lips, especially the upper one, fleshy; nasal barbels very short, hardly overreaching the posterior nostrils, maxillary barbels ribbon-like, reaching the base of the pectoral fin, very broad at the base, membranaceous, supported by a bony rigid process longer than the supraoccipital crest, lower jaw barbels compressed, the outer ones longer than the inner ones, shorter than the snout, the inner ones not reaching the angle of the mouth; upper jaw teeth multiple-rowed, acute, curved, placed in a broad band resembling the form of a horseshoe, quadripartite, the teeth towards the symphysis and in the inner row longer than the other teeth; lower jaw teeth placed in two rows, acute, only multiple-rowed towards the symphysis, the teeth in the inner row canine, subulate, larger than the other teeth; mouth inferior, strongly curved, resembling the form of a horseshoe, its width contained twice to nearly twice in length of head; gill cover rough or rough-grainy: humeral bone short, smooth, thin, its top obtuse or slightly acute; axillary slime pore conspicuous; lateral line nearly simple, anterior part sloping downwards, posterior part straight, forked at the base of the caudal fin; skin of the entire body smooth; the part of the tail situated behind the adipose fin is about four times as long as high in the middle; dorsal fin acute, higher than body depth, less than twice as high as it is high at the first ray, spine medium-sized, less than twice to a little more than twice as short as the head, anterior side granulated, posterior side without or with only hardly visible small teeth. The spine with a flexible appendage, compressed, far overreaching the first ray but much shorter than the spine itself; adipose fin placed at a distance of much less than twice its length from the rayed dorsal fin and longer than it, nearly triangular, obtuse, twice or more than twice as long 213 as high; pectoral fins acute, broad, emarginated, its first ray contained about 1⅖ times in length of head, spine medium-sized, a little or no longer than the dorsal spine, anterior side granulated, posterior side serrated with conspicuous teeth. The spine has a flexible appendage, strongly compressed, far overreaching the first ray, generally overreaching the base of the ventral fin; ventral fins acute, emarginated, not much shorter than the pectoral fin without its filament; anal fin acute, emarginate, no or a little smaller than body depth, a little higher than base length, not or hardly longer than the adipose fin; caudal fin deeply emarginate, with very acute, prolonged lobes, the upper one longer than the lower one, with its thread contained nearly 3 to 3½ times in the length of the entire body; body olive-coloured, nearly enveloped transversely with broad blackish-dark bands, the first band cephalic, the second dorsal-ventral, the third adipose-axillary, the fourth caudal. Lateral line yellow or orange. Fins with rosy-yellow and, with excep-

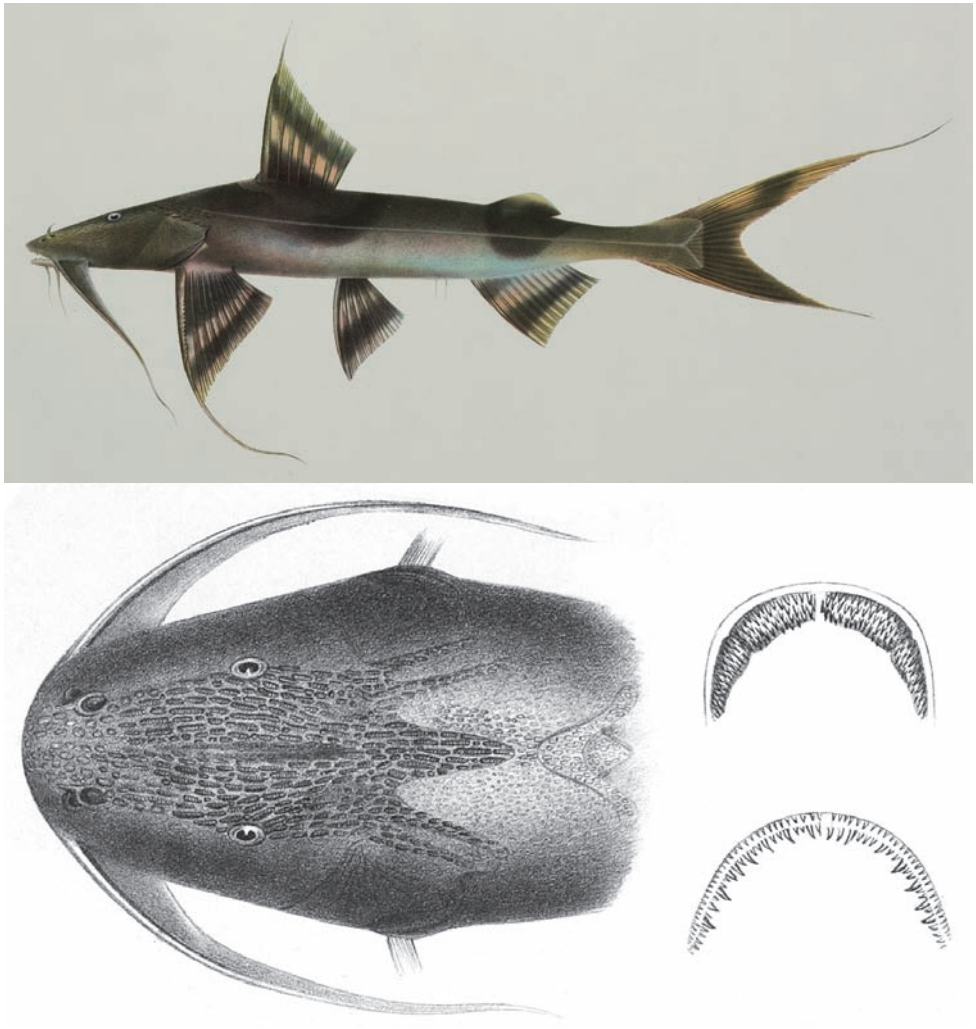

Fig. 45. *Bagarius Buchanani* Blkr.

tion of the adipose fin, two dark or blackish-dark, more or less broad bands. Body and fins moreover have many marks, irregular small blackish spots.

B. 12. D. 1/6. P. 1/12 (in one specimen on the right side 1/9). V. 1/5. A. 3/9 to 4/11. C. 1/15/1 and shorter ones alongside.

Syn. *Pimelodus bagarius* Buch. Gang. Fish. p. 186, 378 tab. 7 fig. 62, CV. Poiss. XV p. 109 tab. 433, Blkr, Verh. Bat. Gen. XXI, I Nieuwe Bijdr. Silur. Jav, p. 10.
Pimélode vachari CV. Poiss. XV p. 109 tab. 433.
Bagrus Yarrelli Sykes Fish. of the Dukhun in Transact Zool. Soc. Lond. II, 5 p. 370 tab. 135 fig. 1.
Vaghari Bengalese.
Kheerd, Mulandah, Guwtj Indig. Deccan.
Kelaling Javanese.
Lika Sundanese.

Hab. Java (Parongkalong, Trogon, Surakarta), in rivers.
Calcutta, in river Hooghly.
Length of the 5 described specimens 318''' to 440'''.

Remark. Apart from the above mentioned specimens I possess a specimen of 800 mm length without the caudal fin, which is damaged but which would have a length of approximately 1200 mm if the caudal fin, as usual, would occupy about ⅓ of the length of the total body. In the large specimens, of which I saw many during a fishing party in the Tjitarum river near Paronkalong (Preanger regencies), the caudal fin extensions seem to be relatively shorter than in the younger specimens. In the specimen in question the head shield, measured from the tip of the snout to the end of the supraoccipital crest has a length of 220''' that is, a little more than 214 a fourth part of the length of the fish without the caudal fin. In Bengal the species is said to reach a length of more than 6 feet. On Java it sometimes becomes considerably longer. I possess two skulls of Likas caught in the large rivers of the Preanger regencies of which the largest has a length of 245 mm measured from the tip of the snout to the end of the supraoccipital crest, from which it can be concluded that the fish without the caudal fin was at least 1600''' long and with the caudal fin and it extensions approximately 2400'''or had a length of more than 8 feet.

The Lika or Kelaling has first become known to science by Buchanan, who gave a rather extensive description and a rather good illustration of it. Mr Valenciennes gave a new description and illustration, the last taken from the variety with small black spots, and shortly afterwards the description and figure of Bagrus Yarrelli Sykes, which represents the same species, was published. This last figure is also made after the variety with small black spots on body and fins, but it is much less good than those of Buchanan and Mr Valenciennes. The characters by which according to Mr Sykes himself, Bagrus Yarelli would differ from Pimelodus bagarius Buch. are certainly also present in the last mentioned species, except for the forementioned small spots, which in my opinion have no more or not much more than individual value. None of the above mentioned authors has noticed the peculiarity that the tooth band in the upper jaw consists of four groups, each of which is placed on a separate bony element and for that reason in relation to the character of the teeth themselves offers an excellent character to determine the genus, which is certainly to be considered as a natural genus.

Glyptosternon McCl.
Djengal

Two dorsal fins, the anterior rayed, the posterior adipose. Anal fin medium-sized. Jaw teeth multiple-rowed, small, equal, acute, placed in a simple or bipartite band. No vomerine or palatine teeth. 215 Eyes covered with head skin. 8 barbels, the maxillary ones membranaceous, supported by a bony stem, the lower jaw ones close to the mouth. Branchiostegal membrane with 8 or 9 rays. Gill slit prolonged posteriorly, up to the tip of the gill cover. Interbranchial membrane very deeply emarginate. Dorsal and pectoral fin spines cartilagenous or bony, covered with skin. Head shield invisible, covered with skin. Nostrils touching each other, wide open, neither tubular nor with valves. Caudal fin bilobed. The thoraco-postgular area with a sucking disk. The skin of the body is smooth. No swim bladder.

Remark. This genus because of its habitus reminds one more or less of the genera Platyptera V. Hass. and Homaloptera Van Hass., which also are at home in the higher reaches of the rivers and which are built in such a way that they can cling to the stones of the riverbed in fast running streams. The flat underside of the body, the horizontal position of the pectoral fins on the ventral margin of the body, the inferior mouth and the broad fleshy upper jaw barbels supported by an extension of the maxilla, would be sufficient for this attatchment to stones or rock-like river beds, but moreover in Glyptosternon the pectoral post pharyngeal area is organised to support the remaining organs in their clinging function in all respects. This organisation is very simple and consists of a number of transverse or longitudinal skin grooves, which divide the skin behind the pharynx in longitudinal or transverse plates, which give the fish the possibility to cling to an object when they are pressed against it.

Mr MacClelland has discovered this organisation in a number of species caught in the rivers of Kabul and of the Kasyah- Simla- and Mishmee mountains, and published the short descriptions of five and the illustrations of two species in the year 1842 in the 2nd Volume of the Calcutta Journal of Natural History.

Species of this genus had already become known earlier and were discovered by Kuhl and Van Hasselt in their Pimelodus platypogon 216 and was found by Buchanan in Bengal in his Pimelodus nangra. I myself discovered another new species belonging to this genus. It has been described by me in former times under the name of Pimelodus platypogonides.

Judging from the species in my possession the genus Glyptostenon has another character that strengthens the ability of these fishes to attach themselves to stones or other objects in mountain streams. I refer to the last tooth of the pectoral fin spines, which is bent hook-like and extends anterior to the bony tip of the spine itself. Both my species have this character strongly expressed.

As far as I can ascertain the following species at this moment can be brought to Glyptosternon with more or less certainty:

Glyptosternon reticulates McCl., Glyptosternon sulcatus McCl., Glyptosternon striatus McCl., Glyptosternon pectinopterus McCl., Glyptosternon labiatus McCl., Glyptosternon nangra Blkr and the two species of my collection from Java and Sumatra, Glyptosternon platypogon and Glyptosternon platypogonides. These last two species can be distinguished from each other and from the remaining known species using the following scheme.

I. Dorsal and pectoral spines bony, posterior side dentate. Lips not lobed. D. 1/6. A. 4/7 to 4/9.
   A. Thoraco-postgular area with longitudinal grooves that converge backwards. Maxillary barbels do not reach the ventral fins.
      † Supraoccipital crest twice as long as basal width. The part of the tail situated behind the adipose fin hardly longer than high.

Glyptosternon platypogon Blkr.

      † Supraoccipital crest 3 times as long as basal width. The part of the tail situated behind the adipose fin more than twice as long as high.

Glyptosternon playpogonides Blkr.

217 *Glyptosternon platypogon* Blkr.
Atl. Silur. tab. XXXV fig. 2. [fig. 3]
Flat-barbelled Djengal

A Glyptosternon with an elongate body, anterior part a little broader than deep, posterior part compressed, body depth contained 5⅔ to nearly 5 times in its length without, and 7½ to 5½ times in its length with caudal fin. Head acute, convex, contained 3⅗ to 4½ times in length of body without, and 4⅓ to 5⅓ times in length of body with caudal fin; depth of head contained 2 to 1⅘ times in its length, width 1¾ times to hardly more than once; eyes placed at mid-length of the head, superior, facing upwards, eye diameter contained 8 to 11 times in length of head, distance between the eyes 2 to 3 times their diameter; entire rostro-dorsal profile sloping downwards, slightly convex. Head shield invisible, covered with a glandular skin, smooth when the skin is removed, divided by a longitudinal groove (median fontanel) only up to between the eyes. No posterior lateral fontanels. Posterior part ends in 5 processes, the middle process formed by the supraoccipital crest, triangular, about twice as long as basal width, its top acute, almost reaching the glabrous second interspinal bone, the median processes no shorter than the supraoccipital crest, thin, the lateral processes shorter than the median ones, formed by the suprascapular bones; anterior middle part of the second interspinal bone (the nuchal shield) with a triangular, acute process, the wings are thin, more than twice as long as broad; snout depressed-convex, more than 3 times as long as the eye, protruding beyond the mouth, rostral profile obtusely rounded; nostrils nearly touching each other, nearer to the tip of the snout than to the eye, round, wide open, neither tubular nor with valves; lips fleshy; nasal barbels thin, reaching or nearly reaching the eye, maxillary barbels, broad and membranaceous at the base, supported by a bony stem, reaching the base of the pectoral fin, lower jaw barbels compressed, the outer ones, longer than the inner ones, reaching the gill cover. Teeth well visible, the upper jaw teeth placed in a slightly curved band, less than 4 times as long as broad, the lower jaw teeth placed in a band that is more curved and longer but thinner, with acute angles; mouth inferior, hardly curved, its width contained about twice in length of head; gill cover glabrous: humeral bone fairly long, acute, smooth; lateral line a little or hardly branched, anterior part sloping downwards, posterior part straight, not forked at the base of the caudal fin; skin smooth, without small glands or conspicuous tubercles; axilla with a slime pore that is not very conspicuous; the skin in the chin is glandular. The skin beneath in the thoraco-postgular area with many longitudinal grooves that converge backwards and divided in elongate sucking disks; the part of the tail situated behind the adipose fin hardly longer than high. Rayed dorsal fin acute, no or a little higher than body depth, much less than twice as high as base length, spine covered with an unremarkable skin, contained 1½ to 1⅓ times in length of head, anterior side glabrous, posterior side generally feebly denticulate. The spine has a flexible appendage that does not overreach or hardly overreaches the first ray; adipose fin placed at a distance of less than twice its length from the rayed dorsal fin and longer than it, 3 times or more than 3 times as long as high, obliquely convex or rhomboidal; pectoral fins acute, broad, no or a little longer than the head, spine broad, compressed, covered with skin, longer than the dorsal spine, anterior side glabrous, posterior side armed with 7 to 12 large teeth, first tooth curved, anterior part overreaching top of the spine. The spine has a flexible appendage, compressed, not or hardly overreaching the first ray; ventral fins slightly acute, angular or rounded, shorter than the pectoral fins; anal fin rounded, a little smaller than body depth, hardly or not longer than high, hardly or not shorter than the adipose fin; caudal fin deeply emarginated, with acute or slightly acutely rounded lobes, nearly equal, contained 4½ to 5¼ times in length of body. 218 Colour of upper part of the body and flanks darkish or violetish-green, shining, lower part pearly-rosy or orange. Lateral line yellow or orange, fins orange, generally for the largest part tinged with dark-violet or geen-violet. Iris bluish.

B. 8 or 9. D. 1/6. P. 1/7 to 1/10. V. 1/5. A. 4/7 to 4/9. C. 1/15/1 and shorter ones alongside.

Syn. *Pimelodus platypogon* K.v.H. CV. Poiss. XV p. 113, Val. Zool. Voy. Ind. Jacquem. Atl. Poiss. tab. 18 fig. 3, Blkr, Diagn. Vischs. Sumatra Tiental I to IV. Nat. T. Ned. Ind. III p. 591.
Pimelodus platespogon Val. Zool. Voy. dans l' Ind. Jacquemont 1. c.
Pimelodus gymnocephalus K.v.H. Mss.
Pimelodus cyanochloros Blkr, Verh. Bat. Gen. XXI, I Nieuwe Bijdrage Silur. p. 11.

Fig. 46. *Glyptosternon platypogon* Blkr. [In Atlas 91 mm TL.]

Pimelode à barbillons plats CV. Poiss. XV p. 11.
Djengal Sundanese.
Leleh-gunong Mal. Batav.
Pitang Javan. central Java.

Hab. Java (Batavia, Buitenzorg, Tjampea, Tjipanas, Tjandjiur, Parongkalong, Garut, Surakarta, Malang, Nguntung), in rivers.
Sumatra (Pajakombo), in rivers.

Length of the more than 100 specimens 48''' to 100'''.

Remark. Glyptosternum platypogon primarily lives in the mountain streams of Java, where the riverbeds are shallow and covered with rocks. In Batavia it is rare and only caught now and then when the level of the river is high. However, already in Buitenzorg, only 800-900 foot above sea level, it is very numerous in the Tjidani river.

The local people have noticed very well the large difference between the species which, according to the determination of Mr Valenciennes belong to his genus Pimelodus and have given names to these species, which have the value of generic names.

Thus the Sundanese call the species of Glyptostrenum *Djengal*, those of Acrochordonichthys *Kekel*, those of Akysis *Bangon* and those of Bagarius *Lika*. The Javanese call the species of Glyptosternon *Pitang*, those of Acrochordonichthys *Djogo-ripo* and those of Bagarius *Kelaling*. The Maleyese in Batavia know these fishes less well and the name *Leleh goenoeng* or mountain leleh only indicates a distant resemblance with the Ikan leleh (Clarias punctatus CV.), which they ascribe to Glyptosternon, as well as at the true habitat of this species in the mountain streams.

219 The species of Glyptosternon all remain small and do not seem to reach or become larger than 10 cm. They are not used for consumption. Pimelodus cyanochlorus, which was indicated by myself as new in 1846, since then has proven not to be well distinguishable from Glyptosternon platypogon. The species offers many differences with regard to relative heights of the body and the length and shape of the caudal fin lobes, however, these differences are of no greater than individual value.

Glyptosternon platypogonides Blkr.
Atl. Silur. tab. XXV fig. 3. [fig. 2]
Slender-headed Djengal

A Glyptosternon with an elongate body, anterior part a little broader than deep, posterior part compressed, body depth contained 5 to 5½ times in its length without, and 6⅔ to 6¾ times in its length with caudal fin. Head acute, convex, contained 4¼ to 4⅓ times in length of body without, and 5½ to 5⅔ times in length of body with caudal fin; depth of head contained about 1½ times in its length, width 1⅕ to about 1¼ times; eyes placed halfway length of head, superior, facing upwards, eye diameter contained 7 to 8 times in length of head, distance between the eyes 1⅔ to nearly 2 times their diameter; entire rostro-dorsal profile sloping downwards, slightly convex. Head shield inconspicuous, covered with glandular skin, smooth when the skin is removed, divided by a longitudinal groove (median fontanel) only up to between the eyes. No posterior lateral fontanels. Posterior part of the shield ends in 5 processes, the middle process formed by the supraoccipital crest, thin, about 3 times as long as basal width, its top acute, almost reaching the glabrous second interspinal bone, the median processes not or hardly shorter than the supraoccipital crest, thin, the lateral processes shorter than the median ones, formed by the suprascapular bones; anterior middle part of the second interspinal bone (the nuchal shield) with a triangular, acute process, the wings are rounded, about as broad as long; snout depressed-convex, less than 3 times as long as the eye, protruding beyond the mouth, rostral profile obtusely rounded; nostrils nearly touching, nearer to the tip of the snout than to the eye, round, wide open, neither tubular nor with valves; lips fleshy; nasal barbels thin, not reaching the eye; maxillary barbels broad and membranaceous at the base, supported by a bony stem, reaching the base of the pectoral fin; lower jaw barbels close to the mouth, compressed, outer ones longer than inner ones, reaching the base of the pectoral fin; teeth well visible, upper jaw teeth placed in a slightly curved band, less than 4 times as long as broad, lower jaw teeth placed in a band that is more curved but longer and thinner, with acute angles; mouth inferior, hardly curved, its width contained about twice in length of head; gill cover glabrous: humeral bone fairly long, acute, smooth; lateral line a little or hardly branched, anterior part sloping downwards, posterior part straight, not forked at the base of the caudal fin; skin smooth, without conspicuous tubercles but covered with low, small, smooth glands, placed densely together; axillary slime pore very conspicuous; skin ventrally in the thoraco-postgular area with many longitudinal grooves that converge backwards and divided in elongate sucking disks. The part of the tail situated 220 behind the adipose fin more than twice as long as high; dorsal fin acute, not or a little higher than body depth, less than twice as high as base length, spine covered with an unremarkable skin, contained about 1⅓ times in length of head, anterior side glabrous, posterior side generally feebly denticulate. The spine has a flexible appendage that does not overreach or hardly overreaches the first ray; adipose fin placed at a distance of less than twice its length from the rayed dorsal fin and longer than it, obliquely rhomboidal or convex, about twice as long as high; pectoral fins acute, not or hardly shorter than the head, spine broad, compressed, longer than the dorsal spine, anterior side glabrous, posterior side armed with 8 to 12 large teeth, the first tooth curved, overreaching the top of the spine. The spine has a flexible appendage, compressed, not or hardly overreaching the first ray; ventral fins slightly obtusely or slightly acutely rounded, much shorter than the pectoral fins; anal fin acute, not or hardly emarginate, not or hardly lower than body depth, a little higher than base length, a little longer than the adipose fin; caudal fin with a deep incision and acute lobes, nearly equal, contained 4⅕ to 4⅖ times in the length of the entire body. Head, upper part of the body and flanks are

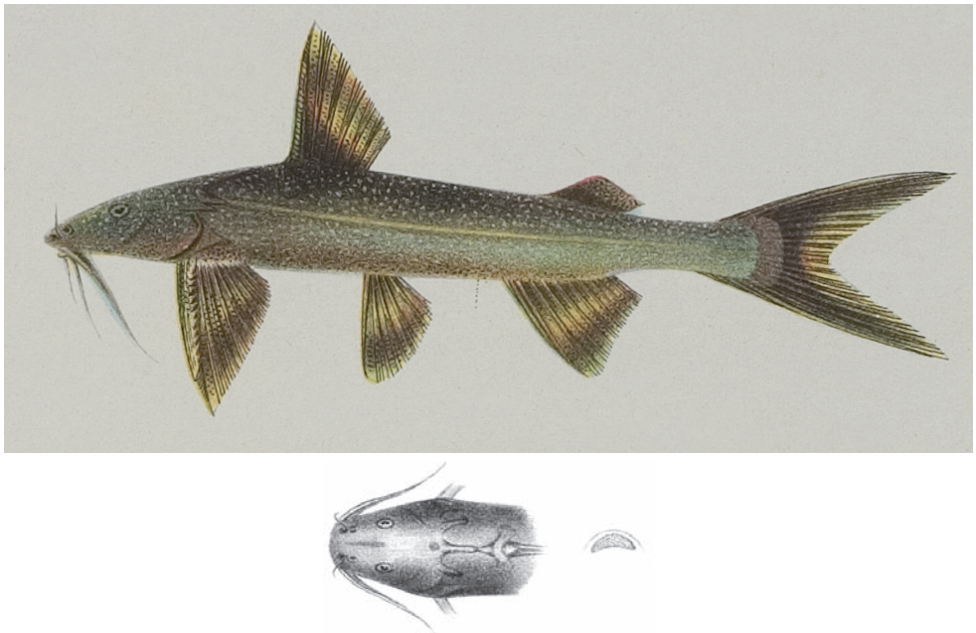

Fig. 47. *Glyptosternon platypogonides* Blkr. [In Atlas 85 mm TL.]

of a beautiful violetish-green colour, with blue points placed densely together. Belly with pearly-rose-coloured, the skin of the nuchal shield and the lateral line are orange, fins are orange. Rayed dorsal and anal fins have a broad, longitudinal violet-dark band at the base and towards the top. Dorsal adipose fin with dark speckles. Pectoral fins with an extended dark spot towards the top. Caudal fin irregularly with dark speckles, especially in the middle of the lobes.

B. 8 or 9. D. 1/6. P. 1/9. V. 1/5. A. 3/9 or 4/9. C. 1/15/1 and shorter ones alongside.

Syn. *Pimelodus platypogonides* Blkr, Nalez. Vischfaun. Sumatra, Nat. Tijdschr. Ned. Ind. IX p. 272.

Hab. Sumatra (Lahat), in rivers.

Length of the 4 specimens 70′″ to 85′′′.

Remark. Glyptosternum platypogonides, although very closely related to Glyptosternum platypogon, should definitively be considered as a different species. It distinguishes itself by a remarkably more slender body, a more slender head and tail, of which the part that lies behind the adipose fin is more than twice as long as high, whereas in Glyptosternum platypogon it is hardly longer than high. These characters can be recognized at first glance, but a further investigation reveals still other differences, which prove the independence of the species without doubt. Thus in Glyptosternum platypogon the supraoccipital process is approximately twice as long as broad (at the base), whereas the same process in the species in question is more slender and approximately three times as long as broad. However, more weight can be attached to the shape of the neck shield wings, which in Glyptosternon platypogon are slender and more than twice as long as broad, whereas in Glyptosternon platypogonides they are broad and rounded and not longer than 221 broad. Moreover in Glyptosternum platypogon the caudal fin lobes are constantly broader and less acute, etc.

Acrochordonichthys Blkr.
Wartfish

Two dorsal fins, the anterior fin rayed, the posterior adipose. Anal fin medium-sized. Jaw teeth multiple-rowed, small, equal, acute, placed in a simple or a bipartite band. No vomerine or palatine teeth. Eyes covered with head skin. Eight fleshy barbels, the maxillary barbels membranaceous at the base, the inner lower jaw barbels close to the mouth, the outer lower jaw barbels inserted far behind the angle of the mouth. Branchiostegal membrane with 7 rays. Gill opening inferior. Interbranchial membrane moderately emarginate. Dorsal and pectoral spines bony, covered with skin. Head shield invisible, covered with skin. Nostrils separate, the posterior ones with barbels, the anterior ones with short tubes. Caudal fin entire. Thoraco-postgular area without a sucking disk. The skin of the body is scabby, with warts placed in longitudinal rows. No swim bladder.

Remark. I erect the genus Acrochordonichthys on the basis of a number of species from Java and Sumatra, which were unknown to science prior to my investigations and described by me earlier as species of Pimelodus. This genus is not less natural than the genera Glyptosternon, Ketengus, Bagarius and Hemipimelodus from this archipelago, although they could all be brought under the large genus Pimelodus of Mr Valenciennes if the notion which Mr Valenciennes attaches to it would not have received a higher meaning than a generic one by the increasing knowledge of very diverse forms which fit into it.

I name this genus wart fish (Acrochordonichthys) after the skin warts, which in longitudinal rows are extended over the entire body in all my species. One can also observe this wart forming, be it in much lesser measure, in the genus Akysis, which will be mentioned in detail below, but apart from those warts it has a character to which a higher value can be attached. This character is found in the nature of the gill opening, which is inferior, 222 *i.e.*: it is situated on the ventral side of the body where it forms a transverse slit. It is not extended above the base of the pectoral fin spine as the branchial cavity is completely closed behind the head. Moreover, all species have the head covered with a scrofulous skin; the well developed fin spines covered with a thick skin membrane; the adipose fin apparently small and low, extending forward till close to the rayed dorsal fin in a low but long wart-like crest; the caudal peducle slender behind the adipose fin and the caudal fin entire, truncate or not notably concave, while the number of branchiostegal rays in all species is constantly 6, the outer lower jaw barbels are placed far posteriorly behind the mouth corner, the eyes are very small, dot-like, etc. Formerly I have already published short descriptions of 4 species of this genus which I have given the names Pimelodus zonatus, Pimelodus melanogaster, Pimelodus rugosus and Pimelodus pleurostigma. Since then I have discovered two more species, which are described below under the names Acrochordonichthys platycephalus and Acrochordonichthys ischnosoma, so that I now know 6 species of this genus. Outside the Indian archipelago it seems to have no representatives, although I would not be surprised if the large rivers of South Asia would harbour similar species.

The six known species are closely related and possess no trenchant characters by which they can be separated apart from those of their coloration. As the coloration as a result of the preservation of the specimens so often are partly or entirely lost, I have tried to find besides this character others which can always be traced back in long preserved specimens. For this reason I have come to separate them according to the following scheme.

223 I. Longitudinal groove of the head shield reaching or nearly reaching the base of the supraoccipital crest.

A. Greatest body width contained 4 or nearly 4 times in its total length.

a. Only posterior true lateral fontanels. Supraoccipital crest more than twice as long as basal width. Posterior part of the flank has three round, separate orange spots.

Acrochordonichthys platycephalus Blkr.

b. True median and posterior lateral fontanels present. Supraoccipital crest hardly longer than broad at the base and in the middle. Entire belly dark-black.

Acrochordonichthys melanogaster Blkr.

B. Greatest body width contained 4⅙ to 4⅓ times in its total length.

a. Only true posterior lateral fontanels. Supraoccipital crest more than twice as long as basal width. Entire body deep brown or darkish-orange.

Acrochordonichthys rugosus Blkr.

C. Greatest body width contained 4¾ to 5 times in its total length.

a. Only true posterior lateral fontanels. Supraoccipital crest less than twice as long as basal width. On the upper part of the flanks are several rounded, orange spots, placed in a longitudinal row.

Acrochordonichthys pleurostigma Blkr.

b. No true lateral fontanels. Supraoccipital crest twice or more than twice as long as basal width. A very broad dark dorso-anal band, surrounding the entire body.

Acrochordonichthys zonatus Blkr.

II. Longitudinal groove of the head shield ending long before the base of the supraoccipital crest.

A. Greatest body width contained about 5⅔ times in its total length.

a. No true lateral fontanels. Supraoccipital crest elongate-oval. Entire body darkish.

Acrochordonichthys ischnosoma Blkr.

224 *Acrochordonichthys platycephalus* Blkr.
Atl. Silur. tab. XXXVI fig. 4. [fig. 2.]
Wide-headed wartfish

An Acrochordonichthys with an elongate body, anterior part much broader than deep, posterior part slightly compressed, body depth contained about 5½ times in its length without, and about 6½ times in its length with caudal fin. Greatest width of the body (between the humeral bones) contained nearly

4 times in its length with caudal fin. Head acute, depressed, contained about 4 times in length of body without, and 4⅔ to 4¾ times in length of body with caudal fin; depth of head contained about 1½ times in its length, width nearly once; eyes dot-like, superior, set partly in the third anterior part of the head, facing upwards, eye diameter contained 20 to 24 times in length of head, distance between the eyes about 8 times their diameter; rostro-dorsal profile slightly convex at the snout and nape, more or less straight at the forehead and crown. Head shield invisible, covered with a glandular skin, smooth when the skin is removed. The entire head shield is divided by a longitudinal groove (median fontanel) reaching the base of the supraoccipital crest; conspicuous, true posterior lateral fontanels (but no median ones); supraoccipital crest, longitudinaly striped when the skin is removed, thin, more than twice as long as broad at the base and in the middle, its top slightly truncate, nearly reaching the second interspinal bone; second interspinal bone (the nuchal shield) slightly rough when the skin is removed, in the middle triangular, slightly acute, the wings oblique, angular, compressed at the base, longer than broad; snout depressed, convex, 6 to 8 times as long as the eye, protruding beyond the mouth, rostral profile obtusely rounded; posterior nostrils, nearer to the eyes than to the anterior nostrils, can be closed by a barbel that is membranaceous at the base, which surrounds the opening for a large part; anterior notrils much nearer to the tip of the snout than to the eye, with short tubes; lips a little fleshy; nasal barbels not or hardly overreaching the eye, maxillary barbels membranaceous at the base, supported by a bony rod, reaching the humeral bone; lower jaw barbels fleshy, the inner ones close to the mouth, reaching the base of the outer barbels, the outer ones inserted far behind the angle of the mouth, reaching the base of the pectoral fin. Jaw teeth multiple-rowed, the upper jaw teeth placed in a slightly curved band, the lower jaw teeth in a crescent-shaped band, the lower jaw tooth band longer but thinner than the premaxillary band; mouth inferior, a little curved, its width contained 1⅔ to 1¾ times in length of head; gill cover glabrous: humeral bone fairly long, acute, rough when the skin is removed; lateral line simple, anterior part sloping downwards, posterior part straight, not forked at the base of the caudal fin; skin on the head and body

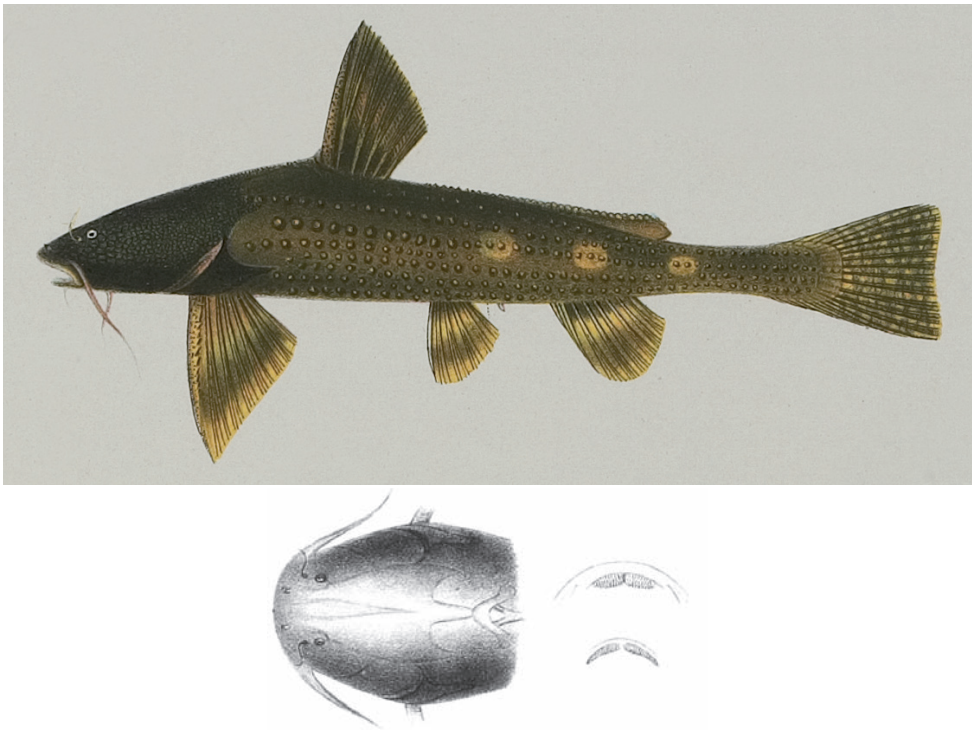

Fig. 48. *Acrochordonichthys platycephalus* Blkr. [In Atlas 97 mm TL.]

glandular-verrucose, the warts on the head irregular, on the snout and cheeks larger than the other warts. The warts on the body are elevated, on the back and flanks placed in about 6 longitudinal rows, on the belly few, small, not placed in rows; axillary slime pore not very conspicuous; part of the tail situated behind the adipose fin is about 3 times as long as high. Rayed dorsal fin acute, convex, a little smaller than body depth, nearly twice as high as base length, spine robust, contained about 1½ times in length of head, posterior side in the middle only feebly denticulate. The spine has a flexible appendage that does not overreach or hardly overreaches the first ray; adipose dorsal fin very small, with its verrucose ridge about three times as long as the rayed dorsal fin, posterior part oblique nearly rhomboidal; pectoral fins acute, not or hardly shorter than the head, spine robust, hardly curved, longer than the dorsal spine, the middle of posterior side armed with a few teeth. The spine has a flexible appendage that does not overreach or hardly overreaches the first ray; ventral fins obtuse, rounded, about twice as short as the pectoral fins; anal fin obtuse, rounded, fin depth smaller than body depth, higher than base length, more than twice as short as the adipose fin; caudal fin truncate, with rounded angles, contained about 6⅔ times 225 in the length of the entire body. Colour of head deep brown-dark, back and flanks dark, belly orange or yellowish-orange. In the middle of each flank are 3 round, orange spots placed at a distance of each other, in a longitudinal row under the adipose fin. Fins orange, with two very broad blackish-dark bands or marbled with the same colour. Barbels orange.

B. 6. D. 1/5. P. 1/7. V. 1/5. A. 3/6 or 3/7. C. 1/11/1 and shorter ones alongside.

Hab. Sumatra (Palembang), in rivers.

Length of the only specimen 97‴.

Remark. At first glance one could mistake this species for Acrochordonichthys pleurostigma, which is also characterized by some round or oval orange coloured spots on the flanks. Except for the fact that these spots in the last mentioned species are placed closer together and are more numerous, both species differ in several other characters. Thus in Acrochordonichthys pleurostigma head and body are remarkably more slim (lower and more slender), the supraoccipital crest is less than twice as long as broad, the upper jaw barbels are shorter etc.

The characters concerning the presence or absence of the median and posterior fontanels are only well visible when one has removed the skin from the head shield. True fontanels I call those, which consist of openings in the skull covered essentially only by a membrane. However, in several species one perceives at the location of these fontanels a depression in the skull the bottom of which is cartilaginous and therefore can easily be penetrated with a needle. One might name these deepenings untrue or false fontanels.

In the species in question only the true posterior fontanels are found, however in a related species, Acrochordonichthys melanogaster, except for the posterior ones, true middle fontanels are also present.

Acrochordonichthys melanogaster Blkr.
Atl. Silur tab. XXXVI fig. 2. [fig. 3.]
Black-bellied wartfish

An Acrochordonichthys with an elongate body, anterior part much broader than deep, posterior part slightly compressed, body depth contained about 5¾ times in its length without, and about 6⅔ times in its length with caudal fin. Greatest width of the body contained about 4 times in its length with caudal fin. Head acute, depressed, contained about 4 times in length of body without, and 226 about 4¾ times in length of body with caudal fin; depth of head contained about 1¾ times in its length, width about once; eyes dot-like, superior, facing upwards, set partly in the third anterior part of the head, eye diameter contained about 15 times in length of head, distance between the eyes about 6

times their diameter; rostro-dorsal profile convex, only slightly concave at the crown. Head shield invisible, covered with a glandular skin, smooth when the skin is removed. The entire head shield is divided by a longitudinal groove (median fontanel) reaching the base of the supraoccipital crest; conspicuous, true median and posterior lateral fontanels, the posterior fontanel on each side larger than the median fontanel; supraoccipital crest slightly quadrate, hardly longer than broad at the base and in the middle, its top truncate or emarginate, reaching the second interspinal bone; second interspinal bone (the nuchal shield) glabrous, in the middle triangular and slightly obtuse, the wings oblique, angular, compressed at the base, longer than broad; snout depressed, convex, about 5 times as long as the eye, protruding beyond the mouth, rostral profile obtusely rounded; posterior nostrils nearer to the eyes than to the anterior nostrils. They can be closed by a barbel that is membranaceous at the base and partly surrounds the opening; anterior notrils much nearer to the tip of the snout than to the eye, with short tubes; lips a little fleshy; nasal barbels not or hardly overreaching the eye, maxillary barbels membranaceous at the base, supported by a bony rod, hardly reaching the gill cover; lower jaw barbels very short, the inner ones close to the mouth, the outer ones inserted after the angle of the mouth. Jaw teeth multiple-rowed, the upper jaw teeth placed in a slighty curved band, the lower jaw teeth in a crescent-shaped band, the lower jaw tooth band longer but thinner than the premaxillary band; mouth inferior, its width contained 1⅔ to 1¾ times in length of head, moderately curved; gill cover glabrous, humeral bone fairly long, acute and glabrous; lateral line simple, elevated, anterior part sloping downwards, posterior part straight, not forked at the base of the caudal fin; skin on head and body glandular-verrucose, the warts on the head irregular, on the snout and cheeks larger than the other warts, warts on the body elevated, on the back and flanks placed in about 6 longitudinal rows, on the belly numerous, dense, not placed in rows; axillary slime pore well visible; the part of the tail situated behind the adipose fin is about three times as long as high in the middle. Rayed dorsal fin acute, not emarginate, not or hardly smaller than body depth, less than twice as high as base length, spine robust, contained 1⅔ to 1⅗ times in length of head, glabrous, the middle of posterior side only

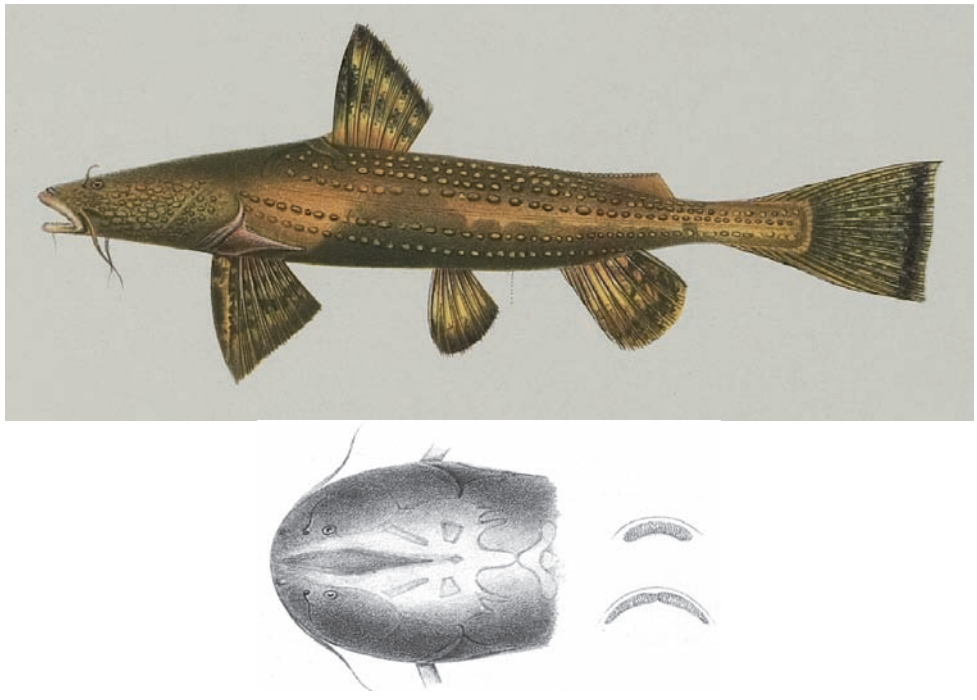

Fig. 49. *Acrochordonichthys melanogaster* Blkr. [In Atlas 111 mm TL.]

feebly denticulate. The spine has a flexible appendage that does not overreach or hardly overreaches the first ray; adipose dorsal fin very short, with its verrucose ridge more than twice as long as the rayed dorsal fin, posterior part triangular; pectoral fins acute, a little shorter than the head, spine robust, curved, longer than the dorsal spine, the middle of posterior side armed with a few teeth. The spine with a flexible appendage that does not overreach or hardly overreaches the first ray; ventral fins obtuse or slightly rounded, about twice as short as the pectoral fins; anal fin obtuse, rounded, fin depth a little smaller than body depth, a little higher than long, more than twice as short as the adipose fin; caudal fin extended, truncate, with acute angles, contained about 6⅔ times in the length of the entire body; colour of upper part of the body deep brown-orange, lower part blackish-dark, with a deepening dark in the posthumeral area, towards the rayed dorsal fin. Barbels orange variegated with dark, fins orange densely clouded-reticulated with dark.

B. 6. D. 1/5. P. 1/7. V. 1/5. A. 3/5/1. C. 1/10/1 and shorter ones alongside.

Syn. *Pimelodus melanogaster* Blkr, Overz. Ichth. Sumatra, Nat. Tijdschr. Ned. Ind. VII p. 89.

Hab. Sumatra (in the province of Palembang where the rivers Lamantang and Enim come together).

Length of the only specimen 110‴.

227 Remark. This species, already externally distinguishable by its black-brown belly and strongly developed snout and cheek warts, moreover seems to be an unique species because of the shape of its supraoccipital crest, which is much broader and relatively shorter than in the other species, as well as by the four lateral fontanels in the caudal part of the head shield. In my simple object the skin and the lower jaw are badly damaged, so that what I have said concerning the lower jaw barbels has to be confirmed by further research. Although I do not doubt their existence I am not sure about the length of these barbels.

Acrochordonichthys rugosus Blkr.
Atl. Silur. tab. XXXV fig. 4.
Wrinkly wartfish

An Acrochordonichthys with an elongate body, anterior part much broader than deep, posterior part slightly compressed, body depth contained 6 to 5¾ times in its length without, and 7 to 6¾ times in its length with caudal fin. Greatest width of the body contained 4⅓ to 4⅙ times in its length with caudal fin. Head acute, depressed, contained nearly 4 to a little more than 4 times in length of body without, and 4¾ to 5 times in length of body with caudal fin; depth of head contained 2 to 1¾ times in its length, width once to a little more than once; eyes dot-like, superior, facing upwards, set partly in the third anterior part of the head, eye diameter contained 20 to 24 times in length of head, distance between the eyes about 8 times their diameter; rostro-dorsal profile convex at the snout and nape, more or less straight at the forehead and crown. Head shield invisible, covered with a glandular skin, smooth when the skin is removed, the entire head shield is divided by a longitudinal groove (median fontanel) reaching the base of the supraoccipital crest; conspicuous, true posterior lateral fontanels present (but no median ones); supraoccipital crest thin, slightly rough, more than twice as long as basal width, tapering towards the top, the top itself slightly truncate, almost reaching the second interspinal bone; second interspinal bone (the nuchal shield) slightly rough when the skin is removed, in the middle triangular, slightly obtuse, the wings oblique, angular, compressed at the base, longer than broad; snout depressed, convex, 6 to 8 times as long as the eye, protruding beyond the mouth, rostral profile slightly obtusely rounded; posterior nostrils nearer to the eyes than to the anterior nostrils; posterior nostrils can be closed by a barbel that is membranaceous at the base and surrounds the opening for a large part; anterior notrils, with short tubes much nearer to the tip of the snout than to the eyes; lips a little fleshy; nasal barbels reaching or nearly reaching the eye; maxillary barbels, membranaceous, at the base supported

by a bony rod, reaching or nearly reaching the gill covers; lower jaw barbels fleshy, the inner ones close to the mouth, not or hardly reaching the base of the outer barbels, the outer ones inserted far behind the angle of the mouth, overreaching the gill opening. Jaw teeth multiple-rowed, the upper jaw teeth placed in a slighty curved band, the lower jaw teeth in a crescent-shaped band, lower jaw tooth band longer but thinner than the premaxillary band; mouth inferior, moderately curved, its width contained nearly twice to twice in length of head; gill cover glabrous: humeral bone fairly long, acute, rugous when the skin is removed; lateral line 228 simple, elevated, anterior part sloping downwards, posterior part straight, not forked at the base of the caudal fin; skin on the head and body glandular-verrucose, the warts on the head irregular, on the snout and cheeks larger than the other warts. The warts on the body are elevated, on the back and flanks placed in about 6 longitudinal rows, on the belly fairly numerous, dense, not placed in rows, axillary slime pore well visible; the part of the tail situated behind the adipose fin is about three times as long as high in the middle. Rayed dorsal fin acute, not emarginate, not or a little smaller than body depth, less than twice as high as base length, its spine with a flexible appendage that does not overreach or hardly overreaches the first ray; robust, contained 1⅔ to 1¾ times in length of head, the middle of posterior side only feebly denticulate, adipose dorsal fin very short, with its verrucose ridge about three times as long as the rayed dorsal fin, posterior side obliquely nearly rhomboidal; pectoral fins acute, a little shorter than the head, its spine has a flexible appendage that does not overreach or hardly overreaches the first ray; robust, curved, longer than the dorsal spine, the middle of posterior side armed with a few teeth, ventral fins obtuse, angular or rounded, about twice as short as the pectoral fins; anal fin obtuse, rounded, fin depth not or hardly smaller than body depth, higher than base length, more than twice as short as the adipose fin; caudal fin truncate, with an acute upper angle and rounded lower angle, contained 6¾ to 7 times in the length of the entire body. Colour of body deep brown or yellowish-orange, warts on the body here and there dark. Fins with orange and, with exception of the adipose fin, with broad, dark or blackish-dark bands. Barbels orange.

B. 6. D. 1/5. P. 1/7. V. 1/5. A. 3/6 or 3/7. C. 1/11/1 and shorter ones alongside.

Syn. *Pimelodus rugosus* Blkr, Verh. Bat. Gen. XXI, I Nieuwe Bijdr. Silur. p. 11.
Djogo-ripo Javan.

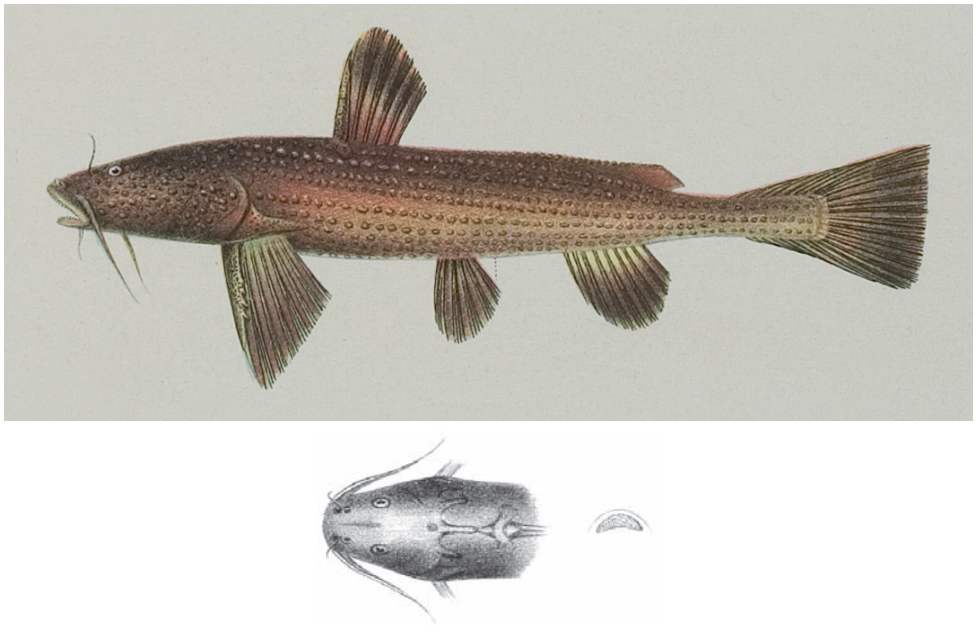

Fig. 50. *Acrochordonichthys rugosus* Blkr. [In Atlas 91 mm TL.]

Hab. Java (Surakarta), in rivers.
Sumatra (Palembang), in rivers.
Length of the 3 specimens 90‴ to 110‴.

Remark. Acrochordonichthys rugosus is an intermediate form between the species described above and Acrochordonichthys pleurostigma and Acrochordonichthys zonatus. It has its head and body less broad than the first mentioned and still remarkably broader than the last mentioned species. In habitus it resembles Acrochordonichthys melanogaster most, but in the species in question the largest width of the body goes more than four times in the total length of the fish and moreover it differs by the absence of the large dark brown belly spot, by the presence of true lateral fontanels only and because the supraoccipital crest is twice as long as broad. Moreover the bands of jaw teeth are more curved than in Acrochordonichthys melanogaster and even than in all remaining species.

Two of my specimens were caught in Soerakarta, in the river 229 Pepeh, in which I discovered the species in 1846. The third specimen originates from the Moessi river, near Palembang.

Acrochordonichthys pleurostigma Blkr.
Atl. Silur. tab. XXXV fig. 5.
Spotted wartfish

An Acrochordonichthys with an elongate body, anterior part much broader than deep, posterior part slightly compressed, body depth contained nearly 7 to 6⅓ times in its length without, and 8 to 7½ times in its length with caudal fin, greatest width of the body contained 4¾ to nearly 5 times in its length with caudal fin. Head acute, depressed, contained about a little more than 4 times in length of body without, and nearly 5 to 5 times in length of body with caudal fin; depth of head contained 1¾ to 1⅔ times in its length, width once to a little more than once; eyes dot-like superior, facing upwards, set partly in the third anterior part of the head, their diameter contained 15 to 18 times in length of head, distance between the eyes 5 to 6 times their diameter; rostro-dorsal profile slightly convex at the snout and nape, more or less straight at forehead and crown. Head shield invisible, covered with a glandular skin, slightly rough when the skin is removed. The entire head shield is divided by a longitudinal groove (median fontanel) reaching the base of the supraoccipital crest. Conspicuous, true posterior lateral fontanels present (but no median ones); supraoccipital crest slightly rough when the skin is removed, less than twice as long as basal width, the top broad, slightly truncate, nearly reaching the second interspinal bone; second interspinal bone (the nuchal shield) slightly rough when the skin is removed, in the middle triangular, slightly obtuse, the wings oblique, angular, compressed at the base, longer than broad; snout depressed, convex, 5 to 6 times as long as the eye, protruding beyond the mouth, rostral profile obtusely rounded; posterior nostrils nearer to the eyes than to the anterior nostrils. They can be closed by a barbel that is membranous at the base and surrounds the opening for a large part; anterior nostrils much nearer to the tip of the snout than to the eye, with short tubes; lips a little fleshy; nasal barbels not or hardly reaching the eye; maxillary barbels, membranous, at the base supported by a bony rod, reaching the gill cover; lower jaw barbels fleshy, the inner ones close to the mouth, reaching the base of the outer barbels, the outer ones reaching the base of the pectoral fin. Jaw teeth multiple-rowed, the upper jaw teeth placed in a slighty curved band, the lower jaw teeth in a crescent-shaped band, the lower jaw tooth band longer but thinner than the premaxillary band; mouth inferior, moderately curved, its width contained about twice in length of head; gill cover glabrous: humeral bone fairly long, acute, slightly rough when the skin is removed; lateral line simple, anterior part sloping downwards, posterior part straight, not forked at the base of the caudal fin; skin on the head and body glandular-verrucose, the warts on the head irregular, on the snout and cheeks larger than the other warts. The warts on the body are elevated, placed in 6 or 7

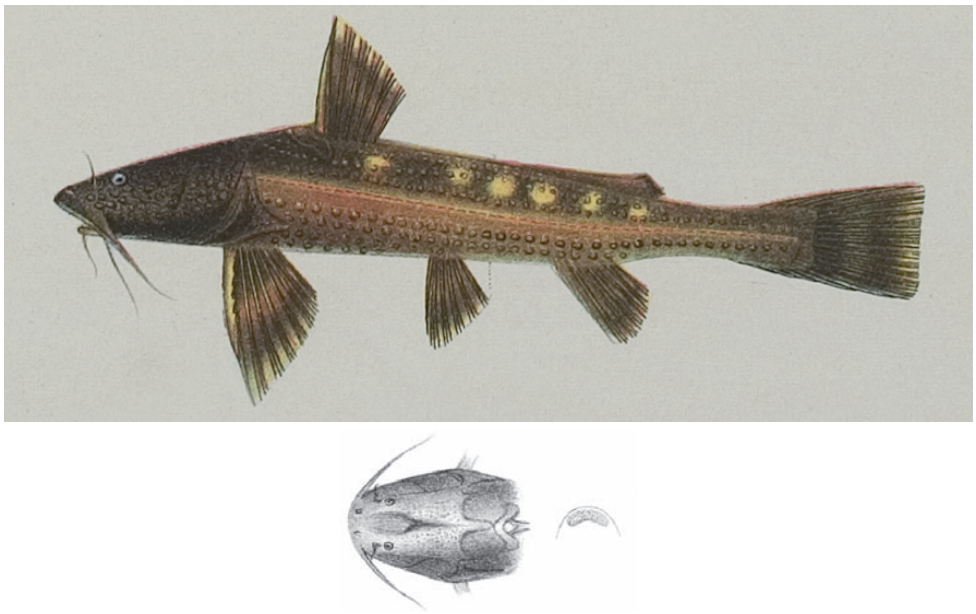

Fig. 51. *Acrochordonichthys pleurostigma* Blkr. [In Atlas 74 mm TL.]

longitudinal rows, none on the belly. Axillary slime pore very conspicuous; the part of the tail situated behind the adipose fin is more than twice as long as high in the middle. Rayed dorsal fin acute, not emarginate, a little higher than body depth, less than twice as high as base length, its spine has a flexible appendage that does not overreach or hardly overreaches the first ray and is robust, contained 1⅓ to 1⅗ times in length of head, entirely glabrous, adipose dorsal fin very short, with its verrucose ridge about three times as long as the rayed dorsal fin, posterior side obliquely nearly rhomboidal; pectoral fins acute, longer than the head, spine robust, a little curved, longer than the dorsal spine, the middle of posterior side armed with a few teeth. The spine has a flexible appendix that does not overreach or hardly overreaches the first ray; ventral 230 fins acute or acutely rounded, about twice as short as the pectoral fins; anal fin slightly acutely or slighly obtusely rounded, fin depth not or hardly smaller than body depth, higher than base length, more than twice as short as the adipose fin; caudal fin truncate or hardly emarginate, generally with an acute upper angle and rounded lower angle, contained nearly 6 to 6⅓ times in the length of the entire body. Colour of body dark or violetish-dark, its lower part more softly coloured, head slightly dark blue. On the upper side of each flank are 4 to 8 rounded or oval, orange, separated spots, placed in a longitudinal row. Fins orange, with two very broad blackish-dark bands, or marbled with the same colour. Barbels orange.

B. 6. D. 1/5. P. 1/6 or 1/7. V. 1/5. A. 3/5 or 3/6 or 2/6. C. 1/11/1 and shorter ones alongside.

Syn. *Pimelodus pleurostigma* Blkr, Spec. pisc. Javan. nov. Nat. Tijdschr. N. Ind. VII p. 442.
Kekel Mal., Batav. and Sundan.

Hab. Java (Batavia, Parongkalong), in rivers.

Length of the 12 specimens 48‴ to 99‴.

Remark. As mentioned above, Acrochordonichthys pleurostigma in its colour pattern most resembles Acrochordonichthys platycephalus. However, in the last mentioned species the width of the body hardly fits four times in its length, and the height only about 6 times in its total length, which makes the Javanese species remarkably more slender, which is most apparent when similar sized specimens of

both species are compared. Moreover the lateral blotches in Acrochordonichthys platycephalus are less numerous, whereas the supraoccipital crest is more than twice as long as broad.

Acrochordonichthys pleurostigma is not very rare in the Tjiliwong river in Batavia. Several of my specimens have been caught in this river in the centre of the capital, but always one specimen at the time. I caught the rest of my specimens in Parongkalong, in the Tjandjioer regency, during a fishing party with akar toeba (Dalbergia heterophylla) in the Tjitarum river. These specimens are all larger than my specimens from Batavia, thus it seems that the species belongs more in the higher parts of the drainages.

Acrochordonichthys zonatus Blkr.
Atl. Silur. tab. XXXVI fig. 1. [fig. 5.]
Girdle-bearing wartfish

An Acrochordonichthys with an elongate body, anterior part much broader than deep, posterior part slightly compressed, body depth contained slightly more than 6 to nearly 6 times in its length without, and 7½ to nearly 7 times in its length with caudal fin. Greatest width of the body contained 4¾ to 5 times in its length with caudal fin; 231 head acute, slightly depressed, contained 4⅕ to 4½ times in length of body without, and 5 to 5⅓ times in length of body with caudal fin; depth of head contained 1¾ to 1⅔ times in its length, width about once; eyes dot-like, superior, facing upwards, set in the anterior half of the middle third part of the head, their diameter contained about 18 to 20 times in length of head, distance between the eyes 6 times their diameter; rostro-dorsal profile slightly convex at the crown and snout, more or less straight or slightly concave at the forehead. Head shield invisible, covered with a verrucose-glandular skin, smooth when the skin is removed, slightly striped; entire head shield divided by a longitudinal groove (median fontanel) reaching the base of the supraoccipital crest. No true median or posterior lateral fontanels; supraoccipital crest elongately-triangular, twice or more than twice as long as basal width, the top acute, reaching or nearly reaching the second interspinal bone; second interspinal bone (the nuchal shield) glabrous, slightly striped, in the middle triangular, about twice as short as the supraoccipital crest, the wings thin, about twice as long as broad; snout depressed, convex, more than 5 times as long as the eye, protruding beyond the mouth, rostral profile slightly obtusely rounded; posterior nostrils nearer to the eyes than to the anterior nostrils. They can be closed by a barbel that is membranaceous at the base and surrounds the opening for the largest part, anterior notrils nearer to the tip of the snout than to the posterior nostrils, with short tubes. Lips a little fleshy. Nasal barbels hardly reaching the eye; maxillary barbels, membranaceous towards the base, reaching or hardly reaching the gill covers; lower jaw barbels fleshy, the inner ones close to the mouth, reaching or hardly reaching the base of the outer barbels, the outer lower jaw barbels, inserted far after the angle of the mouth, reaching or hardly reaching the base of the pectoral spine. Jaw teeth multiple-rowed, placed in a curved, nearly crescent-shaped band, the slower jaw tooth band hardly thinner and longer than the premaxillary band; mouth inferior, feebly curved, its width contained about 1⅔ times in length of head; gill cover glabrous; humeral bone fairly long, acute, smooth; lateral line simple, elevated, anterior part sloping downwards, posterior part straight, not forked at the base of the caudal fin; skin on the body glandular-verrucose, the warts elevated, placed in about 7 longitudinal rows; axillary slime pore conspicuous; the part of the tail situated after the adipose fin more than twice as long as high in the middle; dorsal fin acute, not emarginate, not or hardly higher than body depth, less than twice as high as base length, The spine has a flexible appendage that does not overreach or hardly overreaches the first ray and is robust, contained 1½ to 1⅔ times in length of head; adipose fin very short, more than twice as long as the first dorsal fin, anterior side in the form of a ridge, posterior side triangular; pectoral fins acute, no to a little shorter than the head, spine robust, much longer than the dorsal spine, the middle of posterior side armed with a few teeth,

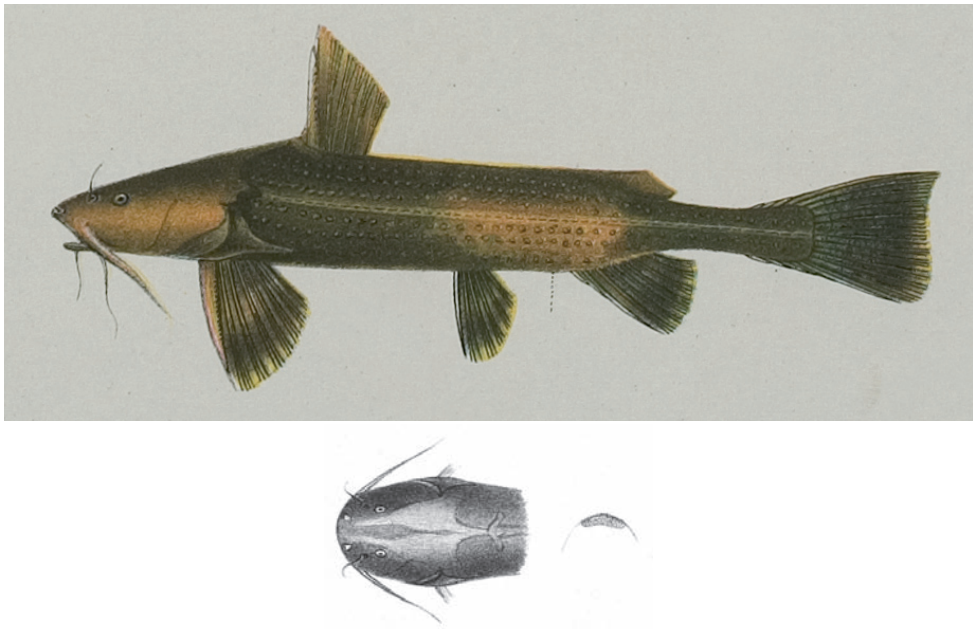

Fig. 52. *Acrochordonichthys zonatus* Blkr. [In Atlas 77 mm TL.]

its tip with a compressed, flexible appendage that hardly or a little overreaches the first ray; ventral fins acute, rounded, about twice as short as the pectoral fins; anal fin slightly acute, convex, fin depth hardly smaller than body depth, a little higher than long, more than twice as short as the adipose fin; caudal fin truncate or feebly emarginate, with an acute upper angle and an obtuse, rounded lower angle, contained about 6 times in the length of the entire body. Colour of body and fins yellowish-orange, a very broad blackish-dark anal-dorsal band surrounding the entire body, barbels orange variegated with dark, the rayed dorsal, pectoral, ventral and anal fins orange at the top, ventral fins with a transverse band in the middle, anal fin with an orange, longitudinal band in the middle, ventral and caudal fins variegated with orange.

B. 6. D. 1/5. P. 1/7. V. 1/5. A. 3/7. C. 1/11/1 and shorter ones alongside.

Syn. *Pimelodus zonatus* Blkr, Spec. piscium Javanens. nov., Nat. T. Ned. Ind. VII p. 444.
Kekel Mal., Batav. and Sundan.

Hab. Java (Batavia), in rivers.

Length of the 9 specimens 54‴ to 80‴.

232 Remark. Closely related to Acrochordonichthys pleurostigma, the species in question primarily distinguishes itself from that species by the absence of orange colored lateral blotches and by the very broad dark brown band, which girds the entire body between the pectoral and ventral fin, and also a similar band that includes the entire caudal peduncle. Moreover, Acrochordonichthys zonatus is characterised by the absence of true lateral fontanels and because it has the supraoccipital crest twice or more than twice as long as broad. It seems to remain the smallest of all known species. All my specimens were caught in the Tjiliwong [river] in the capital Batavia.

Acrochordonichthys ischnosoma Blkr.
Atl. Silur. tab. XXXVI fig. 3. [fig. 4.]
Slender wartfish

An Acrochordonichthys with an elongate body, anterior part much broader than deep, posterior part slightly compressed, body depth contained about 7 times in its length without, and about 8⅓ times in its length with caudal fin. Greatest width of the body contained about 5⅔ times in its length with caudal fin. Head acute, depressed, contained about 4 times in length of body without, and nearly 5 times in length of body with caudal fin; depth of head contained about twice in its length, width 1⅓ to 1¼ times; eyes dot-like, superior, facing upwards, set partly in the third anterior part of the head, eye diameter contained about 18 to 20 times in length of head, distance between the eyes about 6 times their diameter; rostro-dorsal profile slightly convex at the snout and nape, more or less straight or slightly concave at the forehead and crown. Head shield invisible, covered with a glandular skin, smooth when the skin is removed. Only the beginning of the head shield is divided by a broad longitudinal groove (median fontanel) ending long before the base of the supraoccipital crest. There is an oval pit in a median line to the base of the supraoccipital crest. No true median or posterior lateral fontanels; supraoccipital crest elongate-oval, a little more than twice as long as broad at the base and in the middle, the top rounded, reaching or nearly reaching the second interspinal bone; second interspinal bone (the nuchal shield) glabrous, in the middle triangular, slightly obtuse, the wings obtuse, rounded, compressed at the base, hardly or not longer than broad; snout depressed, convex, about 5 times as long as the eye, protruding beyond the mouth, rostral profile obtusely rounded; posterior nostrils nearer to the eyes than to the anterior nostrils. Posterior nostrils can be closed by a barbel that is membranaceous at the base and partly surrounds the opening; anterior notrils hardly nearer to the tip of the snout than to the eyes, with short tubes; lips a little fleshy; nasal barbels hardly overreaching the eye; maxillary barbels, membranaceous, at the base supported by a bony rod, reaching the gill covers. Lower jaw barbels fleshy, the inner ones close to the mouth, reaching or hardly reaching the base of the outer barbels, the outer barbels, inserted far behind the angle of the mouth, reaching or hardly reaching the base of the pectoral spine. Jaw teeth multiple-rowed, placed in a curved, nearly crescent-shaped band, the lower jaw tooth band thinner and not longer than the premaxillary band; mouth inferior, moderately 233 curved, its width contained about 2 times in length of head; gill cover glabrous: humeral bone fairly long, acute, longitudinally rough; lateral line simple, elevated, anterior part sloping downwards, posterior part straight, not forked at the base of the caudal fin; skin on the body glandular-verrucose, the warts slightly elevated, placed in 6 or 7 longitudinal rows; axillary slime pore very conspicuous; the part of the tail situated behind the adipose fin more than twice as long as high in the middle; dorsal fin acute, not emarginate, a little smaller than body depth, less than twice as high as base length. Its spine has a flexible appendage that does not overreach or hardly overreaches the first ray, and is robust, twice as short as the head. adipose fin very short, about three times as long as the first dorsal fin, anterior part in the form of a ridge, posterior part obliquely rounded; pectoral fins acute, a little shorter than the head, spine robust, curved, much longer than the dorsal spine, the middle of posterior side armed with a few teeth. The spine has a flexible, short appendage that does not overreach or hardly overreaches the first ray; ventral fins slightly obtuse, angular, about twice as short as the pectoral fins; anal fin obtuse, rounded, fin depth hardly smaller than body depth, hardly higher than long, more than twice as short as the adipose fin; caudal fin hardly emarginate, nearly truncate, contained about 6¼ times in the length of the entire body, with a slightly acute upper angle and an obtuse, rounded lower angle. Colour of upper part of the body and flanks gray-dark or darkish-deep brown, here and there with deeper dark points, lower part of the body gray-rose-coloured or gray-orange. Fins orange-rose-coloured and, with exception of the adipose fin, generally characterized by 2 broad blackish-dark bands.

B. 6. D. 1/5. P. 1/7. V. 1/5. A. 3/7. C. 1/12/1 and shorter ones alongside.

Syn. *Kekel* Sundanese.

Hab. Java (Parongkalong, province of Preanger), in river Tjitarum.

Length of only specimen 115‴.

Fig. 53. *Acrochordonichthys ischnosoma* Blkr. [In Atlas 115 mm TL.]

Remark. Whereas in the remaining known species of Acrochordonichthys the transverse head shield groove streches backwards to the base of the supraoccipital crest, it ends here in the middle of the crown before the base of that process. The supraoccipital crest itself also has a different shape being elongate rounded and convex on both sides. These characters, which next to those present in the presence or absence of true posterior and middle lateral fontanels can be observed only after the removal of the scrofulous head skin, are expressed or translated in a extremely slender and long body, which, in the same measure, is not found in any of the other species, whereas the head is also remarkably lower and smaller than in the remaining species. In colour pattern it is most closely related to Acrochordonichthys rugosus, having like this species no characteristic blotches or bands.

The only specimen, which I possess of the slender wartfish, 234 I caught in Parongkalong in the Preanger regencies, during a fishing party in the Tjitarum river arranged by the regent of Tjiandoer.

Akysis Blkr.
Bangon

Two dorsal fins, the anterior one rayed, the posterior one adipose. Anal fin mediumsized. Ventral fins inserted after the rayed dorsal fin, with 1/5 rays. Jaw teeth multiple-rowed, small, equal, acute, placed in a simple or bipartite band. No vomerine or palatine teeth. Eyes covered with head skin. Eight fleshy barbels, not membranaceous at the base, all lower jaw barbels close to the mouth. Branchiostegal membrane with 6 rays. Gill opening posterior, prolonged beyond the tip of the gill cover. Interbranchial mem-

brane hardly or not emarginate. The dorsal and pectoral spines bony, covered with skin. Head shield invisible, covered with skin. Nostrils separate, the posterior ones with barbels, the anterior ones tubular. Caudal fin bilobed. Thoraco-postgular area without a sucking disk. Skin of the body glandular. No swim bladder.

Remark. The genus Akysis in the group of Pimelodonts with eight barbels and common similar-shaped and similar-sized jaw teeth, is characterised by the absence of a swim bladder, a branchial cavity that is open to behind the tip of the opercle, six branchiostegal rays and six (1/5) pelvic fin rays, a scrofulous skin, a bilobed caudal fin, tube-like anterior nasal openings and true bony fin spines.

I cannot determine if there are species among the Bengal Pimelodonts, described by Buchanan and not included in the large Histoire naturelle des Poissons, which might be brought to Akysis. Also amongst the species described by other authors I see no species that could belong to this genus.

Till now I know only one species of Akysis that inhabits the rivers of West Java and that was described by me already eleven years ago under the name Pimelodus variegatus.

235 *Akysis variegatus* Blkr.
Atl. Silur. tab. XXXV fig. 1.
Piebald Bangon

An Akysis with an elongate body, anterior part broader than deep, posterior part slightly compressed, body depth contained 4½ to 5 times in its length without, and 5½ to 6⅓ times in its length with caudal fin, greatest width of the body contained 4¼ to 4 times in its length with caudal fin. Head acute, convex, a little broader than long, length contained 4 to 4¼ times in length of body without, and 5¼ to 5⅗ times in length of body with caudal fin; depth of head contained 1⅖ to 1⅕ times in its length; eyes superior, facing upwards, set partly in the third anterior part of the head, their diameter contained about 14 times in length of head, distance between the eyes 4 to 5 times their diameter; rostro-dorsal profile entirely convex or slightly convex; head shield invisible, covered with a glandular skin, slightly rough when the skin is removed. The entire head shield is divided by a longitudinal groove (median fontanel) reaching the base of the supraoccipital crest. The groove is bipartite, because of a small transverse frontal bony rod. No true median or posterior lateral fontanels on the shield; supraoccipital crest slightly rough when the skin is removed, thin, about twice or more than twice as long as broad at the base, about three times as long as broad in the middle, the top slightly acute, reaching or nearly reaching the second interspinal bone; second interspinal bone (the nuchal shield) in the middle nearly triangular, slightly obtusely rounded, the wings small, thin; snout convex, not protruding beyond the mouth, about 3 times as long as the eye, rostral profile obtusely rounded; posterior nostrils close to the eyes. They can be closed by a barbel that is membranaceous at the base and surrounds the opening for a large part; anterior notrils closer to the tip of the snout than to the eye, with short tubes; lips a little fleshy; nasal barbels reaching the gill covers; maxillary barbels reaching the base of the pectoral fin; lower jaw barbels close to the mouth, fleshy, the outer ones much longer than the inner ones, far overreaching the gill opening, the inner ones overreaching the gill opening a little. Jaw teeth multiple-rowed, the upper jaw teeth placed in a slightly curved band, the lower jaw teeth in a crescent-shaped band, the lower jaw tooth band longer but thinner than the premaxillary band; mouth anterior or nearly anterior, a little curved, its width contained 1¾ to 2 times in length of head; gill cover glabrous, humeral bone short, acute and glabrous; axillary slime pore no conspicuous; skin on the head and body glandular, the small glands a little elevated, placed on the body in longitudinal rows; lateral line simple, slightly elevated, anterior part sloping downwards, posterior part straight, not forked at the

Fig. 54. *Akysis variegatus* Blkr. [In Atlas 43 mm TL.]

base of the caudal fin. The part of the tail situated after the adipose fin is about twice as long as high in the middle. Rayed dorsal fin acute, convex, not or a little lower than body depth, less than twice as high as base length, spine medium-sized, curved a little forwards, a little shorter than the head, with a deep longitudinal groove, anterior side towards the base armed with a simple tooth. The spine has a flexible appendage that does not overreach the first ray, or overreaches it a little; adipose fin small, angular, placed at a distance of less or hardly more than its length from the rayed dorsal fin and longer than it; pectoral fins acute, rounded, a little longer than the head, spine medium-sized, curved a little forwards, hardly longer than the dorsal spine, with a deep longitudinal groove, anterior side towards the base armed with a simple spine which has a flexible appendage that does not overreach or hardly overreaches the first ray; ventral fins rounded, less than twice as short as the pectoral fins; anal fin obliquely rounded, fin depth smaller than body depth, a little higher than long at the base, hardly or not longer than the adipose fin; caudal fin deeply emarginate, with acute or acutely rounded lobes, contained 4½ to 5 times in the length of the entire body; colour of body orange with 4 broad, transverse, irregular dark bands, the first band, surrounding the head, marbled or reticulated with orange, the second, dorso-ventral band very broad, anterior part more or less joined with the head band, the third, adipose-anal band thinner, the fourth caudal. Fins and barbels are orange, variegated with dark.

B. 6. D. 1/5. P. 1/5 or 1/6. V. 1/5. A. 2/6 or 2/7 or 3/6. C. 1/11/1 or 1/12/1 and shorter ones alongside.

Syn. *Pimelodus variegatus* Blkr, Verh. Bat. Gen. XXI, 1 Silur. Batav. consp. p. 53.
Kekel Mal. Batav.
Bangon Sundanese. Provinc. Preang.

Hab. Java (Batavia, Parongkalong), in rivers.

Length of the 22 specimens 31‴ to 43‴.

Remark. I saw this species for the first time in 1845 and described it on the basis of the single, very small specimen then in my possession. Since then, I have examined the numbers of brachiostegal- and fin rays in numerous specimens, and found that there are only six branchiostegal rays and only five dorsal fin rays. This species is remarkable, because of the shape of its fin spines, which are bend slightly forward, and pos-

sess a longitudinal slit, and at the basis of these slits are armed with a relatively strong spinous tooth. These special characters however, can only be observed after one has removed the thick skin covering the spine. Akysis variegates is the smallest siluroïd of the Indian archipelago, known to me thus far, the length of the largest of my 22 specimens is only 43 millimetres.

Hemipimelodus Blkr.

Two dorsal fins, the anterior one rayed, the posterior one adipose. Anal fin mediumsized. Jaw teeth multiple-rowed, small, equal, acute, placed in a bipartite band. No vomerine or palatine teeth. Eyes covered with head skin. Six barbels, the lower jaw barbels close to the mouth. Branchiostegal membrane with 5 or 6 rays. Interbranchial membrane not emarginate. The dorsal and pectoral fin spines bony and naked. Head shield conspicuous, grainy. Nostrils not tubular, the posterior ones with valves. caudal fin bilobed. Swim bladder present. Lateral line forked at the base of the caudal fin.

Remark. I isolate the genus Hemipimelodus from the remaining genera of the Pimelodini with many rows of uniform teeth in both 237 jaws based on some peculiarities in the organisation, which do not allow to keep them united with those genera. On the basis of its 6 barbels it would belong to Pseudopimelodus, a genus however, just like Pimelodus, even if restricted as mentioned above, it still is a composition of various natural genera, the characters of which according to the present state of science can not be given with the necessary clarity.

Both species that I posses of Hemipimelodus, in habitus have such a large resemblance with the genus Arius that one easily could bring them under this genus if one would not have examined the dentition.

Indeed they greatly resemble Arius gagora CV. and Arius microcephalus Blkr, however the absence of palatine- and vomerine teeth immediately excludes them from the group of the Ariodonts.

The principal character on which in my opinion the difference with Pseudopimelodus seems to be founded, is based on the number of branchiostegal rays. Since I was not able to examine any of the species of Pseudopimelodus from nature, I cannot determine how the total lack of an excision of the branchiostegal membrane, the eyes covered with head skin and the shape of the head shield could be of generic value. In both my species a large triangular fontanel is situated on each side behind the head shield, which in it self however, does not seem to be of generic value, as similar fontanels are also present in Cephalocassis melanochir Blkr.

From the species that have become known by other authors Pimelodus Peronii CV. seems to belong to Hemipimelodus, as the nasal openings are built in the same way and the number of branchiostegal rays is 6. It also does not seem improbable to me that Nalla-jella of Russell and Tachysurus chinensis Lac. can be brought to Hemipimelodus, and possibly also Silurus quadrimaculatus Bl., as well as Pimelodus viridescens Buch., Pimelodus cenia Buch. Pimelodus jatius Buch., Pimelodus asperus McCl. and Pimelodus mong Richds.

Both species of my collection can be distinguished from each other by the following scheme.

238 I. Head contained nearly 4 to 4⅖ times in length of body without caudal fin.

Hemipimelodus borneënsis Blkr.

II. Head containted 3¼ to 3⅖ times in length of body without caudal fin.

Hemipimelodus macrocephalus Blkr.

Hemipimelodus borneënsis Blkr.
Atl. Silur. tab. XXXIV fig. 3.
Bornean Hemipimelodus

A Hemipimelodus with an elongate body, anterior part a little broader than deep, posterior part compressed, body depth contained 5 to about 5⅖ times in its length without, and nearly 6 to nearly 7 times in its length with caudal fin. Head acute, convex, contained nearly 4 to 4⅖ times in length of body without, and nearly 5 to 5½ times in length of body with caudal fin; depth of head contained 1⅓ to 1½ times in its length, width 1⅓ to 1⅕ times; eyes covered with head skin, superior, facing more sideways than upwards, placed partly in the third anterior part of the head, their diameter contained 7 to 8 times in length of head, distance between the eyes 1⅔ to 2 times their diameter; rostro-dorsal profile convex at the snout, crown and nape. Head shield nearly entirely divided by a longitudinal groove (median fontanel) nearly reaching the base of the supraoccipital crest. Posterior part of each side has a triangular fontanel larger than the eye. The head shield is rough-grainy with small, fairly numerous granules upwards from the eyes; triangular supraoccipital crest, rough-grainy with small granules arranged in rays, a little longer than broad at the base, about twice as long as broad in the middle, the top truncate, emarginate, reaching the short, triangular, grainy-rough second interspinal bone; snout convex, less to hardly more than twice as long as the eye, protruding a little beyond the mouth, rostral profile obtusely rounded; nostrils nearly touching, closer to tip of the snout than to the eye; anterior ones round, the posterior ones oblong and can be closed by an elevated small valve; lips very fleshy; barbels thin, round, without membranaceous appendages; maxillary barbels, rigid at the base, hardly reaching or reaching the humeral bone; outer lower jaw barbels, longer than the inner ones, not reaching the gill opening. Teeth well visible, upper jaw teeth placed in a hardly curved band, with rounded angles, lower jaw teeth placed in a nearly crescent-shaped, curved band, longer but thinner than the premaxillary band, with acute angles; its width contained 2⅔ to 3 times in length of head; gill cover glabrous and veined: humeral bone short, acute, smooth or slightly rough; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin; swim bladder cellular, with thick walls; axillary slime pore conspicuous . Rayed dorsal fin acute, not or a little higher than body depth, twice or a little more than twice as high as base length, spine robust, contained 1 to 1⅓ times in length of head, rough at the upper part of the anterior side only, posterior side for the largest part serrated with small teeth. The spine has a flexible appendage that does not hardly overreach the first ray; adipose fin placed at a distance of less than twice its length from the rayed dorsal and a little longer than this fin, twice or more than twice as long as high, obliquely convex; pectoral fins acute, contained a little more than once in length of head, spine thick, not or a little longer than the dorsal spine, striped at the flanks, anterior side towards the base 239 granulated, towards the top feebly serrated, posterior side armed with many conspicuous teeth; ventral fins slightly obtusely rounded, contained 1⅔ to 1⅗ times in length of head; anal fin acute or slightly obtuse, feebly emarginate, less high than long, a little longer than the adipose fin; caudal fin deeply forked and with acute lobes, the upper lobe generally longer than the lower one, contained 5 to 5½ times in the length of the entire body. Colour of upper part of the body olive, lower part pearly or silvery. Adipose fin slightly olive, other fins yellowish, towards the free edge more or less with dark speckles. Crown has a saffron-yellow spot in the median groove.

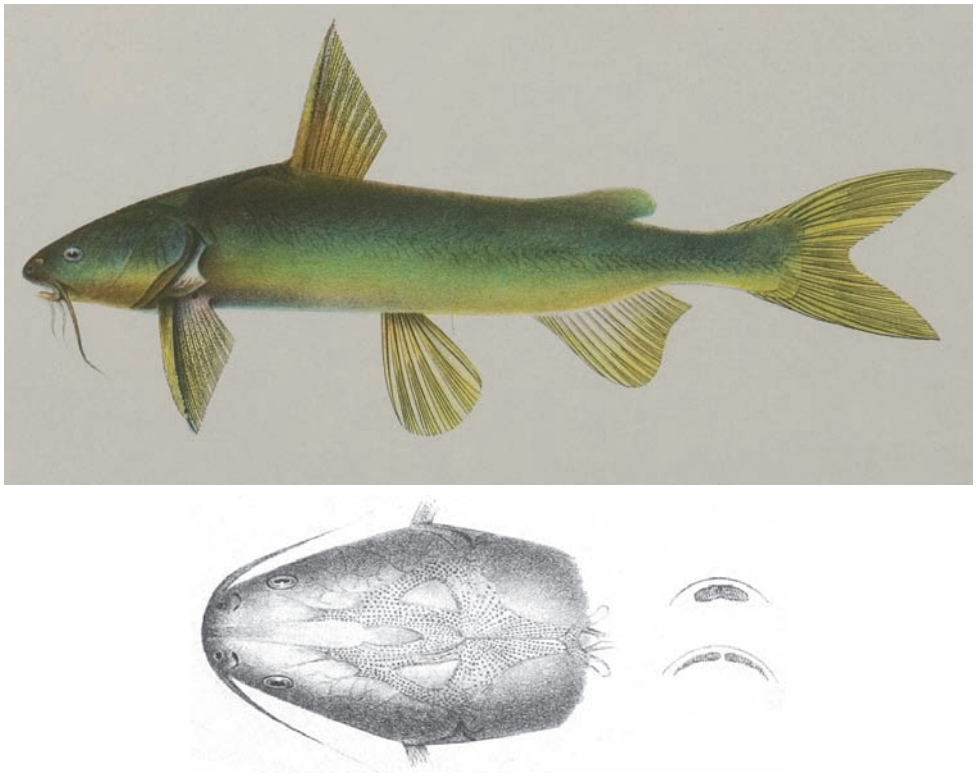

Fig. 55. *Hemipimelodus borneënsis* Blkr.

B. 5. P. 1/9 or 1/10. V. 1/5. A. 5/13 or 6/13 to 5/15 or 6/15. C. 1/13/1 and shorter ones alongside.
Syn. *Pimelodus borneënsis* Blkr, Vijfde Bijdr. ichth. Borneo, Nat. Tijdschr. Neerl. Ind. II p. 430.
Anak Dukang Palemb.
Hab. Sumatra (Palembang), in rivers.
Borneo (Bandjermasin, Sambas), in rivers.
Length of the 17 specimens 112‴ to 198‴.

Remark. I discovered this species in August 1851 and described it at the abovementioned place still under the generic name Pimelodus, after the only specimen then available to me. Since then my cabinet has been enriched with numerous specimens, so that I was able to change and improve my original description.

The species does not seem to be rare especially in the river of Bandjermassin. I have received many specimens from Bandjermassin, which I have partly presented to European musea.

Hemipimelodus macrocephalus Blkr.
Atl. Silur. tab. XXXIV fig. 2.
Large-headed Hemipimelodus

A Hemipimelodus with an elongate body, anterior part a little broader than deep, posterior part compressed, body depth contained 5½ to 5⅗ times in its length without, and 6½ to 7 times in its length with caudal fin. Head acute, contained 3⅗ to 3¼ times in length of body without, and a little more than 4 times in length of body with caudal fin; depth of head contained nearly 2 to 2 times in its length, width about 1½ times; eyes covered with head skin, superior, facing sideways, placed partly in the third anterior part of the head, eye diameter contained about 8 times in length of head, distance between the eyes 2 to 2½ times their diameter; rostro-dorsal profile convex at the snout and nape, sloping downwards and more or less straight at the forehead and crown. Head shield nearly entirely divided by a longitudinal groove (median fontanel) nearly reaching the base of the supraoccipital crest. Posterior part of each side has a nearly triangular fontanel, not or hardly larger than the eye. The

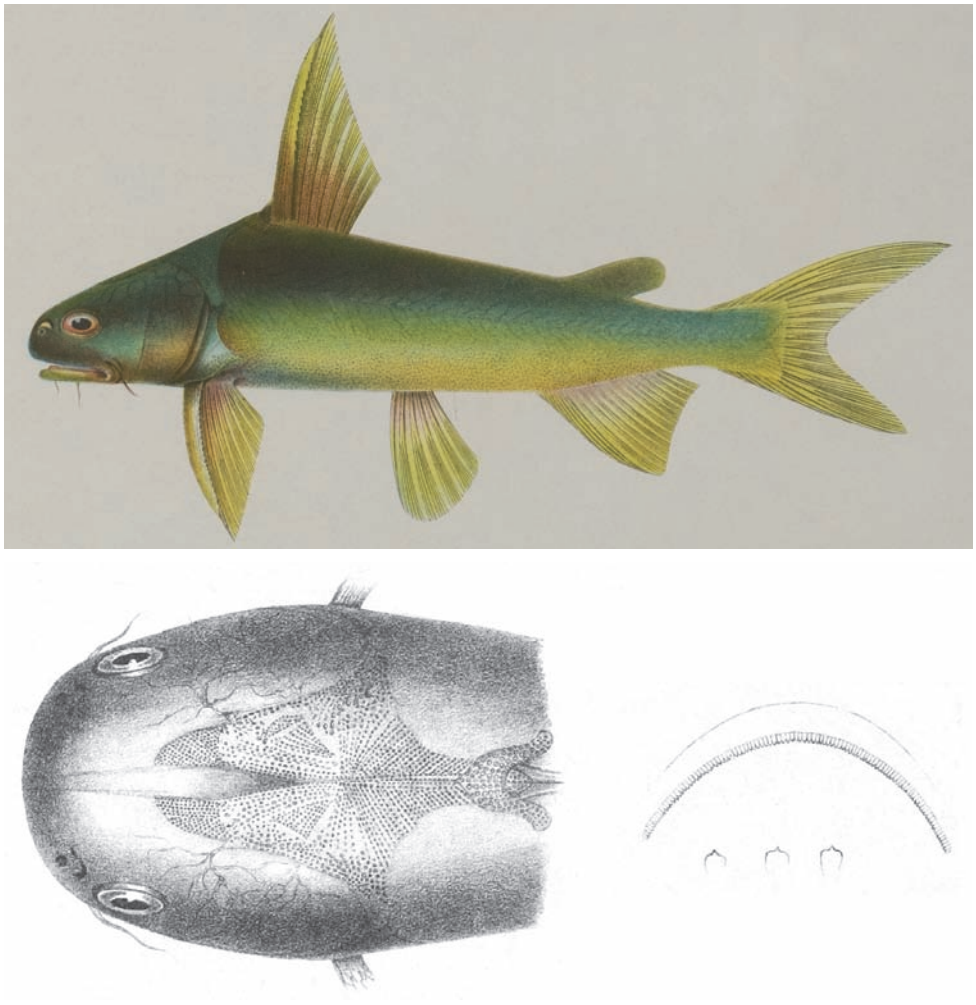

Fig. 56. *Hemipimelodus macrocephalus* Blkr.

head shield is rough-grainy, with small, numerous granules, upwards from the eyes; supraoccipital crest triangular, a little longer 240 than it is broad at the base, twice or more than twice as long as broad in the middle, with a ridge, its surface rough-grainy with small granules arrranged in rays, the top truncate, emarginate, reaching the short, triangular, grainy-rough second interspinal bone; snout convex, twice or a little more than twice as long as the eye, protruding a little beyond the mouth, rostral profile obtusely rounded; nostrils nearly touching, closer to tip of the snout than to the eye; anterior ones round, the posterior ones oblong and can be closed by an elevated small valve; lips fleshy; barbels thin, round, with membranaceous appendages; maxillary barbels, rigid at the base, reaching the gill covers; lower jaw barbels, the outer ones longer than the inner ones, not reaching the gill covers. Teeth well visible, the upper jaw teeth placed in a hardly curved band, with rounded angles, the lower jaw teeth placed in a band curved nearly in the form of a crescent, longer but thinner than the premaxillary band, with acute angles, its width contained about 3 times in length of head; gill cover glabrous, veined: humeral bone short, acute, smooth or slightly rough; lateral line branched, anterior part sloping downwards, posterior part straight and forked at the base of the caudal fin; axillary slime pores conspicuous; swim bladder cellular, with thick walls. Rayed dorsal fin acute, a little higher than body depth, twice or a little more than twice as high as base length, spine fairly robust, contained about 1½ times in length of head, only the anterior upper part rough, posterior side for the largest part serrated with small, conspicuous teeth. The spine has a flexible appendage that not or hardly overreaches the first ray; adipose fin placed at a distance of about twice its length from the rayed dorsal and hardly longer than this fin, twice or more than twice as long as high, obliquely convex; pectoral fins acute, contained 1⅓ to 1¼ times in length of head, spine fairly thick, no or a little longer than the dorsal spine, striped at the flanks, anterior side towards the base granulated, towards the top feebly serrated, posterior side armed with many conspicuous teeth; ventral fins slightly obtuse, rounded, about twice as short as the head; anal fin acute or slightly obtuse, slightly emarginate, less high than long, longer than the adipose fin; caudal fin with a deep incision and acute lobes, the upper lobe generally longer than the lower one, contained 5 to 5¾ times in the length of the entire body. Colour of upper part of the body olive-green, lower part pearly or silvery. Adipose fin slightly olive-coloured, other fins yellowish, more or less with dark speckles. Crown has a saffron-yellow spot in the median groove.

B. 5. D. 1/7. P. 1/10. V. 1/5. A. 6/13 to 7/14. C. 1/13/1 and shorter ones alongside.

Hat. Borneo (Bandjermasin), in rivers.

Length of the 3 specimens 125‴ to 140‴.

Remark. It becomes more and more clear that the length proportions of the head in several genera of Siluroïds, applied with judgement and certain restrictions, yield a very good character for the determination of the species. I have already demonstrated this above for the genera Osteogeneiosus, Cephalocassis, Arius, Ariodes, Bagrus.

Hemipimelodus macrocephalus gives a new example thereof. The species in question is so closely related to Hemipimelodus borneënsis, that I have preserved it for a long time in the same jar as my specimens of the last species, and only after I 241 had examined all these specimens again, it appeared that three of them, the ones described above, belonged to a different species. Indeed, however large the relationship between these two species may be, so that even the descriptions are largely the same, the species in question distinguishes itself distinctly from Hemipimelodus borneënsis by a remarkably longer, less convex head, while moreover the dorsal and pectoral fin spines and the pelvic fins are remarkably shorter in proportion to the head. The upper jaw barbels also seem constantly shorter. The differences in the proportions of the head are very apparent when specimens of a similar size are compared. Thus one also perceives that in Hemipimelodus macrocephalus the snout is longer and that the eyes in Hemipimelodus borneënsis are directed more upwards than sideways.

KETENGUS Blkr, Verh. Bat. Gen. XXI, I Nieuwe Bijdr. Silur. p. 9.
Nieuwe Bijdr. Ichthyol. Borneo, Nat. Tijdschr. Ned. Ind. I p. 265.
KETENG

Two dorsal fins, the anterior rayed, the posterior adipose. Jaw teeth conical-compressed or nearly wedge-shaped, placed in a simple row. No vomerine or palatine teeth. Six barbels, on upper- and lower jaw. Eyes free, placed above the mouth corner. Branchiostegal membrane with 5 rays. Interbranchial membrane not or hardly emarginate. Nostrils not tubular. Swim bladder present.

Remark. I discovered this genus in the year 1856, during a journey across Java, in the Strait of Madura, and described it in the above cited contribution concerning the Siluroïds of Java. In the only specimen I had available, I observed only 4 barbels, as at that time I did not notice the very short and thin inner lower jaw barbels, a mistake, which I after having received several specimens, have corrected in the second contribution referred to above.

Ketengus is one of the most natural genera one 242 can imagine, and in physiognomy is so different from all remaining Siluroïds, that one can recognize it at first glance. This physiognomy is mainly caused by the blunt, high and plump snout, the very fleshy lips, the very much backwards extended mouth slit and the eyes which are placed above the mouth slit entirely before the mouth corner. This habitus resembles most that of the genus Batrachocephalus Blkr, where the mouth is also deeply split and the eye is also placed above the mouth corner, however Batrachocephalus does not have the blunt, rounded and high snout, misses the thick lips and moreover can be recognised by the protruded lower jaw rather far extending before the upper jaw, not to mention its entirely different dentition.

Ketengus typus Blkr.
Verh. Bat. Gen. XXI, I, Nieuwe Bijdr. Silur. p. 9, Nieuwe Bijdr. Ichth. Borneo,
Nat. Tijdschr. Ned. Ind. I p. 271, Atl. Silur. tab. XXXIV fig. 1.
Common Keteng

A Ketengus with an elongate body, anterior part broader than deep, posterior part compressed, body depth contained 5 to 4½ times in its length without, and 6⅓ to 5⅗ times in its length with caudal fin. Head depressed, obtuse, contained 4⅓ to 4½ times in length of body without, and 5½ to 5¾ times in length of body with caudal fin; depth of head contained 1¼ to 1⅓ times in its length, width once to a little more than once; eyes placed above the angle of the mouth, free, facing sideways, eye diameter contained 3 to 4¾ times in length of head, distance between the eyes 1¾ to 2¼ times their diameter; rostro-dorsal profile very convex at the snout, sloping downwards and more or less straight at the forehead and crown; head shield entirely grainy upwards from the eyes, with many small, dense granules, with a median, longitudinal groove ending a little before the base of the supraoccipital crest; supraoccipital crest triangular, no longer than it is broad at the base, much longer than broad in the middle, grainy with small, very dense granules in the form of rays, the top obtuse, emarginate, reaching the second interspinal bone, which is shorter than the eye and grainy; snout very convex, slightly truncate, in younger fishes shorter than the eye, in older fishes not shorter than the eye, protruding beyond the mouth, rostral profile very obtusely rounded; nostrils fairly close to the eye, nearly touching; anterior ones rounded, the posterior ones are oblong and can be closed by an elevated small valve that surrounds the opening at the front; lips most fleshy; barbels short, thin; maxillary barbels hardly

reaching the gill cover; outer lower jaw barbels longer than the inner lower jaw barbels, a little shorter or hardly longer than the eye; each jaw with 50 to 100 teeth, conical-slightly compressed, at the top obtuse or nearly tricuspid; mouth ending under the posterior edge of the eye or a little behind the eye, crescent-shaped, its width contained 1⅕ to 1⅓ times in length of head; gill cover veined or slightly rough-veined: humeral bone medium-sized, acute, rough or rough-grainy; axillary slime pore well visible; lateral line branched, anterior part sloping downwards, posterior part more or less straight, forked at the base of the caudal fin. Rayed dorsal fin acute, 243 a little higher than body depth, twice or more than twice as high as base length, spine thick, generally longer than the head, the flanks and the lower anterior side grainy, the upper anterior side feebly serrated, posterior side armed with many conspicuous teeth. The spine has a soft appendage that does not overreach the first ray, or overreaches it a little; adipose fin placed at a distance of twice to 3 times its length from the rayed dorsal fin and not or a little shorter than it, less than twice as long as high, obliquely rounded; pectoral fins acute, not or hardly longer than the head, spine thick, generally a little shorter than the dorsal spine, rough-grainy laterally, anterior side towards the base grainy, towards the top feebly serrated, posterior side armed with small, conspicuous teeth; ventral fins acute or obtuse, angular or rounded, contained 1⅖ to 1⅙ times in length of head; anal fin acute, emarginate, a little longer than high, twice or less than twice as short as the adipose fin; caudal fin with a deep incision and acute lobes, the upper lobe longer than the lower lobe, contained 4¼ to nearly 5 times in the length of the entire body. Colour of upper part of the body olive-green or bluish-olive, lower part pearly or silvery. Adipose fin golden-olive, other fins yellowish, more or less with dark speckles. Iris yellowish. The fontanel on the anterior part of the head shield has an extended, saffron-yellow spot in younger and older fishes.

B. 5. D. 1/7. P. 1/8 or 1/7. V. 1/5. A. 7/13 or 8/13. C. 1/13/1 and shorter ones alongside.

Syn. *Pimelodus pectinidens* Cant. Catal. Mal. Fisch. p. 26l.
Keteng Madur.

Fig. 57. *Ketengus typus* Blkr.

Hab. Java (Surabaja), in rivers and sea water.
Madura (Kammal, Bangcallang), in the strait of Madura.
Borneo (Bandjermasin), in rivers.
Length of the 16 specimens 80‴ to 240‴.

Remark. This species, which was already made known by me in 1846, was redescribed in more detail in 1849 under the name Pimelodus pectinidens by Mr Cantor, who observed it in Pinang where it lives in fresh water. Mr Cantor in his only specimen with a length of 4¼ inches observed only 4 branchiostegal rays, however the species very certainly has five, a number I have found constantly in numerous specimens. The yellow fontanel spot that is also mentioned by Mr Cantor, in all my specimens is more or less clearly visible, even in my largest specimen, which is about twice as large as the one described by Cantor.

In the river of Bandjermassin, in south east Borneo, Ketengus typus seems to occur rather frequently. From Java this species has only become known to me from the mouth of the Kalimas near Soerabaja and from the brackish waters of the Strait of Madura.

244 *Rhamdia ? javanica* Blkr.
Javanese Rhamdia

A Rhamdia with 6 barbels, rayed dorsal fin and adipose fin nearly touching each other. Maxillary barbels amounting to ⅗ times length of body, outer lower jaw barbels twice as long as the inner lower jaw barbels, reaching the top of the pectoral fin. Caudal fin bilobed, the lower lobe longer than the upper lobe. Small pectoral and ventral fins, no spine (or bony ray). Head shield less continuous, more rounded (than in the preceding species: Pimelodus ctenodus Agass., Pimelodus quadrimaculatus CV. etc.), entirely smooth. Colour of the entire fish dark.

D. 7. A. 13. C. 17, etc.
Syn. *Pimelodus javus* K.v.H. CV. Poiss. XV p. 139.
Pimélode javanais CV. ibid.
Hab. Java.
Length of the described specimen 4½ Parisian inches.

Remark. In my collection I possess no species on which the above given description, translated from the large Histoire naturelle des Poissons, fits. The only six barbelled genera of Pimelodonts that I know from nature from the Indian archipelago, are Ketengus and Hemipimelodus. According to the description of Pimelodus javus K.v.H. by Mr Valenciennes this species can on no account belong to one of these genera, however the data mentioned therein are not sufficient to arrange the species among any of the numerous remaining six barbelled genera. In view of the spineless fins, the bilobed caudal fin and the long adipose fin I am inclined to bring it under my genus Rhamdia, notwithstanding the fact that the other species of this genus, with the exception of Pimelodus Deppei Müll. Trosch. are all American. For this reason they are mentioned above under this generic name, however only preliminary.

245 Phalanx III
Anodontes

No teeth in the jaws and on the palate.

The anodont Bagrichthyoidei differ from the Ariodonts and Pimelodonts by the absence of teeth on the palate and on the jaws. In the genus Conorhynchos of the Pimelodonts the teeth of the upper jaw were already lacking, but the lower jaw still was set with one band with many rowed small teeth. In the genus Hypophthalmus Val. however, all traces, also of jaw teeth stop. It is the only genus that can be brought to this group and contains only a few species. It connects the Bagrichthyoïds with the Siluri-chthyoïds because of the related build of the body and for this reason as well as because of the very long adipose fin it also has a relationship with the Pangasines and Euanemines. Apart from the mentioned characters it can be recognised by its six barbels, posterior or even inferior placed eyes, numerous branchiostegal rays, little developed toothless fin spines and pelvic fins, and a first dorsal fin, which is placed above the anal fin.

The Old world does not have representatives of this group and the few known species of it all belong to the fresh waters of South America. i. e.

Hypophthalmus	marginatus CV.	Hab.	Surinam, Guyana.
"	longifilis CV.	"	Surinam.
"	edentatus Spix = Hypophthalmus Spixii CV.	"	Brasil.

246 *Appendix*

When the foregoing pages were in press I received another new Bagrichthyoïd from Palembang, which I have named in honour of its discoverer.

Cephalocassis Stormii Blkr.
Atl. Silur. tab. LII.
Storm's shieldhead fish or *Doekang*

A Cephalocassis with an elongate body, anterior part not or a little broader than deep, posterior part compressed, body depth contained about 4¾ to 4½ times in its length without, and nearly 6 to 5⅔ times in its length with caudal fin. Head depressed, acute, contained about 3½ to 3⅗ times in length of body without, and about 4⅓ to 4½ times in length of body with caudal fin; depth of head contained 1⅗ to 1½ times in its length, width about 1⅕ to 1¼ times; eyes free, facing hardly more sideways than upwards, placed entirely in the anterior half of the head, eye diameter contained nearly 9 to 9½ times in length of head, distance between the eyes 3⅔ to 4⅓ times their diameter. Head shield for the largest part divided by a longitudinal groove (median fontanel) ending fairly far before the base of the supraoccipital crest, its posterior part narrowed. No lateral fontanels. The shield is only grainy behind the eyes, with many small, dense granules, placed ray-like; supraoccipital crest only a little longer than it is broad at the base, more than twice as long as broad in the middle, entirely rough-grainy with dense granules, triangular, towards the base on each side more or less emarginate, the top obtuse and slightly truncate, reaching the very short, grainy second interspinal bone; snout depressed, not convex, very fleshy, 3 times or more than 3 times as long as the eye, protruding far beyond the mouth, rostral profile obtuse, with a rounded angle. Jaw teeth multiple-rowed, conical, acute, medium-sized, the upper jaw teeth placed in a slightly curved band, the lower jaw teeth in a crescent-shaped band; vomerine-palatine teeth conical, acute, medium-sized, placed in two oblong groups, posterior part broader than anterior part, feebly curved, obliquely set in anterior part of the palate, at a great distance from each other, diverging especially backwards; mouth inferior, its width contained nearly twice in length of head; maxillary barbels reaching the gill covers; lower jaw barbels inserted in the same transverse line a little after the mouth, the outer ones a little longer than the inner ones, hardly reaching the gill opening or overreaching it a little; anterior and posterior nostrils nearly touching each other, nearer to the eye than to tip of the snout, anterior ones round, surrounded by a tumid edge, the posterior ones are nearly oblong and can be closed by a small broad valve that surrounds the entire opening and is elevated anteriorly; gill cover and humeral bone veined and smooth, humeral bone acute; axillary slime pore conspicuous; lateral line much branched, with elongate branches that are partly bifurcate or branching, anterior part sloping downwards, posterior part straight, not forked at the base of the caudal fin but curved upwards. Rayed dorsal fin acute, higher than body depth, about twice as high as base length, spine very thick, a little or hardly shorter than the head, striped laterally, anterior side granulated, posterior side in its entire length serrated with medium-sized teeth that are inclined upwards; adipose dorsal fin almost equal to the spiny dorsal and anal fins in length, placed at a distance of less than twice its length from the rayed dorsal, less than three times as long as high, the upper edge oblique, convex; pectoral fins acute, contained 1⅔ to 1¼ times in length of head, 247 spine very thick, shorter than the dorsal spine, striped laterally, anterior side grainy, posterior side in its entire length serrated with strong teeth; ventral fins obtuse and rounded, a little to fairly much shorter than the pectoral fins; anal fin about as high as long, slightly emarginate, top rounded; caudal fin with a deep incision and acute lobes, the upper lobe longer than the lower lobe, contained 5¼ to 5 times in the length of the entire body. Colour of upper part of the body slightly olive, lower part pearly, flanks yellowish, iris yellow-brown with a golden pupillary edge, fins yellowish, pectoral fins in the middle violetish-dark, adipose fin without spots.

B. 6. D. I/7. P. 1/11. V. 1/5. A. 6/10 or 5/11 or 6/11. C. 1/13/1 and shorter ones alongside.

Syn. *Dukang* Palemb.

Hab. Sumatra (Palembang), in river Mussi.

Length of the 2 specimens 415‴ and 520‴.

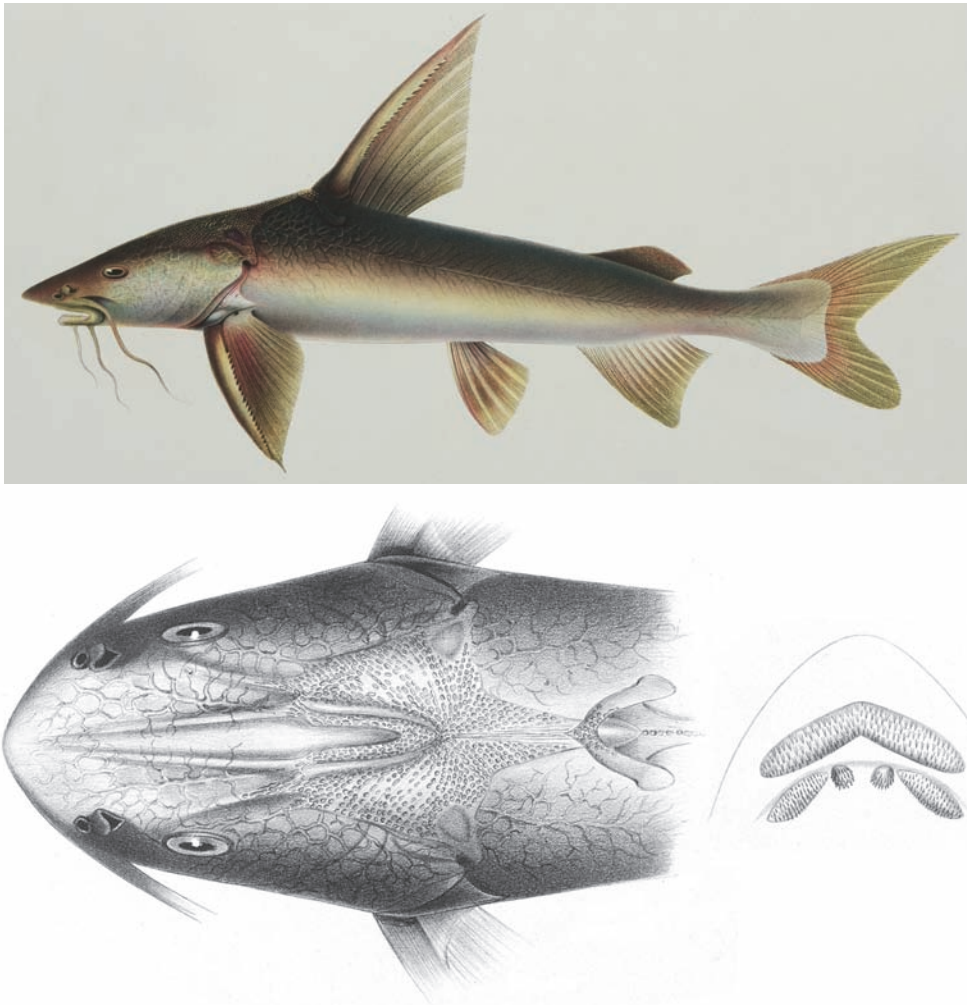

Fig. 58. *Cephalocassis Stormii* Blkr [In Atlas as *Hemiarius Stormii* Blkr. Drawing of vomero-palatine teeth adapted to changed description in Atlas. Head and dentition 75% of original size.]

Remark. The Doekang is the eighth species of the genus Cephalocassis, which has become known to me from the Sunda archipelago. In relationship it stands between Cephalocassis melanochir Blkr and Cephalocassis macronotacanthus Blkr, but approaches the first mentioned species most. Like Cephalocassis melanochir it has a relatively large adipose fin, the dorsal fin spine teeth are directed upwards, and the lateral line at the basis of the caudal fin is not bifurcated but only turned upwards and a similar massive build of the fin spines. However, it differs remarkably from its Palembangian congenerics by the absence of lateral head fontanels, by the larger development of the head shield and of the supraoccipital crest process (which makes the species distinguishable from all other known species), the shark-like mouth or the angularly anterior to the mouth slit elongated snout, etc.

I owe my specimens to Mr Storm van 's Gravensande, Gouvernment commissioner of Djambi, who presented it to me together with some other fishes from the river of Palembang, accompanied by a note from Mr E.A. Lange, directing officer 2nd class, which makes clear that the Doekoeng, just like various other Bagrichthyoïds, belong to those fishes, which on Sumatra and Borneo are responsible for the sounds, which some travellers in the large rivers of those islands have heard and compared to the tones of an Aeolian harp.

248 *Subfamily IV*
Ailichthyoidei

A simple dorsal fin, adipose. Body naked.

Remark. Both remarkable fishes, which belong to this subfamily, differ from the remaining Siluroïds by the absence of a rayed dorsal fin and the simultaneous presence of an adipose fin.

One of those fishes is peculiar to South Asia and is represented by Ailia coila Blkr (Ailia bengalensis Gr.). The other fish lives in Africa and has become famous under the name Silurus or Malapteru[ru]s electricus. Other species of the genera Ailia and Malapteru[ru]s are not known till now.

Malapterurus links up more with the Pimelodini, whereas Ailia forms the link between the Schilbeïnes and the Pangasines. Apart from numerous other differences in build, both genera can be characterised as follows in a few words.

Aila Gray. 8 barbels. Vomerine teeth present. Anal fin about twice as short as the body. Eyes free.

Malepterurus Lac. 6 barbels. No vomerine teeth. Anal fin more than 6 times as short as the body.

As none of both genera are represented in the Indian archipelago I will here not go into further details.

249 *Subfamily V*
Silurichthyoidei

A simple, rayed dorsal fin or no dorsal fin. Body naked.

Remark. The Silurichthyoïds form a large subfamily of the Siluroïds, not less rich in important forms and differences in organisation than the other large subfamily of the Bagrichthyoïds, although in number of species it yields much to the Bagrichthyoïds.

It contains all those genera, in which the back is provided with only one rayed fin or is even entirely finless and the opercle is movable. The adipse fin is constantly lacking.

The Old and the New world feed numerous species of Silurichthyoïds, however the Old world species belong to totally different species than those of the New world.
America nourishes the genera Cetopsis, Trachelyopterus, Brontes, Astroblepus, Schilbeodes (based on Silurus gyrinus Mitch.), Nematogenys, Trichomycterus, Eremophilus, Pareiodon and Vandellia.

The Old world on the contrary possesses the genera Schilbe, Schilbeichthys, Wallago, Belodontichthys, Silurus, Silurichthys, Silurodes, Pseudosilurus, Siluranodon, Kryptopterus, Kryptopterichthys, Micronema, Phalacronotus and Hemisilurus, genera, explained below and largely erected on the basis of recently discovered species.

It is difficult to split the Silurichthyoïds in natural groups, or in other words, it is difficult to deliminate those natural groups. There is no family of fishes, in which important characters cross over so much as in the Siluroïds and although this is most apparent in the subfamily of the Bagrichthyoïds, the subfamily in question shows no less vivid examples.

When one wants to use any character for the division into natural groups, one soon perceives, that it in no way has the absolute value that one originally would like to attach to it and one is forced to look for another character, 250 which however soon will also prove not to possess that absolute value. However, this is more applicable to the American species than to those of the Old world. The latter belong to a large natural group, which one can label after the most developed among them with the name Schilbeïnes, however, here a sharp delimitation is diffucult as well, and can be found only in characters, which as a rule have no high value such as the length of the anal fin combined with a wide gill slit, the absence of axil slime openings and a skin covered crown.

The American genera differ much more from each other and belong to at least three natural groups. I propose to name these Cetopsini, Trachelyopterini and Trichomycterini.

The Cetopsini are characterised by the dorsal fin placed anteriorly on the back, teeth on both jaws and on the vomer, a small, narrow gill slit and axillary slime opening.

The Trachelyopterini are recognisable by their strongly developed head shield, long anal fin, the dorsal fin implanted anterior to the ventral fin, and the absence of vomerine teeth.

In the Trichomycterini the anal fin is very short, the head is covered with skin, and the swimbladder is lacking.

Of the Cetopsini till now only the genus Cetopsis with two species is known; of the Trachelyopterini only the genus Trachelyopterus, with a simple species. To the Trichomycterini I bring all the remaining American species and genera of Silurichthyoïds.

The Silurichthyoïds of the Old world are more numerous in species than those of the New world, that is for as much is known to science. As stated before they form my large group of the Schilbeini and comprise the genera Silurus and Schilbe of the large Histoire naturelle des Poissons.

The Schilbeïnes are much more numerous in species than was known only a few years ago. When 18 years ago the 14th volume of the large Histoire naturelle des Poissons was published, 19 species of Schilbeïnes were described therein, which were all placed into two genera Silurus and Schilbe.

251 As a result of the investigations of Mrs Cantor, Heckel, Richardson and Temminck & Schlegel, published since 1839 this number increased to 26 and these new species were all arranged under both genera accepted by Mr Valenciennes.

When I, in 1845, began my ichthyological studies, only two species of Schilbeïnes

from the Indian archipelago were known, i.e. Silurus bimaculatus CV. and Silurus bicirrhus CV. Through my investigations numerous other species of the Sunda islands have been discovered and nowadays I have knowledge of more species of these regions than Mr Valenciennes in 1839 summed up from the entire known earth. Of all those species, 23 in number, except for the two mentioned above, only Silurus wallago CV. was known to science, so that I was able to add in total 20 new species to science by which the total number of species has now increased to 48.

Originally and in the course of the discovery of those species, I brought them under the genus Silurus Val., - and when I began to realise that all those species could not be brought under one natural genus, I came to the drafting of the genus Wallago, which I created from those species in which the vomerine teeth are placed in two groups that are separate from each other.

However, species I received still later and especially a new study of the entire group have taught me that the approximately 50 now known species of Schilbeïnes do not belong to only two or three but to a considerable larger number of natural genera, genera which differ from each other in more or less important characters and depart more from each other than is the case in numerous genera of other families, which are considered natural by the principal ichthyologists.

That splitting in genera is presented below.

The Schilbeïnes all have in common a long tail and an anal fin that is longer than the head and usually surpasses it more than two to five times in length and 252 stretches itself from near the pelvic fins to near or against the caudal fin. In all species the tail is narrowed keel-shaped ventrally. The dorsal fin, if present, always occupies only a small part of the back and is always much higher than broad or long. The head shield in all species is covered with skin and usually for a larger or smaller part even with the neck muscles. In all species the gill slit is wide, the branchial membrane many rayed, the branchiostegal membrane incised deeply upwards from the base and the nasal openings are double with the anterior ones placed near the free mouth edge.

The Silurichtyoïds are connected to the Bagrichthyoïds, on the one hand because of the genera Brontes and Astroblepus, which one might place after the series of the Pimelodonts, and on the other hand by the genus Schilbeichthys, which is closely related to the genus Eutropius of the Pangasines. The genus Schilbeichthys among the Schilbeïnes with regard to the completeness of organisation, is placed on top, not only because of its complex dentition, its eight well developed barbels and less developed anal fin, but also because of its more developed head shield and dorsal fin and free eyes.

From Schilbeichthys onwards the dorsal fin, the barbels and the dentition decrease in development. In the genera Micronema, Phalacronotus and Hemisilurus the dorsal fin is totally lost, and one perceives only a subcutaneous knob at the place one would expect the dorsal fin. In the genus Phalacronotus the barbels are reduced to only two hair-thin upper jaw barbels and teeth in the jaws and on the palate cease to exsist in the African genus Siluranodon, represented by Silurus auritus Géoffr.

In the nature of the dorsal fin, the number of barbels and the specialities of the dentition the characters for the grouping of the genera of the Schilbeïnes are found.

If one considers them with regard to the nature of the dorsal fin one perceives four groups.

In the first type one finds that fin still composed of a serrated spine and a number of normal isolated rays, which are connected by a membrane.

253 To this group belong the genera *Schilbe* and *Schilbeichthys*.

In the second type the dorsal fin still constists of a number of normal rays separated by a membrane, but the spine is lacking and is reduced to an undivided and unserrated less flexible ray.

To this type belong the genera *Wallago*, *Belodonthichthys*, *Silurus*, *Silurodes*, *Pseudosilurus*, *Silurichthys* and *Siluranodon*.

In the third type the dorsal fin is only rudimentarily present and represented by a simple hairlike ray, with which usually 2 or 3 rudimentary hardly visible rays are closely connected, without a separating membrane.

My genera *Kryptopterus* and *Kryptopterichthys* can be brought to this type.

Finally, in my fourth type, not even a trace of a dorsal fin is present, unless one would like to consider as such a small subcutaneous knob, which, although not in all species, one can feel at the place where one would expect the dorsal fin.

This type is represented by the genera *Micronema*, *Phalacronotus* and *Hemisilurus*.

The dentition of the Schilbeïnes offers numerous differences as well.

Only in one of the genera the teeth are said to be entirely lacking, i.e. in the African genus Siluranodon, which I base on Silurus auritus Géoffr.

In the remaining genera the jaws as well as the palate are provided with teeth, but in the arrangement of those teeth one perceives various specialities, which, combined with other characters are very useful for the determination of the genera themselves.

Usually in the palate only vomerine teeth are present, which then are placed in one simple band or in two groups. Only in one of the genera, Schilbeichthys, besides the two band shaped groups of vomerine teeth, two separate groups of palatine teeth are present, which are placed on the lateral side of the vomerine groups.

254 The genera in which only vomerine teeth divided into two groups or bands are present, are Wallago, Belodontichthys, Pseudosilurus and Hemisilurus, but they have specialties in their dentition, which as a reflection of other important characters indicates their generic differences. In the genera Wallago and Belodontichthys the vomerine groups are elongated and converging forward in an acute angle. However, in Wallago the teeth in the jaws are placed in numerous rows and purely brush- or bodkin-shaped, whereas the jaw teeth in Belodontichthys are placed only in three separate rows and are lance-shaped at the tip. In Pseudosilurus on the contrary, the vomerine teeth are placed in two separate slender bands that are arranged in a simple transverse line, which also seems to be the case in Silurus, whereas the same teeth in Hemislurus form two separate round or oval groups.

In all remaing groups, Schilbe, Silurus, Silurodes, Silurichthys, Kryptopterus, Kryptopterichthys, Micronema and Phalocronotus, the vomerine teeth are placed in a simple undivided transverse band, but that band is now long and much bent, then long and almost straight, and sometimes even very short. The genera in this series can only be determined with more certainty by including under the characters those which are based on the nature or presence of the dorsal fin, on the number of barbels and the relation of the anal to the caudal fin.

If one divides the Schilbeïnes on the basis of the number of barbels, which range from 8 till 2, than to the 8-barbelled genera belong Schilbe, Schilbeïchthys and Siluranodon; to the 6-barbelled only Silurus; to the 4-barbelled Wallago, Belodontichthys,

Pseudosilurus, Silurichthys, Silurodes, Kryptopterus and Micronema; and to the 2-barbelled Kryptopterichthys, Phalacronotus and Hemisilurus.

The division of the Schilbeïnes based on the nature of the dorsal fin seems to me to agree most with the natural relationships of the genera, reason why I have taken that for the basis of the following diagnostic review.

255 I. Dorsal fin membrane- and spine-bearing. 8 barbels.
Schilbe Valenc. in part. Vomerine-palatine teeth placed in a transverse, undivided band.
Schilbeichthys Blkr. Vomerine-palatine teeth placed in 4 groups.

II. Dorsal fin membrane-bearing and spineless.
Wallago Blkr. Jaw teeth multiple-rowed and setaceous. Eyes not covered with skin. 4 barbels.
Belodontichthys Blkr. Jaw teeth placed in three rows, lanceolated. Eyes covered with skin. 4 barbels.
Silurus L. CV. in part. 6 barbels. Vomero-palatine teeth placed in an undivided band. Anal and caudal fins confluent.
Silurichthys Blkr. Vomerine-palatine teeth placed in an undivided band. 4 barbels. Anal and caudal fins confluent. Eyes placed above the mouth corner.
Silurodes Blkr. Vomerine-palatine teeth placed in an undivided band. 4 barbels. Anal and caudal fins not joined. Eyes placed behind the mouth corner.
Pseudosilurus Blkr. Vomerine-palatine teeth placed in 2 separate groups. 4 barbels. Eyes covered with skin. Jaw teeth multiple-rowed, setaceous.
Siluranodon Blkr. No teeth. 8 barbels.

III. Rudimentary dorsal fin formed by a simple or composite filament. Vomero-palatine teeth band undivided.
Kryptopterus Blkr. 4 barbels.
Kryptopterichthys Blkr. 2 barbels.

IV. No dorsal fin.
Micronema Blkr. Vomero-palatine teeth band undivided. 4 barbels.
Phalacronotus Blkr. Vomero-palatine teeth band undivided. 2 barbels.
Hemisilurus Blkr. Vomerine teeth placed in 2 separate groups. 2 barbels.

The existing descriptions of the Schilbeïnes in general do not possess the precision or completeness of detail that would allow one to place all species with certainy in the genera erected above. When I have tried to do so here below, it can only be considered as a test, which one shall be able to improve accordingly as the knowledge of the species becomes more detailed.

According to the present state of science the entire group contains, as far as I have been able to determine, the following species.

256 *Schilbeini.*

Schilbe	mystus CV = Silurus mystus L = Schilbe auratus De Joann.	Hab.	Nile.
"	Isidori CV.	"	Nile.
"	intermedius Rüp. = Silurus mystus Hasselq. = Schilbe Hasselquistii CV.	"	Nile.

	"	senegalus CV.	"	Senegal.
	"	uranoscopus Rüpp.	"	Nile.
Siluranodon		auritus Blkr = Silurus auritus Geoffr.	"	Nile.
Silurus		glanis L.	"	Eur. West Asia.
Schilbeichthys		garua Blkr = Silurus garua Buch. = Clupisomu argentata Swns. = Schilbe garua CV. Blkr ol.	"	Bengal.
Wallago		Russellii Blkr = Silurus wallago CV. etc.	"	Hind. Beng., Bism. Java.
	"	Leerii Blkr	"	Sumatr. Borneo.
	"	? dauricus Blkr = Silurus dauricus Pall.	"	Dauria.
	"	? asotus Blkr = Silurus asotus L. ?	"	Bengal.
	"	triostegus Blkr = Silurus triostegus Heck.	"	Syria.
Belodontichthys		macrochir Blkr = Wallago dinema Blkr ol.	"	Sumatra. Borneo.
Silurichthys		phaiosoma Blkr = Silurus phaiosoma Blkr	"	Born. Banka. Biliton.
	"	Hasseltii Blkr.	"	Java.
	"	? Basilewskii Blkr = Silurus asotus Basilewski (nec CV.).	"	China borealis
	"	japonicus Blkr = Silurus japonicus T. Schl.	"	Japan.
Silurodes		hypophthalmus Blkr = Silurus hypopthalmus Blkr.	"	Java, Sumatra.
	"	macronema Blkr = Silurus macronema Blkr.	"	Borneo.
	"	pabo Blkr = Silurus pabo Blkr = Schilbe pabo Syk.	"	Hind, Assam.
	"	lamghur Blkr = Silurus lamghur Heck.	"	Cashmir.
Pseudosilurus		bimaculatus Blkr = Silurus bimaculatus CV.	"	Java, Hind.
	"	leiacanthus Blkr = WalIago leiacanthns Blkr.	"	Banka, Sumatra.
	"	anastomus Blkr = Silurus anastomus CV = Wallago anostomus Blkr.	"	Bengal.
	"	microcephalus Blkr = Silurus microcephalus CV. = Wallago microcephalus Blkr.	"	Bengal.
	"	canio Blkr = Silurus canio Buch = Silurus mysoricus CV. = Silurus indicus McCl. etc	"	Hind. Afganistan, China.
	"	pabda Blkr = Silurus pabda Buch.	"	Bengal.
	"	punctatus Blkr = Silurus punctatus Cant.	"	China.
	"	sinensis Blkr = Silurus sinensis Lac.	"	China.
257	"	malabarieus Blkr = Silurus malabarieus CV.	"	Hindost.
	"	cochinchinensis Blkr = Silurus cochinchiensis CV.	"	Cochin-China.
	"	xanthosteus Blkr = Silurus xanthosteus Richds.	"	China.
Kryptopterus		mononema Blkr = Silurus mononema Blkr.	"	Java.
	"	limpok Blkr = Silurus limpok Blkr.	"	Sumatr., Born.
	"	micropus Blkr = Silurus cryptopterus Blkr.	"	Sumatr., Born.
Kryptopterichthys		bicirrhis Blkr = Silurus bicirrhis CV.	"	Java, Sum., Born.
	"	palembangensis Blkr = Silurus palembangensis Blkr.	"	Sumatra.
	"	laïs Blkr = Silurus laïs Blkr.	"	Borneo.
	"	macrocephalus Blkr.	"	Sumatra.
Micronema		typus Blkr = Silurus micronemus Blkr.	"	Java, Sumatra.
	"	hexapterus Blkr = Silurus hexapterus Blkr.	"	Sumatra, Born.
Phalacronotus		micruropterus Blkr = Silurus phalacronotus Blkr.	"	Sumatra, Born.
	"	leptonema Blkr = Silurus leptonema Blkr.	"	Sumatra.
	"	micropogon Blkr = Silurus apogon Blkr = Silurus micropogon Blkr.	"	Sumatra, Born.
	"	siluroides Blkr = Ompok siluroides Lac.	"	Sunda Isl.
Hemisilurus		heterorhynchos Blkr = Wallago heterorhynchos Blkr.	"	Sumatra.
	"	schilbeides Blkr.	"	Sumatra, Born.

Concerning the American groups of Silurichthyoïds, its genera can be characterised briefly in the following way.

Cetopsini

Cetopsis Ag. 6 barbels. Vomerine and lower jaw teeth placed in a simple row, premaxillary teeth placed in a simple row or in many rows. Gill opening narrow and inferior. No dorsal or pectoral spines.

Trachelyopterini

Trachelyopterini CV. 6 barbels. Jaw teeth only, multiple-rowed. Anal fin longer than the head. Gill opening narrow and superior. Dorsal and pectoral spines. Swim bladder present.

Trichomycterini

Brontes CV. Dorsal fin beginning before the ventral fins. 2 maxillary barbels. Jaw teeth all or partly bifurcated. B. 4.

Astroblepus CV. Dorsal fin much nearer to the head than to the 258 caudal fin. No ventral fins. 2 barbels, maxillary. B. 4. Teeth? (short Val.)

Nematogenys Gir. Dorsal fin partly placed opposite to the ventral fins. 6 barbels: nasal, maxillary and on lower jaw. Gill covers spineless. Jaw teeth setaceous, multiple-rowed.

Schilbeodes Blkr. Dorsal fin nearer to the caudal fin than to the head. Anal fin confluent with the caudal fin. 8 barbels.

Trichomycterus CV. Dorsal fin inserted behind the ventral fins. 8 barbels. B. 7 or 8. Gill cover and interopercle with a spine. Jaw teeth multiple-rowed.

Pareiodon Kner. Dorsal fin inserted behind the ventral fins. 4 barbels: on each side 2 maxillary (labial). Jaw teeth incisor-like, placed in a single row. Gill cover and interopercle with spines. (Swim bladder ??)

Eremophilus CV. Dorsal fin partly placed opposite to the anal fin. No ventral fins. 6 barbels: nasal, maxillary and on the lower jaw. Jaw teeth multiple-rowed. Gill cover and interopercle with spines. B. 8.

Vandellia CV. Dorsal fin partly placed opposite the anal fin, beginning behind the ventral fins. 2 maxillary barbels. No jaw teeth? Vomerine teeth elongate placed in a single row. Preopercle armed with spines at the corner.

The species of the American groups, which have been discovered till now, are restricted to the following.

Cetopsis	coecutiens Ag. = Silurus coecutiens Lichtenst.	Hab.	Brasil.
"	candira Ag = Siturus candiru Spix.	"	Brasil.
Trachelyopterus	coriaceus CV.	"	Guyana
Brontes	prenadilla CV.	"	Cotopaxi
Astroblepus	Grixalvii V. Humb.	"	Popoyan.
Nematogenys	inermis Gir. = Trichomycterus inermis Guich.	"	Chili.
Schi[l]beodes	gyrinus Blkr = Silurus gyrinus Mitch.(1).	"	North Am.

(1) Silurus gyrinus, in 1818 already briefly but insufficiently described by Mitchill, to me seems to belong to the Trichomycterini. It seems to have he dorsal fin much closer to the caudal fin than to the head and the anal fin ending very closely to the caudal. Moreover. it has 8 barbels, 7 dorsal fin- and 16 anal fin rays. Maybe it is an intermediate form between Trichomycterus and Nematogenys.

259 Trichomycterus punctulatus CV. = Trichomycterus punctatus CV. = Pygidium dispar Tschud.		"	Peru.
"	areolatus CV.	"	Chili.
"	maculatus CV.	"	Chili.
"	nigricans CV.	"	Brasil., Chili.
"	rivulatus CV.	"	Guasacona, Apurimac.
"	Incae CV.	"	Guatanai riv.
"	gracilis CV.	"	Andes.
"	barbatula CV.	"	Andes.
"	Macraei Gir.	"	Uspullata (Cordill. or.)
Pareiodon	microps Kner.	"	Borba?
Eremophilus	Mutisii Humb.	"	Bogota.
Vandellia	cirrhosa CV.	"	Para.

Most probably the streams of America nourish still numerous other forms, which belonging to the above meant groups, whose discovery remains dependant on new investigations.

The total number of Silurichthyoïds known at present according to the enumeration above amounts to 66, of which 47 occur in the Old world and only 19 in America.

Wallago Blkr.
Tjangop

A single dorsal fin, rayed, well developed, membrane-bearing. Anal and caudal fins confluent or not confluent. Four maxillary and lower jaw barbels. Jaw teeth acute, multiple-rowed, unequal, setaceous, mobile. Vomerine teeth acute, placed in two oblique separated groups. Branchiostegal membrane with 16 to 20 rays. Interbranchial membrane has a deep incision. Eyes free, not covered with head skin, superior. Anterior nostrils tubular. Lower jaw protruding beyond the upper jaw.

260 Remark. Among all genera of Schilbeïnes without a dorsal fin, Wallago preeminently is characterized by its free eyes that are not covered by the skin of the head. It has this character in common with Schilbeïchthys, where I have seen it in its only known species (Schilbeïchthys garua Blkr) and maybe also in Schilbe (which I am unable to check). However, it cannot be confused with any of these genera, both by the absence of the dorsal fin, the position of the eyes above the wide mouth slit and the absence [presence!] of only 4 barbels, and by the entirely different grouping of the vomerine teeth, which are arranged in two obliquely lengthwise separated groups, and the tube-like anterior nasal openings.

Wallago in relationship stands between Silurus Blkr and Belodontichthys Blkr.

Silurus, only represented by the already age-long known unique European species, has a habitus which differs from that of Wallago, the vomerine teeth are arranged in a different way, the caudal and anal fin are united and [it has] six barbels. I do not know whether the eyes are free or suffused with skin.

Belodontichthys to me seems to be still more closely related to Wallago, however it very sharply differs from it by its covered eyes, three rowed lancet- or arrow shaped

jaw teeth and by the position of the small vomerine tooth bands, which have approached each other very closely, on a simple transverse line.

I know with certainty only two species of Wallago, both of which are present in my cabinet. Probably Silurus asotus L. can be brought to it as a third species, and it would neither surprise me when Silurus triostegus Heck. and Silurus dauricus Pall. would turn out to belong to Wallago, which, however, I cannot determine because of the insufficiency of the descriptions regarding the nature of the eyes and of the dentition. Anyway Silurus dauricus and Silurus triostegus are species that differ from Wallago Russelii and Wallago Leerii because of their concave caudal fin and the anal fin confluent with this fin.

My two species can easily be separated from each other and from related species by the following characters.

261

I. Bilobed caudal fin, not confluent with the anal fin.
   a. Mouthcorner extended behind the eyes. Anterior jaw line slightly acute. Lower jaw barbels nearly reaching the angle of the mouth. A. 86 to 93.

Wallago Russellii Blkr.

   b. Mouth ending under the eye. Anterior jaw line very obtuse. Lower jaw barbels hardly visible, no longer than the eye. A. 67 to 73.

Wallago Leerii Blkr.

Wallago Russellii Blkr.

Verh. Bat. Gen. XXV Nalez. Ichth. Beng. p. 108. Atl. Silur. tab XXXVIII fig. 1.

Russell's Tjangop

A Wallago with an elongate, compressed body, body width contained 1⅓ to 1⅕ times in its depth, body depth contained 7 to 5 times in its length without, and 8 to 6 times in its length with caudal fin. Head depressed, compressed, acute, contained 4⅝ to 4¼ times in length of body without, and nearly 5 to 5½ times in length of body with caudal fin; depth of head contained 1¾ to 2 times in its length, its width about twice, depth of the head above the angle of the mouth contained a little more than twice to 2¼ times in its length; eyes placed entirely before the angle of the mouth, eye diameter contained 6½ to 10 times in length of head, distance between the eyes 3 to 5⅓ times their diameter; rostro-dorsal profile slightly concave at the head, at the nape sloping downwards, more or less straight or slightly convex. Head shield only covered with muscles at posterior part, traversed by a longitudinal groove reaching the thin, entirely subcutaneous supraoccipital crest; snout depressed, acute, rostral profile slightly acutely rounded; nostrils separate, the anterior ones close to the anterior edge of the snout, tubular; lower jaw protruding a little beyond the upper jaw. Teeth very conspicuous, multiple-rowed, feebly curved, the posterior jaw rows longer than the anterior rows, the teeth in each jaw placed in a V-shaped band, rounded at the top; vomerine teeth placed in 2 separate oblong-elongate longitudinal groups, diverging at the back; maxillary barbels supported by a bony rod that is longer than the eye, reaching anterior part of the anal fin, lower jaw barbels thin, inserted on the skin of the chin, below the middle of the mouth, hardly reaching or overreaching the angle of the mouth; mouth longer than it is broad, its length contained 1¾ to 1⅝ times in length of head; lips thin; lower part of the lower jaw has conspicuous pores placed in longitudinal series; gill cover striped in the form of rays; scapular bone short, obtuse, rounded; lateral line feebly curved anteriorly, then more or less straight, characterized by touching small tubes that form a short branch beneath; axillary slime pore not visible; dorsal fin thin, acute, the first ray longer than the other rays and the postocular part of the head; pectoral fins

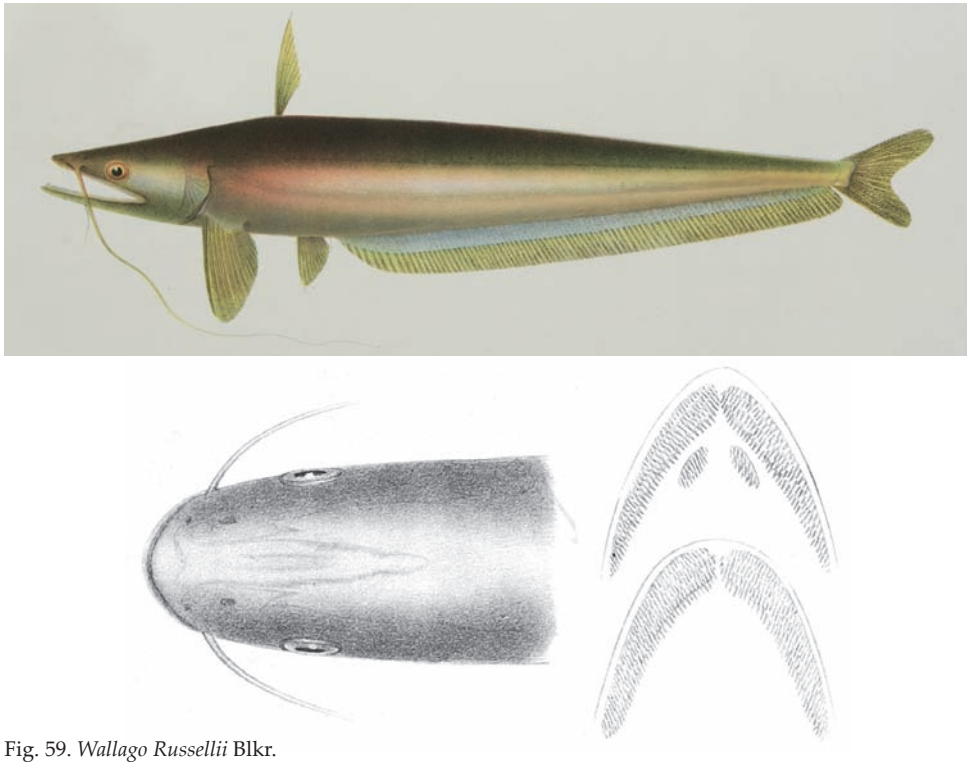

Fig. 59. *Wallago Russellii* Blkr.

obtuse or slightly acute, convex, contained about 1½ times in length of head, spine thin, the bony part shorter than the postocular part of the head, without conspicuous teeth; ventral fins acute or slightly obtusely rounded, about twice as short as the pectoral fins; anal fin less than three times as long as the head, ending before the base of the caudal fin; caudal fin has a deep incision and slightly acutely or slightly obtusely rounded lobes, the upper lobe longer than the lower one, contained 7¾ to 8½ times in length of body. Colour of 262 upper part of the body golden-green or blackish-green, lower part pearly or silvery or yellowish, fins yellowish- or softly violetish-hyaline, more or less with dark speckles.

B. 18 to 20. D. 1/4. P. 1/13 or 1/14. V. 1/9. A. 86 to 93. C. 1/15/1 and shorter ones alongside.

Syn. *Platvisch* Nienh. Gedenkw. Zee- en Lantr. p. 273.
Wallagoo Russ. Corom. Fish. II p. 50 fig. 165.
Silurus attu and *Silurus atthu* Bl. Schn. Syst. posth. p. 378 tab. 75.
Silurus boalis Buch. Gang. Fish. p. 154, 375 tab. 29 fig. 49.
Callichrus macrostomus Swns. Nat. Hist. Fish. II p. 306.
Silurus wallagoo CV. Poiss. XIV p. 263.
Silure wallagoo CV. Poiss. XIV p. 263.
Schilbe boalis Syk. Fish. Dukh. Transact. Zoöl. Soc. II p. 368 tab. 64 fig. 2.
Silurus Mülleri Blkr, Verh. Bat. Gen. XXI, I Silur. bat. consp. p. 18.
Wallagoo Mülleri Blkr, Diagn. Vischs. Sumatra Tient. I to IV Nat. Tijdschr. Ned. Ind. III p. 585.
Poorram and *Worshoorah* Maratt.
Wallagoo Indig. Vizagap.
Boalis Bengal.
Ata or *Attu calvu* Tamul.

Limpok Djambal, *Tjaba*, *Tjangop* Mal. Batav.
Hab. Java (Batavia, Udjong Krawang, Udjong Tangerang, Gempol), in rivers.
Bengal (Calcutta) in river Hooghly.
Length of the 13 specimens 285'" to 503"'.

Remark. The Tjangop is not rare in the rivers Tjitarum and Tjidani, which discharge themselves in the Bay of Batavia, and is often, though usually only with few specimens at a time, brought to the market of Batavia, where it is bought only by the less well to do Chinese and local people. I have seen specimens with a length of about 3 feet, but it can reach a length of 6 feet. The swim bladder has a thick wall and forms an spacious, elongate ovoid shaped sac, which is not divided in chambers and which empties itself through a tube near the gullet in the stomach. The stomach itself forms a large blind sac and the intestinal canal is not longer than the anal fin. In it I found the remains of Barbus species. The liver consists of bi-angular elongated lobes, which are united to one another and encircle the upper part of the stomach.

It does not seem unlikely to me that Nieuhof already knew this fish and described it briefly under the name "Platvisch" [Flat fish] in the following words "the flat fish is about a foot long, 263 has a smooth skin without scales, and has a wide mouth, but shines like silver. At the back is a slender small fin and on each side a small fin. Under the belly, including the tail is only one fin. This fish does have a good taste, but is so "hairigh" [has so many fish-bones??] that many do not eat it. It lives in fresh water and is caught with net and hook." This description would also fit Pseudosilurus bimaculatus Blkr, however as Nieuhof elsewhere also seems to indicate this species, is it likely that with his "Platvisch" he has indicated the species in question.

Since the beginning of this century it has been described and depicted by various ichthyologists.

Mr Valenciennes is inclined to accept, that the species briefly described and depicted by Johann Gottlieb Scheider in Bloch's Systema Ichthyologiae, represents the same species as Russell's Tjangop and this opinion is based on an investigation of the specimen Schneider used for the description. The figure of Schneider is erroneous in various respects, because the dorsal fin spine in Russell's Tjangop is not serrated, the caudal fin not rounded or lancet shaped and the skin covered head shield does not have the fontanel-like depression near the base of the supraoccipital crest as expressed in the figure of Silurus attu. Russell was the first to give a fairly good figure of Wallago Russelii. However, he remarks unjustly that the first dorsal fin ray is serrated, although for the rest his description, for his time, leaves little to desire. He mentions that the fish because of its strong and trainy-oil taste is not found at the tables of the Europeans and is only eaten by the lower classes of the indigenous population. The weavers of the surroundings of lake Ankapilly use the lower jaws with their tightly set tooth rows to card the finest kinds of cotton.

Buchanan gave a description and figure of Wallago Russelii under the name Silurus boalis. His figure is better than that of Russell. In his description it is rightfully said that the first dorsal fin ray and the pectoral fin spines are without serrations. The species would be very common throughout the whole of Bangal and Hindostan, it would reach 264 a length of six feet and would be considered as a good food by the indigenous people of Bengal.

Mr Valenciennes went into more details than his predecessors. He even gave some osteological details, but not a figure. The species, in former days only known from Bengal and Hindostan, was indicated by him also as inhabitant of Birma.

Lieutenant colonel (now Colonel) W.H. Sykes described the species again in 1841 as an inhabitant of Dekkan and for the fourth time published a figure of it under the name Schilbe boalis. However, this figure represents the physiognomy of the species less well than that of Buchanan. It is the Poeran or Worshoera of the Marattes. Mr Sykes already suspected that it should be brought under a genus different from Silurus. In his specimen he found only 84 anal fin rays.

Until my investigations this Wallago was unknown from the Indian archipelago. When I observed it for the first time in Batavia I took it for a proper species and described it briefly under the name Silurus Mülleri. Later, especially after the comparisson of Javanese with Bengal specimens, I recognized Silurus Mülleri to be identical with the boalis of the Bengalese and therefore also with Russell's Wallago.

Wallago leerii Blkr.
Vijfde bijdr. ichth. Borneo, Nat. Tijdschr. Ned. Indië II p. 427, Atl. Silur. tab. XXXVII.
Van Leer's Tjangop

A Wallago with an elongate, compressed body, body width contained 1⅓ to 1¼ times in its depth, body depth contained 4⅗ to 5 times in its length without, and 5⅓ to 5¾ times in its length with caudal fin. Head depressed, acute, contained 3⅝ to 4¼ times in length of body without, and 4½ to 5 times in length of body with caudal fin; depth of head contained 1⅘ to 1⅔ times in its length, width 1¾ to 1⅗ times, depth of the head above the angle of the mouth contained 2⅔ to 3 times in its length; eyes placed partly above the angle of the mouth, eye diameter contained 7 to 9 times in length of head, distance between the eyes 3½ to 5 times their diameter; rostro-dorsal profile feebly concave on the head, convex on the nape. Head shield only covered with muscles at posterior part, traversed by a longitudinal groove reaching the very thin, entirely subcutaneous supraoccipital crest; snout depressed, rostral profile obtusely rounded; nostrils separate, the anterior ones close to the anterior edge of the snout, tubular; lower jaw protruding 265 beyond the upper jaw; teeth very conspicuous, multiple-rowed, feebly curved, the posterior jaw rows longer than the anterior rows; upper jaw teeth placed in a band resembling the form of a horse-shoe, lower jaw teeth in a band in the form of a horse-shoe; vomerine teeth placed in 2 oblong, oblique, separated groups; maxillary barbels supported by a bony rod that is not shorter than the eye, reaching anterior part of the anal fin; lower jaw barbels very thin, inserted on the skin of the chin, a little before the angle of the mouth, not or hardly longer than the eye; mouth much less than twice as broad as long, length contained 2¼ to 2⅔ times in length of head; lips broad towards the angle of the mouth; ventral part of the lower jaw has conspicuous pores placed in longitudinal rows; gill cover with many diverging stripes: humeral bone short, obtuse, rounded; lateral line feebly curved anteriorly, then straight, characterized by touching small tubes; axillary slime pore not visible; dorsal fin thin, acute, rounded, longer than the postocular part of the head; pectoral fins obtuse, convex, longer than the part of head behind the mouth, spine thin, the bony part shorter than the postocular part of the head, posterior side without conspicuous small teeth or only armed at the place of insertion; ventral fins slightly obtuse and convex, nearly twice to more than twice as short as the pectoral fins; length of the head contained less than 2½ times in the length of the anal fin; anal fin ending before the base of the caudal fin; caudal fin with a deep incision and slightly acutely rounded lobes, the upper lobe longer than the lower one, contained nearly 7 to 7⅓ times in the length of the entire body. Colour of upper part of the body and flanks olive-dark, or deeply clouded with an olive-dark colour, lower part orange-slightly olive-coloured or pearly with dark speckles. Fins orange- or rose-slightly olive-coloured or dark. The base of the caudal fin has a thin, transverse curved, deeply violet band.

Fig. 60. *Wallago Leerii* Blkr.

B. 16 or 17. D. 1/4. P. 1/14 or 1/5. V. 1/9 or 1/10. A. 67 to 73. C. 1/15/1 and shorter ones alongside.
Hab. Sumatra (Palembang), in rivers.
Banka (Marawang), in rivers.
Borneo (Kahajan, Pontianak, Sintang, Sambas), in rivers.
Length of the 6 specimens 222‴ to 490‴.

Remark. Just like with other species of Silurichthyoïds, in former days I did not notice the barbels, which indeed are very thin, short and placed far posteriorly on the skin of the chin. However, a more detailed investigation has taught me that they are present in all my specimens. The species differs at first glance from Wallago Russellii by its shorter mouth slit, which ends under the eye and by the blunt horizontal rounding of snout and lower jaw. As I have never received Wallago Russellii from Sumatra, Banka and Borneo, and Wallago Leerii does not seem to occur on Java, there is some reason to suspect that Wallago Leerii on the mentioned islands is the substitute of Wallago Russellii. It also seems to become just as large.

266 Belodontichthys Blkr.
Arrowtooth fish

A simple dorsal fin, rayed, well developed, membrane-bearing. Anal and caudal fins not confluent. Head compressed, with a ridge. Four maxillary and lower jaw barbels. Jaw teeth acute, placed in a few rows, unequal, shaped as arrows. Vomerine teeth acute, placed in 2 oblique, separated groups. Branchiostegal membrane with 14 or 15 rays. Interbranchial membrane has a deep incision. Eyes covered with head skin, superior. Nostrils on both sides paired, the anterior ones tubular. Lower jaw protruding beyond the upper jaw.

Remark. Belodontichthys among the Schilbeïnes is peculiar because of its lateral compressed, keeled head and its three-rowed lance or arrow-shaped jaw teeth, which characters make it differ from all other Schilbeïnes. It is a very natural genus, which also differs in habitus from all others and with regard to this is placed between Wallago and Pseudosilurus. Maybe in Belodontichthys a generic significance can also be given to the extremely well developed acute pectoral fin, which in the only species known till now is much longer than the head and which has its spine very slim and nowhere entirely ossified. Apart from that, the genus has the arrangement of the vomerine teeth, the number of barbels and superior eyes as in Pseudosilurus.

Belodontichthys macrochir Blkr.
Atl. Silur. tab. XXXVIII fig. 2.
Large-handed arrowtooth fish

A Belodontichthys with an elongate, compressed body, body width contained about twice in its depth, body depth contained 4¾ to 5⅔ times in its length without, and 5½ to 6⅔ times in its length with caudal fin. Head compressed, obtuse, with a ridge, acute, contained 4½ to 4 times in length of body without, and 5⅓ to 5½ times in length of body with caudal fin; depth of head contained 1⅗ to 1½ times in its length, width about twice, depth of the head above the angle of the mouth contained 2⅓ to 2¼ times in its length; eyes placed above the mouth corner, partly above the angle of the mouth, eye diameter contained 4 to 5 times in length of head, distance between the eyes 1⅓ to 1¼ times their diameter; rostro-dorsal profile concave on the head, convex on the nape. Head shield in its entire length on each side covered with muscles, with a longitudinal median ridge, very elevated, thin, entirely traversed by a longitudinal groove; no supraoccipital crest; snout slightly depressed, acute, rostral profile slightly acutely rounded; nostrils separate, the anterior ones obliquely perforated by a small tube, placed at a greater distance from the tip of the snout than from the posterior nostrils, the not tubular [posterior] ones placed in the middle between the eye and the anterior nostrils; lower jaw 266 has the anterior teeth produced beyond the upper jaw; jaw teeth placed in three rows, in a band with acute angles, rounded at the front, the lower jaw tooth band longer than the upper jaw band, the teeth in each row separate from each other, shaped as arrows, shorter in the outer row than in the inner rows; vomerine teeth acute, small, placed in 2 small, oblique groups that are only separated a little; mouth longer than it is broad, length contained 2½ to 2⅓ times in length of head; lips thin; maxillary barbels supported by a bony rod generally longer than the eye, extending beyond the base of the pectoral fin or reaching the anterior part of the anal fin; lower jaw barbels very thin, inserted on the chin, under posterior part of the mouth, shorter than the eye, in older fishes visible to the naked eye, in younger fishes only visible with the aid of a lens; chin without conspicuous pores; gill cover characterized by some diverging stripes: humeral bone short, obtuse, rounded; lateral line feebly curved anteriorly, then more or less straight, characterized by touching small tubes; axillary slime pore not conspicuous;

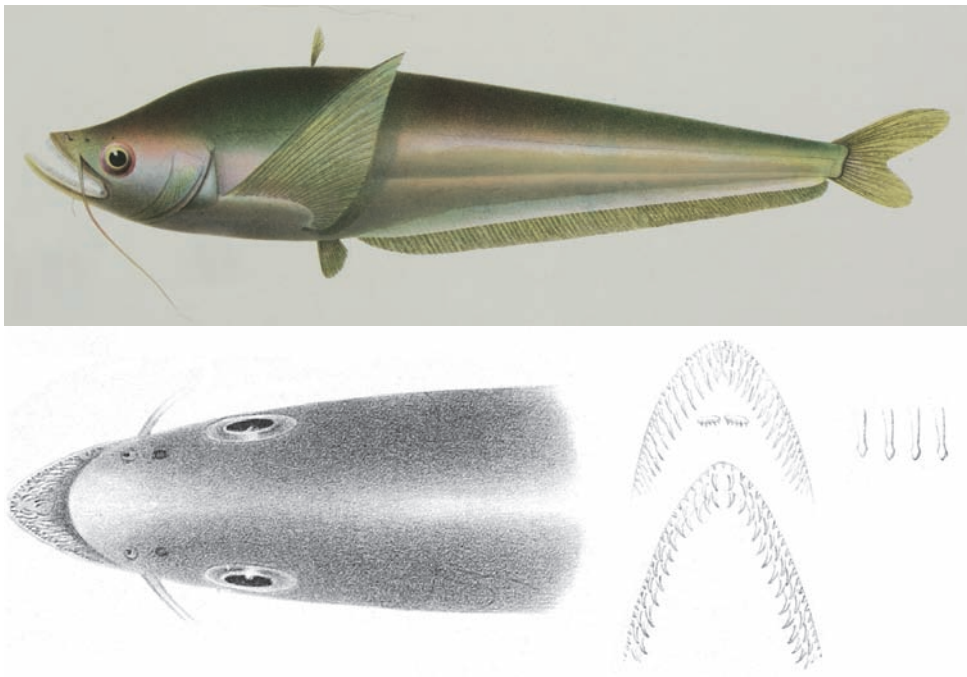

Fig. 61. *Belodonthichthys macrochir* Blkr.

dorsal fin low, the first ray longer than the other rays, generally shorter than the postocular part of the head; pectoral fins acute, broad at the base, much longer than the head, spine thin, the bony part shorter than the head, without conspicuous small teeth; ventral fins slightly acute and rounded, more than three times to more than four times as short as the pectoral fins; anal fin less than three times as long as the head, ending before the base of the caudal fin; caudal fin deeply emarginate, with acutely rounded lobes, the upper lobe longer than the lower one, contained about 7 to 8 times in the length of the entire body. Colour of upper part of the body softly olive, lower part pearly, fins yellowish-hyaline, more or less with dark speckles. The base of the caudal fin sometimes has a small transverse, curved, violet band.

B. 14 or 15. D. 1/3.P. 1/20 to 1/22. V. 1/1 or 1/9. A. 92 to 96. C. 1/11/1 and shorter ones alongside.

Syn. *Wallago dinema* Blkr, Vierde Bijdr. Ichth. Born. Nat. Tijdschr. Neerl. Ind. II p. 202.
Laïs Mal. Bandjerm.

Hab. Sumatra (Palembang), in rivers.
Borneo (Bandjermasin), in rivers.

Length of the 6 specimens 135''' to 320'''.

Remark. Belodontichthys macrochir seems to occur on both Sunda islands and to be restricted to the largest rivers. I discovered this species in the year 1851, when I received it for the first time from Borneo, where it lives in the Barito river. I then named it Wallago dinema, because according to my conception of the genus at the time I believed I had to bring it under that genus, and the lower jaw barbels, which as a matter of fact are hair-thin and in young specimens are difficult to recognize, had escaped my attention. When I brought the species to my new genus Belodontichthys, I also had to change its incorrect name and I have derived the new name from the extremely large

and many rayed 268 pectoral fins. Very remarkable in this species is the large muscle mass under the arm bone and pectoral fin base, which is attached to the pectoral fin base and apparently makes it possible for the pectoral fin to make a strong downward movement like that of the wings of a bird.

Silurichthys Blkr.

A simple dorsal fin, rayed, well developed, membrane-bearing. Anal and caudal fins confluent. Four maxillary and lower jaw barbels. Jaw teeth acute, multiple-rowed, nearly equal. Vomerine teeth acute, placed in a small, undivided group. Branchiostegal membrane with 11 to 13 rays. Interbranchial membrane deeply incised. Eyes covered with head skin, superior. Anterior nostrils tubular.

Remark. The genus Silurichthys comprises an other group of Schilbeïnes, recognisable by an undivided, very short band of vomerine teeth, 4 barbels, eyes placed above the mouth slit and an entirely or partly concave caudal fin which is confluent with the anal fin.

Closely related to Silurodes, it differs however on the one hand by the position of the eyes, which in Silurodes are placed behind the mouth corner, as a result of which the physiognomy becomes entirely different, on the other hand because in Silurodes the band of vomerine teeth occupies the entire width of the palate and the caudal fin is deeply bilobed and entirely free from the anal fin. Although these differences, as such, are not of enough weight to consider them as generic, I take them, in relation to each other, of enough importance to unite the species which possess them in a genus of their own, especially when I take into consideration their peculiar habitus and a profile and coloration deviating from Silurodes.

In my cabinet only a simple species of Silurichthys is found, my Silurichthys phaisoma. Java nourishes another species only known to me from a figure left by Van Hasselt and named in his honour Silurichthys Hasseltii. Moreover, I believe I have to bring to the same genus Silurus japonicus T. Schl. from Japan, 269 while I also believe it likely that to this genus belongs the species described and depicted by Mr Basilewsky in his Ichthyographia Chinae borealis (Noveaux Mémoires de la Société impériale des Naturalistes de Moscou vol. X 1855 p. 2409 tab. 3 fig. 4) under the name Silurus asotus, although the largest size which that species is said to attain (7 feet) rather makes one think of a Wallago.

Both archipelagic species according to the following scheme can be distinguished from each other and the extra-Indian species.

1. Dorsal fin placed opposite the ventral fins. Lower jaw not protruding beyond the uper jaw.
   a. Caudal fin entire, convex. Body marbled.

Silurichthys Hasseltii Blkr.

   b. Caudal fin obliquely truncate or feebly emarginate. Body dark and spotless.

Silurichthys phaiosoma Blkr.

Silurichthys phaisoma Blkr.
Atl. Silur. tab. XXXIX fig. 2.
Brown Silurichthys

A Silurichthys with an elongate, compressed body, body width contained 1⅓ to 1½ times in its depth, body depth contained 6 to 6½ times in its length without, and nearly 8 to 9 times in its length with caudal fin. Head slightly depressed, convex, slightly acute, contained 6½ to 7¼ times in length of body without, and 8¾ to 9½ times in length of body with caudal fin; depth of head contained 1⅔ to 1½ times in its length, width 1⅓ to 1⅕ times, depth of the head above the angle of the mouth contained about twice in its length; eyes placed above the mouth corner, eye diameter contained 7 to 8 times in length of head, distance between the eyes 2½ to 3 times their diameter; rostro-dorsal profile convex at the snout, slightly convex at the rest of the head and the nape; only posterior part of the head shield is covered with muscles, only the anterior half divided by a longitudinal groove, posterior part has about 6 deep pits, only visible when the skin is removed; supraoccipital crest triangular, thin, traversed by a longitudinal groove, entirely subcutaneous; snout convex, rostral profile obtusely rounded; nostrils separate, the anterior ones close to the anterior edge of the snout, tubular; lower jaw hardly shorter than the upper jaw; teeth small, conspicuous, curved, the upper jaw teeth placed in a crescent-shaped band, the lower jaw teeth in a band resembling the form of a horse-shoe; vomerine teeth placed in a small group, less than twice or hardly twice as long as broad; maxillary barbels supported by a short bony rod, reaching posterior part of the anterior half of the anal fin; lower jaw barbels inserted on the skin of the chin, approximately under the angle of the mouth, not or a little shorter than the maxillary barbels; mouth a little oblique, 270 broader than it is long, length contained 2⅓ to 2½ times in length of head; lips broad towards the angle of the mouth; gill cover only rostrally smooth, with 2 low, diverging ridges, inclining downwards; scapular bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous; dorsal fin placed opposite to the ventral fins, thin, acutely rounded, the first ray not or a little shorter than the postocular part of the head; pectoral fins slightly obtuse, convex, not or a little shorter than the head, spine thin, the bony part hardly or not longer than the postocular part of the head, posterior side denticulate; ventral fins rounded, about twice as short as the pectoral fins; anal fin about 5 times as long as the head, the posterior rays longer than the other rays, posterior part entirely confluent with the caudal fin; caudal fin obliquely, not deeply emarginate, with rounded lobes, the upper lobe longer than the lower one, contained 4 to 4⅓ times in the length of the entire body. Colour of body and fins dark, barbels orange variegated with dark or with dark rings. Caudal fin has a transverse, curved blackish-violet band towards the base.

Fig. 62. *Silurichthys phaisoma* Blkr.

B. 9. D. 1/3. P. 1/8 or 1/9. V. 1/5 or 2/6. A. 53 to 56. C. 13. including the short lateral ones.
Syn. *Silurus phaiosoma* Blkr, Vijfde Bijdr. ichth. Born. Nat. Tijdschr. Ned. Ind. II p. 428.
Hab. Banka (Maruwang), in rivers.
Biliton (Tjirutjup), in rivers.
Borneo (Sambas, Kahajan), in rivers.
Length of the 9 specimens 81‴ to 139‴.

Remark. In both species of Silurichthys of the Indian archipelago the dorsal fin is implanted above the ventral fins. Already because of that they distinguish themselves from Silurichthys japonicus and Silurichthys Basilewski, if these species really are Silurichthyds. Both Indian species seem to stay within small dimensions. They differ still rather strongly from each other, because although they have a small head and very slender body in common, Silurichthys Hasseltii has the caudal fin bluntly rounded, the posterior anal fin rays shorter than the anterior and middle ones, reason why the unison of the anal fin with the caudal fin is much less wide, and moreover the lower jaw barbels remarkably shorter, the body bar-like transverse marbeled, etc.

Silurichthys Hasseltii Blkr.
Atl. Silur. tab. XXXIX fig. 1.
Van Hasselt's Silurichthys

A Silurichthys with an elongate, compressed body, body depth contained about 7⅓ times in its length without, and about 9 times in its length with caudal fin. Head depressed, slightly convex, contained about 7 times in length of body without, and about 8⅖ times in length of body with caudal fin; eyes placed above the mouth corner, eye diameter contained about 8 times in length of head, distance between the eyes 3 to 4 times their diameter; maxillary barbels 271 reaching the second fourth part of the anal fin, lower jaw barbels overreaching the base of the pectoral fins; dorsal fin placed opposite the ventral fins, acutely rounded, the longest ray not or hardly longer than the postocular part of the head; pectoral fins broad, obtuse, not or hardly shorter than the head; ventral fins acute, less than twice as short as the pectoral fins; anal fin about 5 times as long as the head, the posterior rays shorter than the middle rays, the posterior ray confluent with the lower ray of the caudal fin; caudal fin obtuse, rounded, contained a little

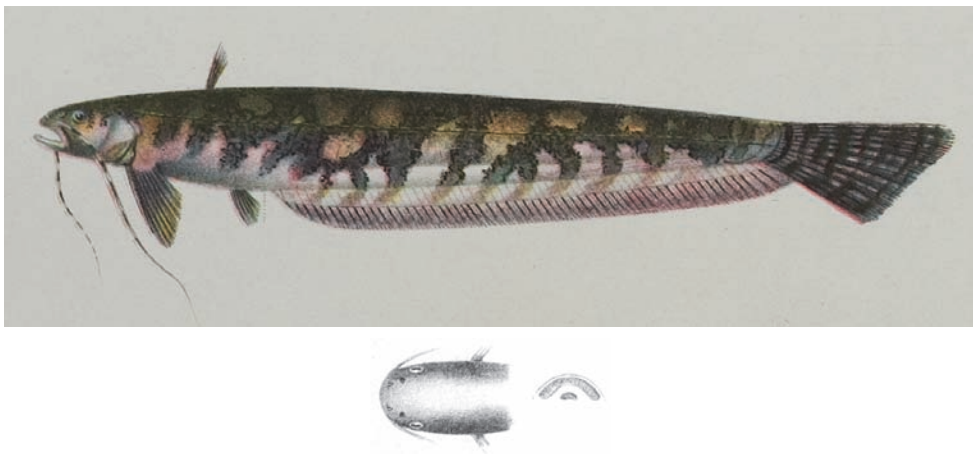

Fig. 63. *Silurichthys Hasseltii* Blkr. [In Atlas 118 mm TL. Figs of dorsal view of head and dentition of upper jaw added in Atlas after examination of holotype.]

more than 6 times in the length of the entire body. Colour of upper part of the body olive, lower part has a softer colour. Head and body have transverse, irregular, more or less joined, dark-violet spots, bordered and nearly marbled with a blackish colour. Fins are violetish-transparent, unpaired fins have thin, transverse or oblique dark-violet bands. Barbels rose-coloured, with a violet-dark rings.

D. 4. P. 1/l1? V. 1/5. A. 56. C. 13 or 14.

Hab. Java (Tjisekat), in rivers.

Length of the described figure 134‘’’.

Remark. The precision of which the drawings left by van Hasselt and Kuhl bear witness and at which I have already pointed several times, make that I do not hesitate to introduce the species in question into science. On Java it seems to be the substitute of Silurichthys phaisoma, which till now is only known from Borneo, Biliton and Banka.

Silurodes Blkr.

A simple, well developed, rayed, membrane-bearing dorsal fin. Anal and caudal fins not confluent. Four barbels, on upper and lower jaw. Jaw teeth multiple-rowed, acute, the jaws placed in a curved band, vomerine-palatine teeth placed in a thin, transverse, uninterrupted band. The branchiostegal membrane has 11 rays. The interbranchial membrane has a deep incision. Eyes covered with head skin, posterior. Anterior nostrils tubular. Lower jaw protruding beyond the upper jaw.

Remark. Among the Schilbeïnes with moderately developed, but spineless dorsal fin recognisable by its four barbels, undivided band of vomerine teeth and posterior- or if you like inferior placed eyes.

Because of this last character one can differentiate it at first glance from Silurichthys, from which it moreover differs by a totally different habitus, a deeply split, acutely lobed caudal fin, an anal fin that is not confluent with the caudal and because the band of vomerine teeth occupies the entire width of the palate.

272 Both species that I possess of Silurodes, have a concave profile and a lower jaw considerably protruding before the upper jaw, characters, which here have also a generic value. They may be characterized as follows.

I. Maxillary barbels reaching the middle or anterior part of the anal fin. Lower jaw hardly protruding beyond the upper jaw.

Silurodes hypophthalmus Blkr.

II. Maxillary barbels nearly reaching the caudal fin. Lower jaw protruding far beyond the upper jaw.

Silurodes macronema Blkr.

Silurodes hypophthalums Blkr.

Atl. Silur. tab. XL fig. 2.

Short-barbelled Silurodes

A Silurodes with an elongate, compressed body, body width contained 2 to 1¾ times in its depth, body depth contained nearly 5 to 4½ times in its length without, and nearly 6 to 5¼ times in its length with

caudal fin. Head depressed, acute, contained 5⅖ to a little more than 6 times in length of body without, and 6⅓ to 7⅕ times in length of body with caudal fin; depth of head contained 1½ to 1⅗ times in its length, width 1¾ to 1½ times, depth of the head above the angle of the mouth contained about 2½ times in its length; eyes postero-inferior, distance between lower margins hardly move than distance between upper margins, eye diameter contained 4 to 5 times in length of head, distance between the eyes at the upper margin nearly 2 to 2⅔ times their diameter; rostro-dorsal profile concave at the head, convex at the nape. Head shield entirely divided by a longitudinal groove reaching the elongate, thin supraoccipital crest, which is traversed by a groove; snout very depressed, rostral profile obtusely rounded; nostrils separate, the anterior ones close to the anterior edge of the snout, with short tubes; upper jaw only a little shorter than the lower jaw; teeth well visible, the upper jaw teeth placed in a crescent-shaped band, the lower jaw teeth in a band resembling the form of a horse-shoe; vomerine-palatine teeth placed in a thin, slightly curved band; maxillary barbels supported at the base by a bony rod, reaching the anterior or middle part of the anal fin; lower jaw barbels very thin, generally much shorter than the head; mouth much less than twice as broad as it is long, length contained 2⅔ to 3 times in length of head; lips thin; chin without conspicuous pores; gill cover with some diverging stripes but without conspicuous ridge: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous. Dorsal fin thin, the first ray longer than the other rays and the postocular part of the head; pectoral fins slightly obtuse or slightly acute, convex, a little longer than the head, spine medium-sized, much shorter than the head, posterior side denticulate; ventral fins slightly obtusely rounded, about 3 times as short as the pectoral fins; anal fin about 4 times as long as the head, ending before the base of the caudal fin; caudal fin with a deep incision and acute lobes, the upper lobe a little longer than the lower one, 273 contained about 6⅓ to 6½ times in the length of the entire body. Colour of upper part of the body deeply or softly olive, lower part pearly. The postscapular area has a fairly large round spot, the tail towards the middle of the base of the caudal fin a small round spot, the caudal fin towards the base has a transverse, curved band all violet, nearly subcutaneous. Fins are yellowish-hyaline, more or less with dark speckles.

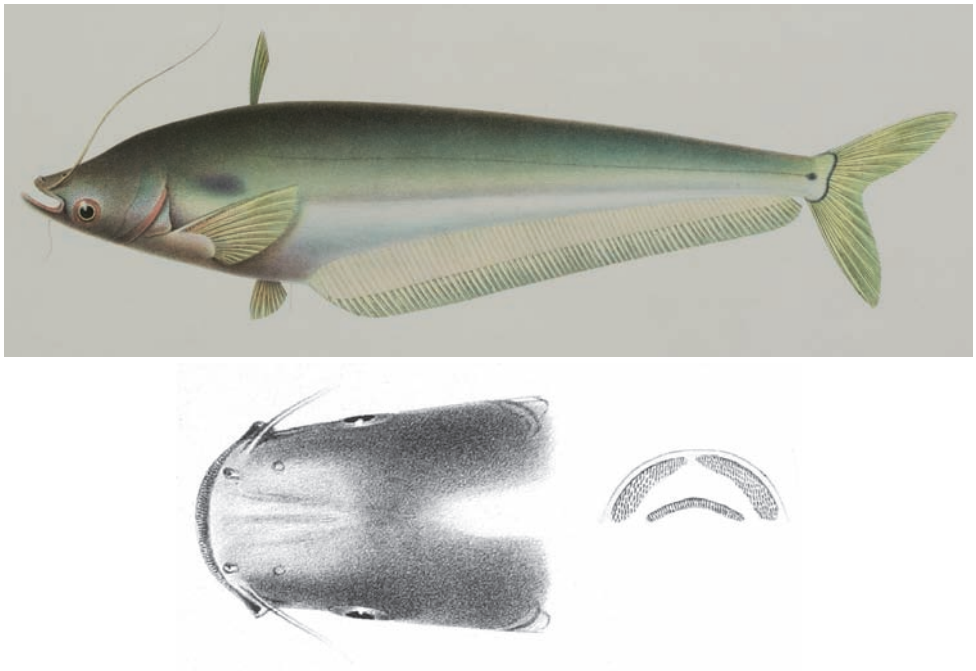

Fig. 64. *Silurodes hypophthalmus* Blkr.

B. 11. D. 1/3 (4). P. 1/12 to 1/14. V. 1/6 or 1/7. A. 76 to 82. C. l/15/1 and shorter ones alongside.
Syn. *Silurus hypophthalmus* Blkr, Verh. Bat. Gen. XXI, I Silur. batav. consp. p. 20.
Limpok Mal.
Laïs Lampong.
Hab. Java (Batavia, Kediri), in rivers.
Sumatra (Palembang, Djambi, Pangahuang provinciae Lampong), in rivers.
Length of the 25 specimens 100''' to 306'''.

Remark. Silurus hypophthalmus is a species that is not rare on Java, although it does by far not occur so often as Pseudosilurus bimaculatus, with which it is caught together now and then. In none of my 20 specimens the upper jaw barbels reach the posterior part of the caudal fin, by which the species can be distinguished from Silurus macronema, in which those barbels nearly or just reach the caudal fin base. I would give less attention to this character, if it was not supported by another, more essential character found in the relative size of the jaws. In Silurus hypophthalmus namely when the mouth is closed, the lower jaw extends only slightly anterior to the upper, however in Silurus macronema the lower jaw rises before and above the upper so that the symphysial part of the lower jaw tooth band bulges completely before the upper jaw and nowhere touches the upper jaw tooth band.

Silurodes macronema Blkr.
Atl. Silur. tab. XL fig. 1.
Long-barbelled Silurodes

A Silurodes with an elongate, compressed body, body width contained 1¾ to nearly 2 times in its depth, body depth contained about 5 times in its length without, and about 6 times in its length with caudal fin. Head depressed, acute, contained about 5½ times in length of body without, and about 6⅓ times in length of body with caudal fin; depth of head contained about 1⅖ times in its length, width nearly 2 times, depth of the head above the angle of the mouth contained a little more than twice in its length; eyes posterior, hardly more separated at the lower than at the upper margin, eye diameter contained about 3½ times in length of head, 274 distance between the eyes at the upper margin 1⅓ to 1¼ times their diameter; rostro-dorsal profile concave at the head, convex at the nape. Head shield entirely divided by a longitudinal groove reaching the thin, acute supraoccipital crest, which is traversed by a groove; snout very depressed, rostral profile obtusely rounded; nostrils separate, the anterior ones close to the anterior edge of the snout, with short tubes; upper jaw much shorter than the lower jaw; teeth mostly visible, the upper jaw teeth placed in a crescent-shaped band, the lower jaw teeth in a band in the form of a horse-shoe; vomerine-palatine teeth placed in a thin, slightly curved band; maxillary barbels supported by a bony rod at the base, nearly reaching the caudal fin; lower jaw barbels very thin, shorter than the head; mouth hardly broader than long, length contained about 2⅖ times in length of head; lips thin; chin without conspicuous pores; anterior part of the gill cover with some diverging stripes but no conspicuous ridge; humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous; dorsal fin thin, the first ray a little longer than the other rays and much longer than the postocular part of the head; pectoral fins slightly obtuse, convex, not or a little longer than the head, spine thin, much shorter than the head, posterior part with hardly conspicuous small teeth; ventral fins slightly obtuse and rounded, 3 to 4 times as short as the pectoral fins; anal fin much less than 4 times as long as the head, ending before the base of the caudal fin; caudal fin has a deep incision and acute lobes (partly missing). Colour of upper part of the body slightly olive, lower part pearly, fins yellowish-hyaline, more or less densely with dark speckles. Caudal fin has a small curved, transverse, violet, nearly subcutaneous band.

Fig. 65. *Silurodes macronema* Blkr.

B. 11. D. 4 (1/3). P. 1/15. V. 1/7. A. 79. C. 1/15/1 and shorter ones alongside.
Syn. *Silurus macronema* Blkr, Vierde Bijdr. Ichth. Borneo, Nat. Tijdschr. Ned. Ind. II p. 203.
Laïs Mal. Bandjermas.
Hab. Borneo (Bandjermasin), in rivers.
Length of the only specimen 140″.

Remark. In former days I have mentioned that this species also occurs near Palembang, but a more detailed investigation of the specimens originating from that place has showed me that they are at most a geographical variety of Silurus hypophthalmus, in which the upper jaw barbels extend to over the middle of the anal fin.

Therefore Silurus macronema according to the present state of knowledge is restricted to Borneo, where my only specimen was caught near Bandjermasin. The species has a close relationship with Silurus hypophthalmus. However, it is sufficiently distinguished from it by the larger mouth slit and teeth, the lower jaw projecting far beyond the upper (so that, when the mouth is closed the band of lower jaw teeth anteriorly completely extends out of the mouth and does not touch the upper jaw teeth) and the upper jaw barbels that reach to near the caudal fin.

275 Pseudosilurus Blkr.
Limpok

A simple dorsal fin, rayed, well developed, membrane-bearing. Anal and caudal fins joined or not joined. Four maxillary and lower jaw barbels. Jaw teeth acute, multiple-rowed, unequal, setaceous, mobile. Vomerine teeth acute, placed in 2 transverse,

separate small bands. The branchiostegal membrane has 11 to 15 rays. The interbranchial membrane has a deep incision. Eyes covered with head skin, superior or posterior. Anterior nostrils tubular.

Remark. Among the dorsal spine-less, four barbelled Schilbeïnes most numerous are those species, in which the vomerine teeth are arranged in two band or groups that are placed in a transverse row and that have the jaw teeth brush-like and many rowed. I bring all those species under one genus, which I name Pseudosilurus. On one hand it is related to Silurus, from which it differs by its 4 barbels, separated groups of vomerine teeth and a different habitus, and on the other hand it is related to Silurodes, from which it principally differs by the splitting of the vomerine teeth in two separate groups. I possess 4 species of Pseudosilurus, two from the Indian archipelago and two from Bengal, however I bring under this genus also some other species which I only know from descriptions and figures, and for which it is still uncertain if they indeed belong to this genus. Only a further investigation of the species from nature can make this clear.

For as far as I can determine about 11 species have become known till now which can be brought to the genus Pseudosilurus. In almost all species the lower jaw is longer than the upper jaw; only Pseudosilurus cochinchinensis (Silurus cochinchinensis) forms an exception. Moreover in nearly all species the anal fin is not confluent with the caudal and the caudal fin itself is bilobed. However, exceptions to this are Pseudosilurus xanthosteus (Silurus xanthosteus Richds.) and Pseudosilurus cochinchinensis Blkr. The remaining species are largely very insufficiently 276 described and it is even difficult to separate them from each other on the basis the existing descriptions. Various species have a dark spot in the postscapular area. Yet they appear to be most easily separable by the lengths of their barbels, the relative height of the body and length of head, the shape of the profile and (within certain limits) the number of the anal fin rays and and length and armoring of the pectoral fin spines. However, a new investigation of those species is needed, either to distinguish the specific characters more clearly, or maybe to discover that some species can only be regarded as nominal ones.

The species of Pseudosilurus are real South Asian forms. They occur from Afganistan to the Chinese Sea and live at the Sunda Islands in the shape of Pseudosilurus bimaculatus and at Sumatra and Banka as a species, described by me in former days under the name Wallago leiacanthus.

In as much the existing data allow, one can separate the now known species from the Indian archipelago from each other and from the remaining known species according to the following scheme.

I. Caudal fin bilobed, not confluent with the anal fin. Lower jaw protruding beyond the upper jaw. Upper jaw barbels reaching the ventral fins or the anal fin. No spots on lower part of the flank and on the anal fin.

   a. Rostro-dorsal profile concave. A. 57 to 66. Pectoral spine denticulate. Head contained 4½ to 4¾ times in length of body without caudal fin. Lower jaw barbels not or hardly longer than the eye.

Pseudosilurus bimaculatus Blkr.

b. Rostro-dorsal profile nearly straight or slightly convex. A. 54 to 57. Pectoral spine not denticulate. Head contained nearly 5 to 5⅔ times in length of body without caudal fin. Lower jaw barbels not or hardly shorter than the head.

Pseudosilurus leiacanthus Blkr.

277 *Pseudosilurus bimaculatus* Blkr.
Atl. Silur. tab. XXXIX fig. 3.
Two-spot Limpok

A Pseudosilurus with an elongate or nearly elongate, compressed body, body width contained 1⅔ to 1¾ to times in its depth, body depth contained 4¼ to nearly 4 times in its length without, and 5 to nearly 4½ times in its length with caudal fin. Head depressed, acute, contained 4½ to 4¾ times in length of body without, and 5⅓ to 5½ times in length of body with caudal fin; depth of head contained 1⅖ to 1½ times in its length, length [width] 2 to 1⅗ times, depth of the head above the angle of the mouth contained 2⅔ to 2⅓ times in its length; eyes almost superior, eye diameter contained 5½ to 7½ times in length of head, distance between the eyes 2½ to 3½ times their diameter; rostro-dorsal profile concave at the head, convex at the nape; posterior part of the head shield only is covered with muscles, head shield traversed by a longitudinal groove reaching the short, thin, subcutaneous supraoccipital crest; snout depressed, rostral profile obtusely rounded; nostrils separate, the anterior ones close to the anterior edge of the snout, tubular; lower jaw protruding very much beyond the upper jaw; teeth clearly visible, multiple-rowed, slightly curved, the posterior rows of the jaw teeth longer than the anterior rows, the upper jaw teeth placed in a crescent-shaped band, the lower jaw teeth in a band resembling the form of a horse-shoe; vomerine teeth placed in 2 thin, separated, transverse small bands; maxillary barbels supported by a bony rod, not or hardly shorter than the eye, overreaching the base of the pectoral fins and in younger fishes generally reaching the anterior anal rays; lower jaw barbels thin, inserted under the angle of the mouth or hardly before the angle of the mouth, generally shorter than the eye; mouth oblique, mouth broader than long, length contained 2⅔ to 3 times in length of head; lips broad towards the angle of the mouth; ventral part of the lower jaw has slightly conspicuous pores placed in longitudinal series; gill cover smooth, generally with 2 slightly conspicuous, diverging ridges; scapular bone short, obtuse, rounded; anterior part of the lateral line is feebly curved, then straight, characterized by touching small tubes; axillary slime pore not conspicuous. Dorsal fin thin, acutely or slightly acutely rounded, the 2 anterior rays longer than the other rays and the postocular part of the head; pectoral fins obtuse, rounded, a little shorter than the head, spine thin, the bony part not or a little longer than the postocular part of the head, posterior side denticulate; ventral fins slightly acutely or slightly obtusely rounded, about twice as short as the pectoral fins; anal fin about 3 times as long as the head, hardly or not joined with the base of the caudal fin; caudal fin fairly deeply obliquely emarginate, generally with obtusely rounded lobes, the upper one longer than the lower one, contained 6½ to 7 times in the length of the entire body. Upper part of the body softly to deeply olive-coloured, lower part pearly, everywhere frequently with dark speckles. The postscapular area has a round, violet spot, placed at a distance of its entire length from the gill opening and traversed by the lateral line in its upper half. Fins softly rosy- or yellowish-hyaline, more or less densely with dark speckles. Caudal fin has a transverse, curved, violet band towards the base.

B. 12 or 13. D. 1/3. P. 1/12 to 1/14. V. 1/7 or 1/6. A. 57 to 66. C. 1/15/1 or 2/15/2 including the shorter ones alongside

Syn. *Weekvis* Nieuhof Gedenkw. Zee- en Lantr. fig.
Witvisch Nieuh. ibid. p. 276.
Ikan Marate Betina Valent. Oost Ind. III p. 507 fig. 513?
Pabia ou Carbauw Ren. Poiss. Mol. tab. fig. 91?
Silurus bimaculatus Bl. Ausl. Fisch. VIII p. 24 tab. 364, Bl. Schn. Syst, posth. p. 278 377 ?, CV. Poiss. XIV p. 267, Blkr, Verh. Bat. Gen. XXI, I Silur. batav. consp. p. 19. McClell. Coll. Fish. Chusan Calc. Journ. Nat. Hist. IV p. 401?

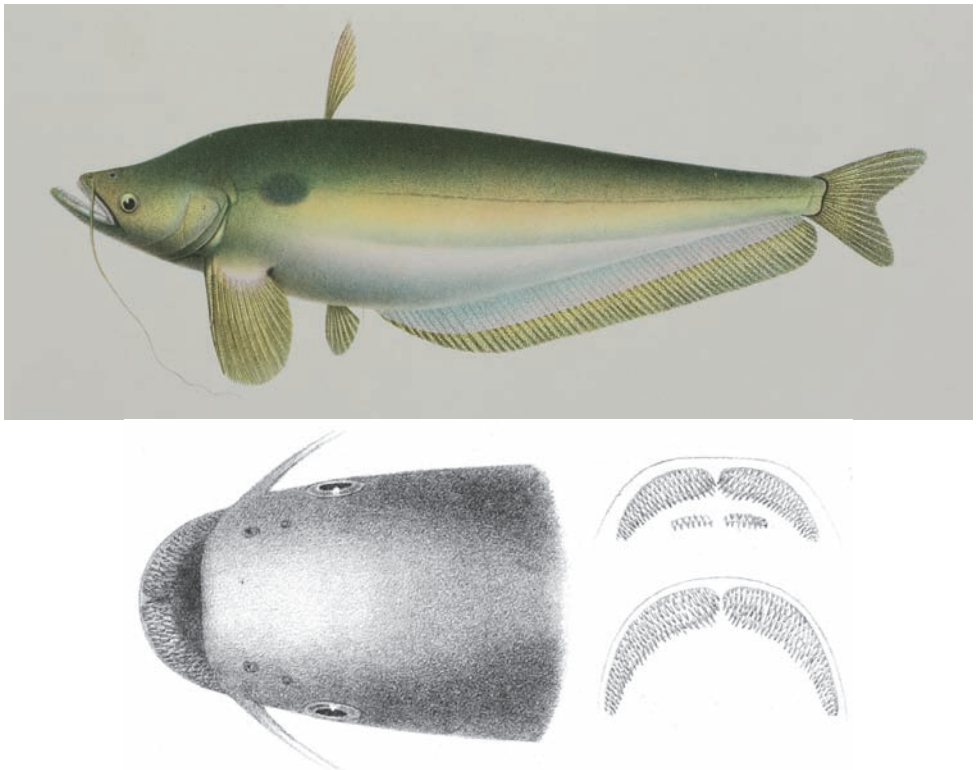

Fig. 66. *Pseudosilurus bimaculatus* Blkr. [In Atlas as *Callichrous bimaculatus* Blkr.]

Silurus binotatus Van Hass. Mss.
Callichrus bimaculatus Swains. Nat. Hist. Fish. II p. 306.
Silure à deux taches CV. Poiss. XIV. p. 267.
Wallago bimaculatus Blkr, Nat. T. Ned. Ind.
Sewaley Tranquebar.
Limpok Mal. Jav.

Hab. Java (Batavia, Tjikao, Gempol), in rivers.
Sumatra (Benculen), in rivers.
Borneo (Pengaron), in rivers.

Length of the 30 specimens l06''' to 284'''.

Remark. The common Limpok is very common in the rivers of the residence Batavia, but is little appreciated as food, even by the lower class of the population, so that it is brought to the market only rarely when the catches by number and sizes of the specimens become of some importance to sell them for drying and salting. It does not seem to become larger than 3 decimeter, that is I have never seen specimens larger than the largest in my collection. However, as a rule the specimens caught have a length of between 150 and 200 mm.

Stomach and intestinal canal and swimbladder are built as in Wallogo Russelli Blkr. The Limpok mainly feeds on small cyprinids.

Although I do not doubt that the Limpok is the same species as Silurus bimaculatus of the large Histoire naturelle des Poissons, I believe that it is uncertain whether Silurus bimaculatus of Bloch is identical with that of Mr Valenciennes.

Nieuhof apparently knew the Limpok and described it under the name "Witfisch" [White fish] and depicted it under the name "Weekvisch" [Weak fish]. His figure can be recognised very well and even shows the postscapular spot. However, one of the upper jaw barbels wrongly gives the idea as if it originates from the lower jaw. Nieuhof's description goes as follows. [Translated] "White fish is about as large as the Whiting. The belly hangs down roundish, the back is straight, the mouth is directed upwards. The caudal fin is split like a fork. On the back is a fin and from the 279 belly till the caudal fin it is full of small fins (the anal fin rays). The body is striped like the bones of a fish. Anterior to the mouth two long appendages are found. This fish has a very sweet taste; though it tastes better when cooked than when it is baked."

It is less certain whether the figure of Valentijn, referred to in the synonymy, concerns the species in question, and the same can be said of the referred figure of Renard, which seems to be copied from Valentijn, unless both figures are copies of an unpublished figure. Valentijn under the male of the "Marate-visch", gives a figure which rather represents a Notopterus, and as the female of the same species [He gives], the aforementioned figure, which because of its upper jaw barbels, pectoral fin spine and long anal fin, gives every cause to take it for a very defective representation of Pseudosilurus bimaculatus. Indeed, Valentijn, who compiled his work mainly at Ambon, where both the freshwater Siluroïds and the Notopterines are not found, could have known this species only from defective drawings or from unprecise memories from Java.

As far as Bloch's Silurus bimaculatus is concerned, if the Malabaric species indeed might be the same as the species in question, its figure is very imprecise, as it has the body much too slim, the head too small and the postscapular spot not at all present, etc. It also seems to me that the species from Chusan mentioned by Mr MacClelland as a variety of Silurus bimaculatus Bl., can also be considered as a proper species, as it is mentioned that all four barbels are shorter than the head.

In earlier contributions I have also mentioned Lacepède's Ompok siluroide (Poiss. V. p. 50) in the synonymy of Silurus bimaculatus CV. However, since I discovered so numerous forms of Schilbeines without dorsal fin or only provided with a dorsal fin thread, I have changed my opinion and now I believe that Lacépède indeed had before him a species, which belongs to one of my genera without dorsal fin and indeed to the genus Phalacronotus.

The limpok is still more closely related to various of its congeneric 280 species from South Asia than to Pseudosilurus leiacanthus. I am in the position to compare Pseudosilurus leiacanthus with two closely related Bengalese species, which Mr Cantor sent me some years ago, and which are already known to science under the names Wallago or Silurus anastomus and microcephalus. Both species surely differ from Pseudosilurus leiacanthus by a slimmer body, which is very apparent when specimens of similar lengths are compared. Moreover Pseudosilurus anastomus has only 50-52 anal fin rays, whereas this number in Pseudosilurus bimaculatus rises to 66 and even in small specimens never is less than 57. Moreover in Pseudosilurus anastomus the lower jaw barbels are as long as or longer than length of head posterior to

the eye, whereas in the Limpok they are hard to see and not longer or shorter than the eyes[1].

Pseudosilurus microcephalus Blkr indeed has at least the same number of anal fin rays as the Limpok, but here also the barbels are much longer, whereas the head is remarkably smaller and fits about 5½ times in length of body without the caudal fin. On the contrary in specimens of the Limpok with an equal size as my specimens of Pseudosilurus microcephalus the head fits only 4⅔ to 4¾ times in the same length.

With regard to the remaining related species I can only mention by the way, what the existing descriptions teach concerning them. However, in those descriptions almost everything that could give proper information on specific differences, is lacking.

Silurus malabariensis CV. would have 15 branchiostegal rays and strongly serrated pectoral fin spines.

Silurus pabda Buch. seems to have the lower jaw extremely high, the body covered with numerous irregular spots, the eyes more superior placed, and both the upper jaw- and the 281 lower jaw barbels longer and 54 anal fin rays.

Silurus canio Buch. or Silurus mysoricus CV. would have the body slimmer than Pseudosilurus bimaculatus, the pectoral fin spines not serrated, 72 to 76 anal fin rays and length of head almost 6 times in length of body.

Silurus punctatus Cant. seems to be recognisable by two longitudinal rows of black spots, which are placed on the flank below the lateral line.

Finally in Silurus sinensis McCl., the upper jaw barbels would be no longer than the head, the pectoral fin spines would be serrated, and the anal fin spines would have 54 rays[2].

Pseudosilurus xanthosteus and Pseudosilurus cochinchinensis belong to another type, recognisable by a complete caudal fin that is confluent with the anal fin.

Pseudosilurus leiacanthus Blkr.
Atl. Silur tab. XLI fig. 1. [fig. 2.]
Smooth-spined Limpok

A Pseudosilurus with an elongate or nearly elongate, compressed body, body width contained about 1½ times in its depth, body depth contained 5 to 4⅗ times in its length without, and 5⅔ to 6½ times in its length with caudal fin. Head depressed, acute, contained nearly 5 to 5⅔ times in length of body without, and 5¾ to nearly 7 times in length of body with caudal fin; depth of head contained nearly 2 to 1⅘ times in its length, length [width] 1⅗ to 1⅕ times, depth of the head above the angle of the mouth contained a little more than twice in its length; eyes nearly superior, eye diameter contained 6 to 7 times in length of head, distance between the eyes 3¼ to 4 times their diameter; rostro-dorsal profile sloping downwards, straight, nowhere concave; only the posterior part of the head shield is covered with muscles, it is traversed by a longitudinal groove reaching the short, thin, subcutaneous supraoccipital crest; snout depressed, rostral profile truncate; nostrils separate, the anterior ones close to the

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[1] At present I doubt very much whether my Pseudosilurus anostomus really is the same species as Silurus anostomus CV. (Poiss. XV p. 269 fig. 410). This species does seems to have a remarkably higher body and to possess 58 to 60 anal fin rays.

[2] Silurus chinensis Lac., maybe the same species as Silurus sinensis McCl., according to the figure given by Lacépède has numerous dark round spots on the anal fin.

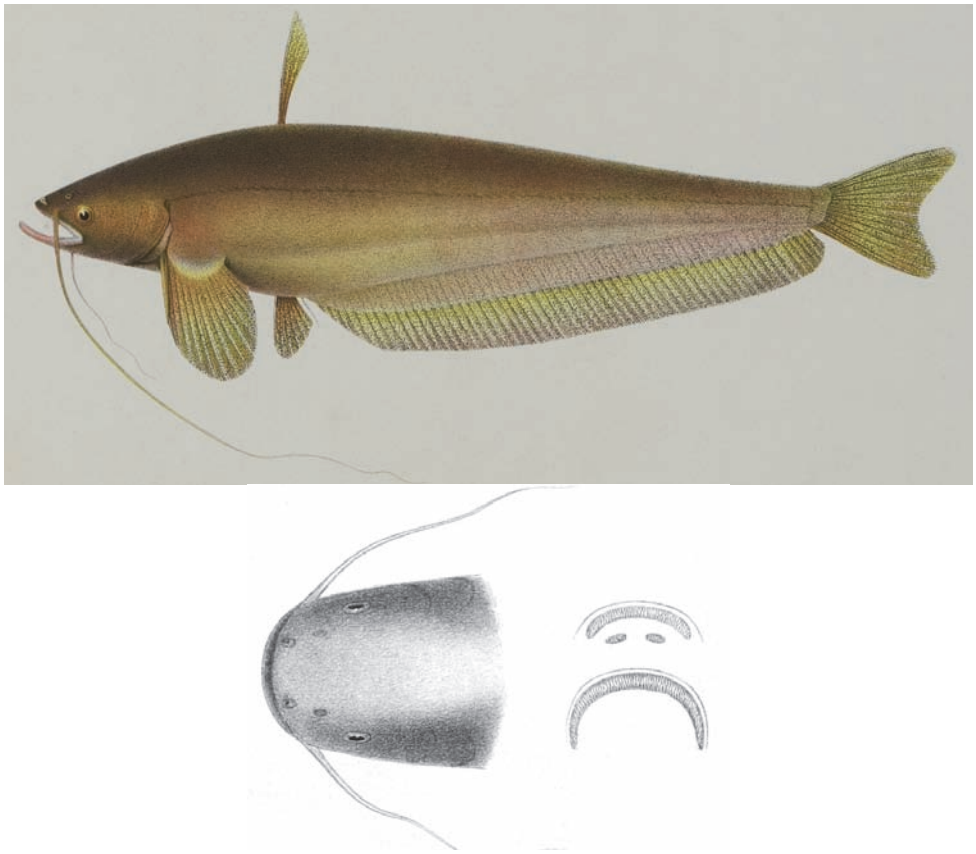

Fig. 67. *Pseudosilurus leiacanthus* Blkr. [In Atlas as *Callichrous leiacanthus* Blkr.]

anterior edge of the snout, tubular; lower jaw protruding a little beyond the upper jaw; teeth small, conspicuous, multiple-rowed, the posterior rows of jaw teeth longer than the anterior rows, feebly curved, mobile, the upper jaw teeth placed in a nearly crescent-shaped band, the lower jaw teeth in a band resembling the form of a horse-shoe; vomerine teeth placed in 2 thin, separated, transverse small bands; maxillary barbels supported by a bony rod, not or hardly shorter than the eye, reaching the second fifth part of the anal fin; lower jaw barbels thin, inserted on the skin of the chin, under or a little behind the angle of the mouth, a little longer or not or hardly shorter than the head; mouth oblique, about twice as broad as long, length contained 3 times to a little more than 3 times in length of head; lips broad towards the angle of the mouth; ventral part of the lower jaw has slightly conspicuous pores placed in longitudinal series; gill covers smooth, 282 without ridges or conspicuous stripes; scapular bone short, obtuse, rounded; lateral line feebly curved anteriorly, then straight, characterized by touching small tubes; axillary slime pore not conspicuous; dorsal fin thin, acutely rounded, longer than the postocular part of the head; pectoral fins obtuse, rounded, a little longer than the head, spine thin, the bony part not or hardly longer than the postocular part of the head, posterior side without or with hardly visible small teeth; ventral fins slightly acutely rounded, more than twice as short as the pectoral fins; anal fin more than 3 times as long as the head, confluent with the base of the caudal fin; caudal fin obliquely moderately emarginate, with slightly acutely rounded lobes, the upper lobe longer than the lower lobe, contained 5½ to 6⅕ times in the length of the entire body. Colour of upper part of the body dark or olive, the lower part has a softer colour. Belly pearly or dark, fins dark or yellow-

ish, speckled with a dense dark colour. Caudal fin with a small transverse, curved, dark violet band towards the base; a postscapular, round violet-black spot is sometimes present.

B. 11. D. 113. V. 1/6 or 1/7. A. 54 to 57. C. 2/13/1 or 2/13/1 or 2/12/1 including the shorter ones alongside.

Syn. *Silurus* sp. nov. Blkr, Bijdr. ichth. Banka, Nat. T. Ned.lnd. III p. 443.
Wallago leiacanthus Blkr, Nalez. ichth. Banka, Nat. Tijdschr. Ned. Ind. V p. 189.
Dawon bambu Indig. Bencul.

Hab. Sumatra (Benculen), in rivers.
Banka (Marawang), in fresh water.

Length of the 4 specimens 87‴ to 189‴.

Remark. Among the species of Pseudosilurus with a bulging lower jaw, forked caudal fin and free anal fin, the species in question is easily recognisable by its convex profile and unserrated pectoral fin spine. Compared to Pseudosilurus bimaculatus it moreover distinguishes itself by a more slender body, much longer lower jaw barbels, remarkably smaller and more closely packed teeth, more superior placed eyes, a smaller head, etc. My specimens are all brown, but this colour, caused by the numerous small spots that cover the body, probably is not constant and only present in individuals occurring in turbid or muddy places, just as it is the case in many other species of various genera and families.

Until recently I knew this species only from the island of Banka. When this publication was in press I also received a small specimen from Mr Van Ophuysen, caught in the freshwaters of Benkoelen. On p. 40 in the column Sumatra therefore has to be indicated that Pseudosilurus leiacanthus also occurs on this island, whereas on p. 43 the only species that 283 is mentioned there for the Island of Banka must be removed. The figures in the columns Sumatra on p. 41 of the totals of Siluroïds and Silures for the same reason have to be increased with 1 and be changed to 53 and 56.

Kryptopterus Blkr.
Backthread fish

A simple dorsal fin, rudimentary, filiform. Anal and caudal fins not confluent. Four upper jaw and lower jaw barbels. Teeth acute, multiple-rowed, the jaw teeth placed in a curved band, the vomerine teeth in a transverse, uninterrupted band. Branchiostegal membrane with 10 to 12 rays. Interbranchial membrane with a deep incision. Eyes covered with head skin, placed behind the mouth corner. Anterior nostrils tubular. Jaws equal or the upper one longer than the lower one.

Remark. My cabinet possesses 7 well characterized species of Schilbeïnes, in which the dorsal fin is reduced to a simple or composite short little thread. Usually this thread is composed of three or four rudimentary rays, but these lay so closely against the first one, that without investigating it with a lens one would consider it as a simple one. The fin membrane, in the remaining genera still stretched between the rays and giving the fin a somewhat fan-like shape, is lacking here or only serves to unite the rudimentary rays to a bundle.

In the revision of my Silurichthyoïds I originally wanted to unite the 7 species in question in one genus, but since then I have brought them on the basis of the different number of barbels and peculiarities in the dentition under two genera, which I have

called Kryptopterus and Krypteropterichthys to indicate in some measure their special characters and their mutual relationship.

The genus Kryptopterus can be recognized by the presence of the lower jaw barbels, which are lacking in Kryptopterichthys. In contrast to Kryptopterichthys it also has the particularity, that the group of vomerine teeth is indeed band-shaped and occupies a larger or smaller part of the width of the palate, whereas in 284 all my four species of Kryptopterichthys the vomerine teeth occupy only a small elongate-oval spot. The two gerera have in common posterior placed eyes, a lower jaw that is not bulging in front of the upper jaw, a free anal fin and a deeply forked caudal fin.

I know three species of Kryptopterus: Kryptopterus mononema, Kryptopterus limpok and Kryptopterus micropus, which can be easily recognised with the following scheme, although they also differ in numerous other characters.

1. Lower jaw barbels shorter than the eye. Premaxillary teeth placed in a band in the form of a horseshoe.

Kryptopterus micropus Blkr.

II. Lower jaw barbels much longer than the head. Premaxillary teeth placed in a slightly curved or nearly crescent-shaped band.
   a. Rostro-dorsal profile very concave. Upper jaw barbels reaching the posterior quarter of the anal fin.

Kryptopterus limpok Blkr.

   b. Rostro-dorsal profile more or less straight. Upper jaw barbels reaching anterior part of the anal fin.

Kryptopterus mononema Blkr.

Kryptopterus micropus Blkr.
Atl. Silur. tab. XLI fig. 3.
Small-finned backthread fish

A Kryptopterus with an elongate, compressed body, body width contained 1⅓ to 1⅔ times in its depth, body depth contained 5⅓ to 4⅗ times in its length without, and 6¼ to 5½ times in its length with caudal fin. Head depressed, acute, contained 5⅓ to 6¼ times in length of body without, and 6⅓ to 7⅓ times in length of body with caudal fin; depth of head contained 1½ to 1⅔ times in its length, width 1⅗ to 1⅓ times, depth of the head above the angle of the mouth contained 2⅓ to 2½ times in its length; eyes posterior, facing rather downwards than upwards, eye diameter contained about 3 times in length of head, eyes less separated at the upper than at lower margin, distance between the eyes 1½ to 1⅔ times their diameter; rostro-dorsal profile sloping downwards a little, nearly straight, only sometimes slightly concave at the crown. Head shield 285 entirely divided by a longitudinal groove reaching the triangular, acute, short supraoccipital crest, which is traversed by a broad groove; snout slightly depressed, convex, rostral profile obtusely rounded; nostrils separate, the anterior ones close to the anterior edge of the snout, with short tubes; upper jaw longer and broader than the lower jaw; teeth small, acute, multiple-rowed, nearly equal, jaw teeth placed in a band in the form of a horseshoe or resembling that form, broader at the sides than in the middle; vomerine teeth placed in a thin, feebly curved band, longer than the pupil; maxillary barbels thin, not or hardly reaching the pectoral fin; lower jaw barbels inserted on the chin, a little before the angle of the mouth, very thin, shorter than the eye; mouth much less than twice as

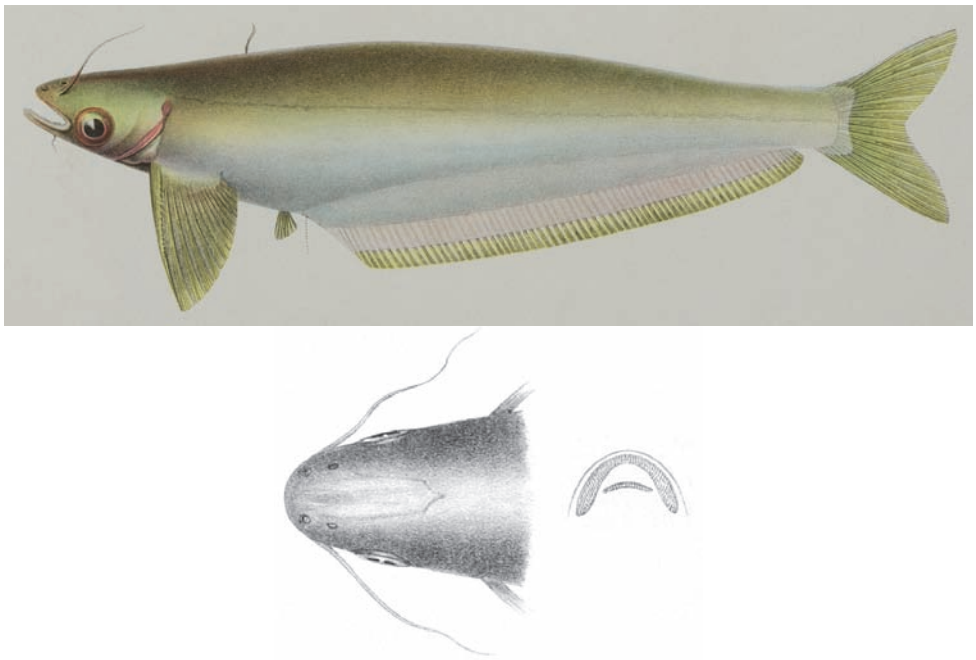

Fig. 68. *Kryptopterus micropus* Blkr.

broad as long, length contained 2⅔ to 3 times in length of head; lips thin; chin without conspicuous pores; gill cover without conspicuous ridges: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous; dorsal fin filiform, short, composed of 2 or 1 fused, simple rays, not or hardly longer than the eye, and 2 or 1 rudimentary, very short rays; pectoral fins acute, convex, much longer than the head, spine thin, the bony part longer or no shorter than the entire head, posterior side with slightly visible small teeth; ventral fins very small, 6 or 7 times as short as the pectoral fins; anal fin less than 4 times as long as the head, ending before the base of the caudal fin; caudal fin with a deep incision and acute, nearly equal lobes, contained 6 to 7 times in the length of the entire body. Colour of upper part of the body soflty olive, lower part pearly. Fins yellowish-hyaline, more or less with dark speckles. No postscapular spot, or band on the caudal fin.

B. 10 or 11. D. 1 or 2 united filaments and 1 or 2 rudimentary filaments. P. 1/13 to 1/15. V. 1/5 or 1/6. A. 64 to 70. C. 1/15/1 and shorter ones alongside.

Syn. *Silurus cryptopterus* Blkr, Nieuwe Bijdr. ichth. Borneo, Nat. Tijdschr. Ned. Ind. I p. 270.

Hab. Sumatra (Palembang), in rivers.
Borneo (Bandjermasin, Sambas, Sintang), in rivers.

Length of the 24 specimens 80′″ to 190′″.

Remark. This species is easy recognisable by its eyes that are converging ventrally, by the lower jaw that is shorter than the upper jaw, horse shoe shaped bands of oral jaw teeth, very small ventral fins, long pectoral fin spines, short barbels, etc. The lower jaw barbels are so thin that they can only be observed with a strong magnifying lens and even then it is difficult. Those threads escaped my attention when I first described the species, however, now I possess numerous specimens, I find them constantly present. Less difficult is the observation of the indeed very small dorsal fin threads. Kryptopterus micropus seems to be very common on Borneo, which I gather from the numer-

ousness with which they are present in my collections from Borneo 286 and the various drainage-area's (Barito, Kapoeas, Sambas) in which they are caught. From Sumatra I received only one specimen of 156 mm.

Kryptopterus limpok Blkr.
Atl. Silur. tab. XLIII fig. 2.
Long-threaded backthread fish

A Kryptopterus with an elongate, compressed body, body width contained 1⅔ times to twice in its depth, body depth contained 4½ to 5½ times in its length without, and 5⅓ to 6⅗ times in its length with caudal fin. Head depressed, acute, contained 6½ to 6⅘ times in length of body without, and 7¾ to 8⅖ times in length of body with caudal fin; depth of head contained 1½ to 1⅓ times in its length, width 1⅖ to 1¼ times, depth of the head above the angle of the mouth contained about 2⅔ to times in its length; eyes posterior, eye diameter contained 3 to 3½ times in length of head, eyes no less separated at the upper than at lower margin, distance between the eyes 1¾ to 2 times their diameter; rostro-dorsal profile very concave at the head, very convex at the nape. Head shield entirely divided by a longitudinal groove reaching the triangular-lanceolated supraoccipital crest, which is traversed by a broad groove; snout depressed, feebly convex, rostral profile very obtusely rounded; nostrils separate, the anterior ones close to the anterior edge of the snout, with short tubes; jaws equal; teeth small, acute, mutiple-rowed, nearly equal, jaw teeth placed in a thin, crescent-shaped band, vomerine teeth in a short, transverse, hardly curved band; maxillary barbels reaching the posterior fourth part of the anal fin; lower jaw barbels inserted on the skin of the chin, before the angle of the mouth, far overreaching the anterior rays of the anal fin; mouth about twice as broad as long, length contained about 4 times in length of head; lips broad towards the angle of the mouth; chin without conspicuous pores; gill cover divided in three parts by 2 low, diverging, conspicuous ridges: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous; dorsal fin filiform, short,

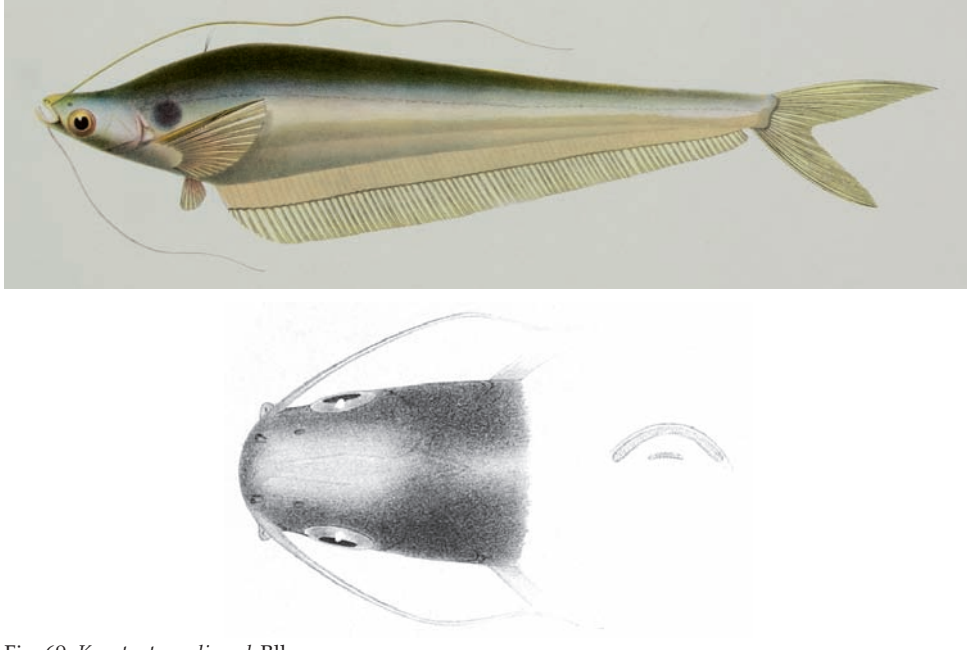

Fig. 69. *Kryptopterus limpok* Blkr.

composed of 2 touching, simple, unequal rays, fused at the base, not or hardly longer than the eye; pectoral fins convex, slightly acute or slightly obtuse, longer than the head, spine robust, the bony part a little shorter than the head, the anterior edge concave, posterior side denticulate; ventral fins slightly acutely rounded, about 3 times as short as the pectoral fins; anal fin about 5 times as long as the head, ending before the base of the caudal fin; caudal fin with a deep incision and acute lobes, the upper lobe a little longer than the lower lobe, contained 5⅓ to 7 times in the length of the entire body. Colour of upper part of the body olive, lower part pearly. The postscapular area has a round, violetish, nearly subcutaneous spot. Fins yellowish-hyaline, more or less with dark speckles. Caudal fin has a curved, transverse, violetish band at the base.

B. 11 or 12. D. 2 united filaments. P. 1/14. V. 117 or 118. A. 76 to 88. C. 1/14/1 and shorter ones alongside.

Syn. *Silurus limpok* Blkr, Diagn. Nieuw. Vischs. Sumatra Tient. I to IV, Nat. Tijdschr. Ned. Ind. III p. 583.

Hab. Sumatra (Palembang), in rivers.
Borneo (Pontianak, Kahajan), in rivers.

Length of the 6 specimens 132‴ to 271‴.

Remark. Kryptopterus limpok on Sumatra and Borneo seems to replace Kryptopterus 287 mononema from Java. Both species can easily be distinguished from each other by the difference in habitus, mainly brought about by the direction of the snout-back profile, which in Kryptopterus mononema is very slightly concave. Moreover, the barbels in the species in question are longer and the head is larger relative to the body without the caudal fin, whereas the opercular crests, which are lacking in Kryptopterus mononema, are distinctly visible. The postscapular area is characterized by a violet spot, a spot that is also lacking in Kryptopterus mononema.

Kryptopterus mononema Blkr.
Atl. Silur. tab. XLIII fig. 1.
Javanese backthread fish

A Kryptopterus with an elongate, compressed body, body width contained nearly twice in its depth, body depth contained about 5⅕ times in its length without, and about a little more than 6 times in its length with caudal fin. Head depressed, acute, contained about 7⅖ times in length of body without, and 9 to nearly 9 times in length of body with caudal fin; depth of head contained about 1½ times in its length, width about 1½ times, depth of the head above the angle of the mouth contained 2¾ to 3 times in its length; eyes posterior, eye diameter contained about 4 times in length of head, eyes separated not less at the upper than at lower margin, distance between the eyes about 2½ times their diameter; rostro-dorsal profile sloping downwards, more or less straight, only slightly concave at the crown. Head shield entirely divided by a longitudinal groove reaching the triangular, short supraoccipital crest, which is traversed by a broad groove; snout slightly depressed, convex, rostral profile very obtusely rounded; nostrils separate, the anterior ones close to the anterior edge of the snout, with short tubes; jaws equal; teeth small, acute, mutiple-rowed, nearly equal, jaw teeth placed in a thin, crescent-shaped band, vomerine teeth in a short, transverse, hardly curved band; maxillary barbels reaching or nearly reaching the second fourth part of the anal fin; lower jaw barbels inserted on the skin of the chin, before the angle of the mouth, overreaching a little the base of the ventral fins; mouth about twice as broad as long, length contained 3½ to 4 times in length of head; lips broad towards the angle of the mouth; chin without conspicuous pores; gill cover without conspicuous ridges: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous; dorsal fin filiform, short, composed of 2 touching, simple, unequal rays, fused at the base, not or hardly longer than the eye; pectoral fins broad, convex, longer than the head, spine medium-sized, the bony part hardly shorter than

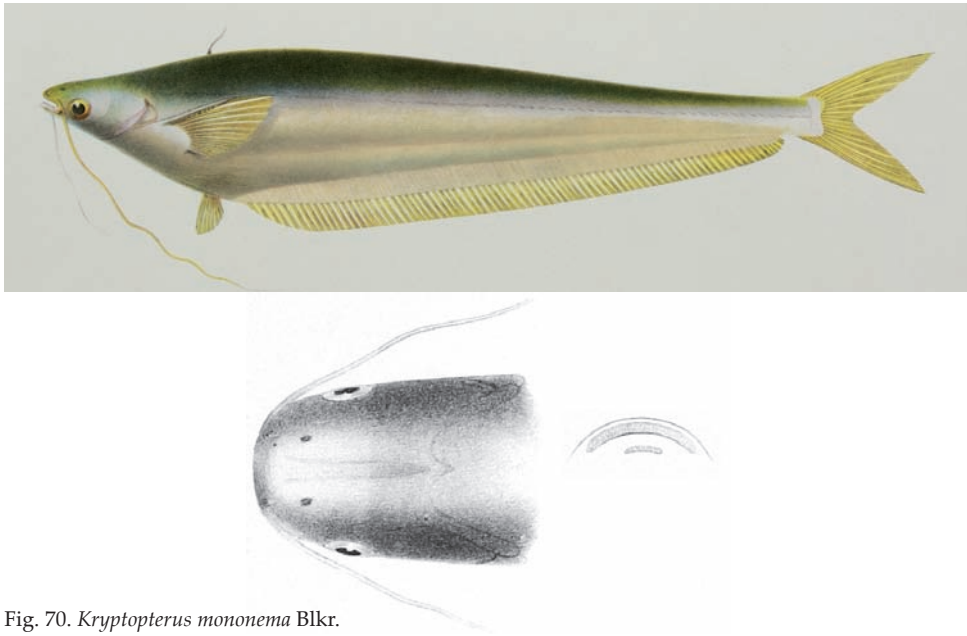

Fig. 70. *Kryptopterus mononema* Blkr.

the head, posterior side with hardly conspicuous small teeth; ventral fins slightly acute or rounded, about 3 times as short as the pectoral fins; anal fin about 5 times as long as the head, ending before the base of the caudal fin; caudal fin with a deep incision and acute lobes, contained 6½ to 6⅔ times in the length of the entire body. Colour of upper part of the body softly olive, lower part pearly. Fins yellowish-hyaline, more or less with dark speckles. No conspicuous postscapular spot, or small band on the caudal fin.

B. 10 or l1. D. 2 united filaments P. 1/14. V. 1/7. A. 76 to 79. C. 1/15/1 and shorter ones alongside.

288 Syn. *Silurus mononema* Blkr, Verh. Bat. Gen. XXI, I, Nieuwe Bijdr. Silur. Java p. 8.
Limpok Javan.

Hab. Java (Surakarta), in rivers.

Length of the 2 specimens 250‴ and 272‴.

Remark. I discovered this species in 1846 in Soerakarta, where the two described specimens were caught in the river Pepeh. The fin thread seems to be simple, but after more detailed research it appears to consist of two united, and at their bases strongly connected threads, of which the posterior one is shorter than the anterior one. The same can be perceived in Kryptopterus limpok and Kryptopterus micropus. The species in question is intermediate between these two. It has the little curved profile of Kryptopterus micropus, but in all other respects, barbels and fin shape, answers more to Kryptopterus limpok. The barbels although much developed, however are still remarkably shorter than in Kryptopterus limpok. Moreover, the eyes are also smaller and less inferior placed and in none of my specimens is a trace visible of the violet postscapular spot.

Kryptopterichthys Blkr.
Smoothback

A simple dorsal fin, rayed, rudimentary, filiform or nearly filiform. Anal and caudal fins not joined. Four upper jaw barbels. Teeth acute, multiple-rowed, the jaw teeth placed in a curved band, the vomerine teeth in a short group. Branchiostegal membrane with 8 to 9 rays. Interbranchial membrane has a deep incision. Eyes covered with head skin, placed behind the mouth corner. Anterior nostrils tubular. Upper jaw protruding beyond the lower jaw.

Remark. However closely related to Kryptopterus and of that chiefly differing only by the absence of lower jaw barbels and the compression of the vomerine teeth in a short very small group, Kryptopterichthys has, at least judging from the four species known to me, moreover a slightly different habitus, brought about by a body that is more compressed. The 289 four species present in my cabinet, seem to remain smaller than the species of Kryptopterus, as none of my numerous specimens reaches the length of the smallest of my species of Kryptopterus (Kryptopterus micropus).

All my four species of Kryptopterichthys have in common, that the upper jaw, when the mouth is closed, extends a little before the lower jaw, that the eyes are posteriorly placed, the caudal fin rather deeply forked, the anal fin free, the pelvic fins very small and the barbels reaching to or beyond the anal fin origin. Although all are closely related, they differ only in characters found in the relative heigth of the body, in the relative size of the head, the shape of the profile, the length of the barbels, and the presence or absence of the postscapular spot, etc.

On the basis of these characters the species can be identified with the following scheme.

I. Head contained 6¾ to 8 times in the length of the total body. Rostro-dorsal profile concave.
   a. Body width contained 3⅓ to 3½ times in its length without caudal fin. Violet postscapular spot present. Barbels reaching the anterior rays of the anal fin.

Kryptopterichthys palembangensis Blkr.

   b. Body depth contained 3¾ to 4 times in its length without caudal fin. No postscapular spot. Barbels reaching the second or third quarter of the anal fin.

Kryptopterichthys Laïs Blkr.

   c. Body depth contained 4 to 4⅗ times in its length without caudal fin. Violet postscapular spot present. Barbels generally reaching the ventral fins, more rarely the anal fin.

Kryptopterichthys bicirrhis Blkr.

II. Head contained about 5½ times in the length of the total body. Rostro-dorsal profile sloping more or less straight downwards.
   a. Body depth contained about 4⅔ times in its length without caudal fin. No postscapular spot. Barbels reaching the second third part of the anal fin.

Kryptopterichthys macrocephalus Blkr.

290 *Kryptopterichthys palembangensis* Blkr.
Atl. Silur. tab XLII fig. 3.
Palembang's smoothback

A Kryptopterichthys with an elongate or nearly elongate, compressed body, body width contained twice to a little more than twice in its depth, body depth contained 3½ to 3⅓ times in its length without, and 4⅖ to a little more than 4 times in its length with caudal fin. Head depressed, slightly acute, contained 5⅗ to 6 times in length of body without, and 6¾ to a little more than 7 times in length of body with caudal fin; depth of head contained about 1¾ times in its length, width 1⅖ to 1¼ times, depth of the head above the angle of the mouth contained 2¼ to 2½ times in its length; eyes posterior, facing downwards rather than upwards, eye diameter contained about 2½ times in length of head, eyes less distant at the upper than at lower margin, distance between the eyes a little more than once to 1½ times their diameter; rostro-dorsal profile concave at the crown, convex at the nape. Head shield entirely divided by a longitudinal groove reaching the triangular, short, acute supraoccipital crest, which is traversed by a groove; snout slightly depressed, convex, rostral profile obtusely rounded; anterior nostrils close to the edge of the snout, with short tubes; upper jaw a little longer and broader than the lower jaw; teeth small, acute, mutiple-rowed, nearly equal, upper jaw teeth placed in a crescent-shaped band, lower jaw teeth in a band resembling the form of a horseshoe; vomerine teeth in a small group, hardly longer than broad; barbels thin, reaching or nearly reaching the anterior rays of the anal fin; mouth about twice as broad as long, length contained 3½ to 4 times in length of head; lips thin; chin without conspicuous pores; gill cover without conspicuous ridges: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous. Dorsal fin filiform, the filament hardly shorter than the eye, and composed of 2 or 1 rudimentary rays, touching the filament; pectoral fins slightly acute or slightly obtuse, convex, much longer than the head, spine thin, the bony part a little or hardly longer than the head, posterior side without small teeth or with small teeth that are only visible with the aid of a lens; ventral fins small, rounded, more than 4 times as short as the pectoral fins; anal fin about 4 times as long as the head, ending before the base of the caudal fin; caudal fin with a deep incision and acute lobes, the upper one a little longer than the lower one, contained 5½ to 5⅔ times in length of body. Colour of upper part of the body softly olive-

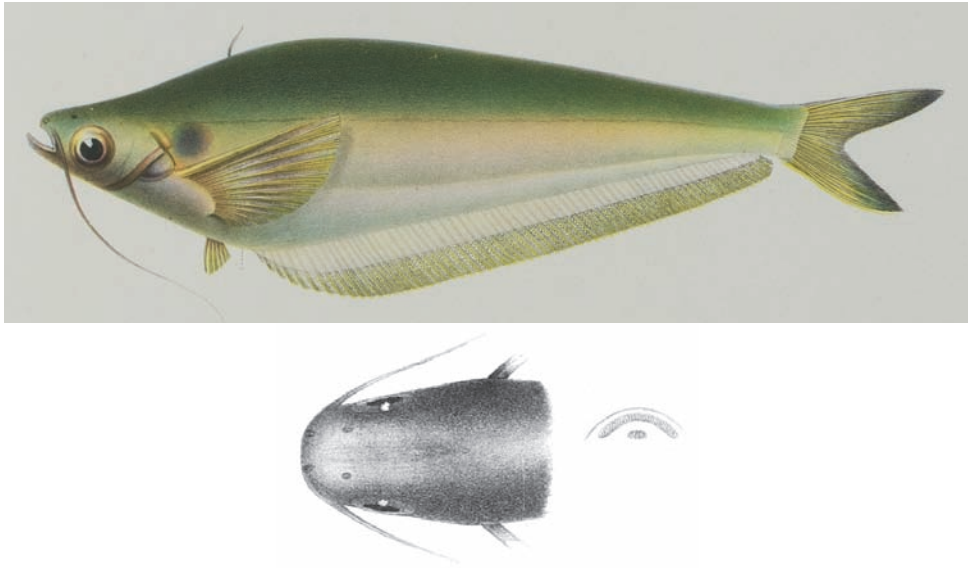

Fig. 71. *Kryptopterichthys palembangensis* Blkr.

hyaline, lower part pearly. Postscapular area has a round, violet, nearly subcutaneous spot. Fins are yellowish-hyaline, more or less with dark speckles.

B. 8 or 9. D. fil. 1 and 2 or 1 rudimentary P. 1/11 or 1/12. V. 1/5. A. 61 to 70. C. 1/15/1 and shorter ones alongside.

Syn. *Silurus palembangensis* Blkr, Diagn. beschr. vischs. Sumatra Tient. I to IV, Nat. Tijdschr. Ned. Ind. III p. 584.

Hab. Sumatra (Palembang, Lahat), in rivers.

Length of the 7 specimens 130‴ to 169‴.

Remark. The Kryptopterichthys described here in relationship is intermediate between Kryptopterichthys bicirrhis and Kryptopterichthys laïs. From the first mentioned species it differs by a much higher body and a more concave profile, from the last mentioned likewise by a higher body, shorter barbels and the presence of a round violet post-scapular spot.

291 Whereas I have received Kryptopterichthys bicirrhis from all large Sunda Islands, I received the present species only from the eastern part of Sumatra, Kryptopterichthys macrocephalus only from the western part of Sumatra and Kryptopterichthys laïs only from Borneo. It therefore seems that the three last mentioned species are restricted to Borneo or Sumatra and are endemic to these islands.

Kryptopterichthys laïs Blkr.
Atl. Silur. tab. XLII fig. 2.
Bornean smoothback

A Kryptopterichthys with a nearly elongate or elongate, compressed body, body width contained a little more than twice in its depth, body depth contained 4 to 3¼ times in its length without, and 5 to 4⅔ times in its length with caudal fin. Head depressed, slightly acute, contained 5½ to 6⅓ times in length of body without, and nearly 7 to 7⅓ times in length of body with caudal fin; depth of head contained 1⅖ to 1½ times in its length, width 1½ to 1⅓ times; eyes posterior, facing rather downwards than upwards, eye diameter contained about 2½ times in length of head, eyes less distant at the upper than at the lower margin, distance between the eyes 1½ to 1⅓ times their diameter; rostro-dorsal profile very concave at the head and the nape. Head shield entirely divided by a longitudinal groove reaching the triangular, short, acute supraoccipital crest, which is traversed by a groove; snout slightly depressed, convex, rostral profile obtusely rounded; nostrils separate, the anterior nostrils close to the anterior edge of the snout, with short tubes; upper jaw a little longer and broader than the lower jaw; teeth acute, small, mutiple-rowed, nearly equal, upper jaw teeth placed in a slightly curved band, lower jaw teeth in a band resembling the form of a horseshoe, vomerine teeth in a short group; barbels thin, reaching the second or third fourth part of the anal fin; mouth about twice as broad as long, length contained 3½ to 4 times in length of head; lips thin; chin without conspicuous pores; gill cover without conspicuous ridges: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous. Dorsal fin filiform, the filament hardly shorter than the eye, and composed of 3 to 1 very short, rudimentary rays, touching the filament; pectoral fins slightly acute or slightly obtuse, convex, much longer than the head, spine thin, a little shorter than the bony part, without small teeth or with small teeth that are only visible with the aid of a lens; ventral fins small, rounded, more than 4 times as short as the pectoral fins; anal fin about 4 times as short as the head, ending before the base of the caudal fin; caudal fin with a deep incision and acute lobes, nearly equal, contained 5½ to a little more than 6 times in the length of the entire body. Colour of upper part of the body slightly olive-hyaline, lower part pearly. Fins are yellowish-hyaline, more or less with dark speckles.

B. 8 or 9. D. fil. 1 and 3 to 1 rudim. P. 1/10 or 1/11. V. 1/5? A. 58 to 66. C. 1/15/1 and shorter ones alongside.

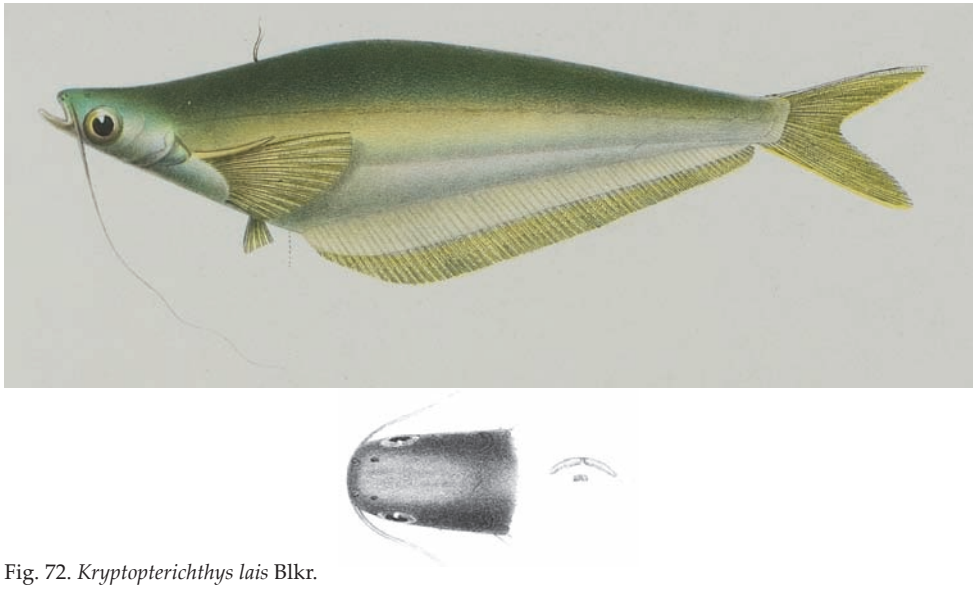

Fig. 72. *Kryptopterichthys lais* Blkr.

Syn. *Silurus laïs* Blkr, Vijfde Bijdr. ichth. Borneo, Nat. Tijdschr. Ned. Ind. II p. 428.
Hab. Borneo (Sambas, Bandjermasin, Kahajan), in rivers.
Length of the 3 specimens 75‴ to 125‴.

292 Remark. This species is remarkable by its physiognomy, caused by the concave snout-back line and by the fact that its back, which is still rising behind the dorsal fin thread, gives it the appearance of being humped. It is closely related to Krypteropterichthys bicirrhis, but it can be distinguished from that species apart from its very apparent peculiar profile, by a higher body and longer barbels and absence of a post-scapular spot. Regarding its profile it is more similar to Kryptopterichthys palembangenis, but it also differs enough from that species by a more slender body, longer barbels, and the absence of the upper axil- or post-scapular area spot.

Kryptopterichthys bicirrhis Blkr.
Atl. Silur. tab. XLII fig. 1.
Two-threaded smoothback

A Kryptopterichthys with a nearly elongate or elongate, compressed body, body width contained 1¾ to 2 times in its depth, body depth contained 4⅗ to 4 times in its length without, and 5¼ to 4¾ times in its length with caudal fin. Head depressed, slightly acute, contained 6 to 6½ times in length of body without, and a little more than 7 to 8 times in length of body with caudal fin; depth of head contained 1½ to 1¼ times in its length, width 1⅔ to 1⅓ times, depth of the head above the angle of the mouth contained 2⅓ to 2½ times in its length; eyes posterior, facing downwards rather than upwards, eye diameter contained 2⅓ to 3 times in length of head, eyes less distant at the upper than at lower margin, distance between the eyes about 1½ times their diameter; rostro-dorsal profile sloping downwards, only slightly concave at the crown. Head shield entirely divided by a longitudinal groove reaching the triangular, short, acute supraoccipital crest, which is traversed by a groove; snout slightly depressed, convex, ros-

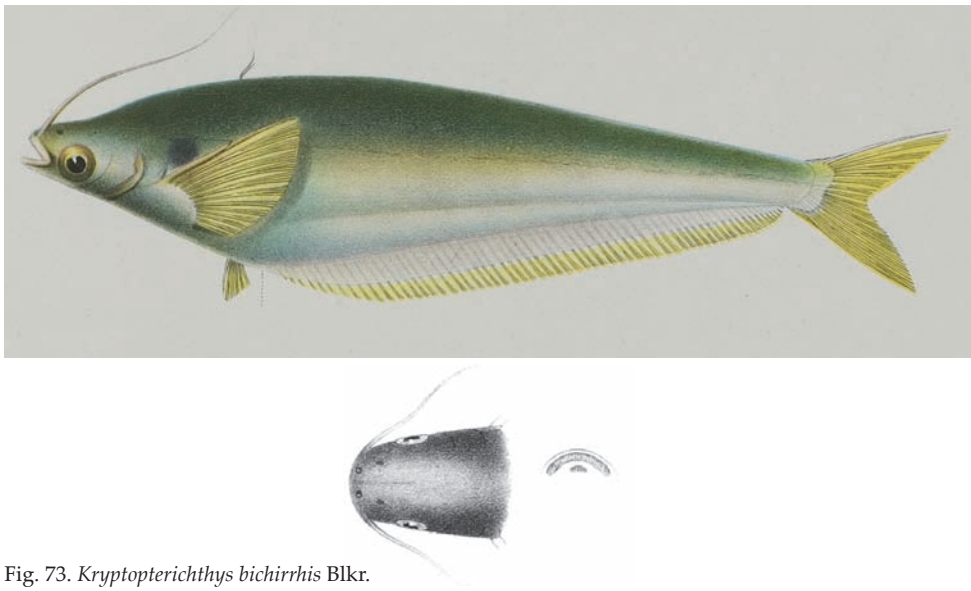

Fig. 73. *Kryptopterichthys bichirrhis* Blkr.

tral profile obtusely rounded; nostrils separate, the anterior nostrils close to the anterior edge of the snout, with short tubes; upper jaw a little longer and broader than the lower jaw; teeth small, acute, mutiple-rowed, nearly equal, upper jaw teeth placed in a crescent-shaped band, lower jaw teeth in a band resembling the form of a horseshoe; vomerine teeth in a short group, hardly longer than broad; barbels thin, much longer than the head, generally reaching the ventral fins, more rarely reaching the anal fin; mouth about twice as broad as long, length contained 3½ to 4 times in length of head; lips thin; chin without conspicuous pores; gill cover without conspicuous ridges: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous. Dorsal fin filiform, the filament hardly shorter than the eye, and composed of 2 or 1 rudimentary rays, touching the filament; pectoral fins slightly acute or slightly obtuse, convex, much longer than the head, spine thin, the bony part generally a little shorter than the head, posterior side with hardly visible small teeth; ventral fins small, rounded, 4 to 5 times as short as the pectoral fins; anal fin about 4 times as long as the head, ending before the base of the caudal fin; caudal fin with a deep incision and acute lobes, nearly equal, contained 5½ to 6 times in the length of the entire body. Colour of upper part of the body softly olive-hyaline, lower part pearly. 293 The postscapular area has a round, violet, seemingly subcutaneous spot. Fins are yellowish-hyaline, more or less with dark speckles.

Syn. *Silurus bichirris* CV. Poiss. XIV p. 272 tab. 411, Blkr, Verh. Bat. Gen. XXI, I Sil. bat. p. 20, Nieuwe Bijdr. ichth. Born. Nat. Tijds. Ned. Ind. I. p. 271.
Silure à deux fils CV. Poiss. XIV p. 272 tab. 411.
Limpok Mal. Batav.

Hab. Java (Batavia, Gempol), in rivers.
Sumatra (Padang), in rivers.
Borneo (Bandjermasin, Sambas, Sintang), in rivers.

Length of the 25 specimens 88‴ to 157‴.

Remark. I now possess of this species a large series of specimens in an excellent state of preservation, which have allowed me to describe it in more detail than was possible in former days. The figure of Mr Valenciennes apparently was made after a specimen that was shrunken and discoloured by the preservation fluid, reason why

the transparency and smoothness of the fish cannot be observed there.

The species is economically of no importance. A very few times numerous specimens are found in Batavia and from one of these catches in a small side arm of the Tjiliwong river, I owe most of my specimens. This species indeed is the most widespread of its genus. It lives both in East Java and in West Java and both in Sumatra and in Borneo, and on the last island they occur in the eastern as well as in the central and the western part.

Kryptopterichthys macrocephalus Blkr.
Atl. Silur. tab. XLI fig. 2.
Large-headed smoothback

A Kryptopterichthys with an elongate, compressed body, body width contained about twice in its depth, body depth contained about 4⅔ times in its length without, and about 5½ times in its length with caudal fin. Head depressed, slightly acute, contained a little more than 5 times in length of body without, and a little more than 6 times in length of body with caudal fin. Depth and width of head contained about 1½ times in its length, depth of the head above the angle of the mouth contained about 2½ times in its length; eyes posterior, facing as much downwards as upwards, eye diameter contained about 3 times in length of head, eyes no less distant at the upper than at lower margin, distance between the eyes about 1¼ times their diameter; rostro-dorsal profile sloping downwards, more or less straight. Head shield entirely divided by a longitudinal groove 294 reaching the triangular, acute, short supraoccipital crest, which is traversed by a groove; snout slightly depressed, convex, rostral profile obtusely rounded; nostrils separate, the anterior nostrils close to the anterior edge of the snout, with short tubes; upper jaw a little longer and broader than the lower jaw; teeth small, acute, multiple-rowed, nearly equal, upper jaw teeth placed in a slightly curved, nearly crescent-shaped band, lower jaw teeth in a band resembling the form of a horseshoe; vomerine teeth in a small

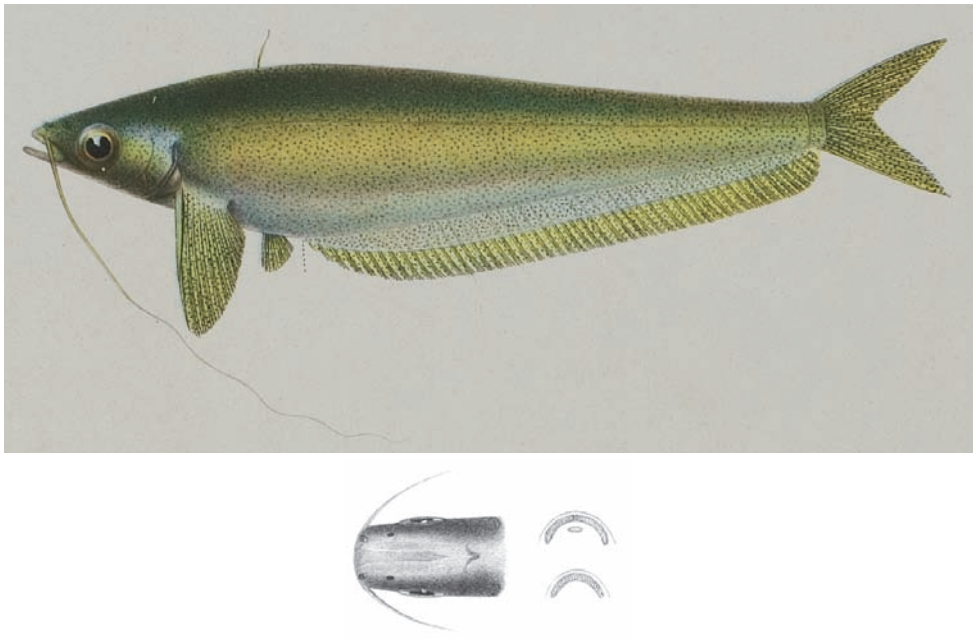

Fig. 74. *Kryptopterichthys macrocephalus* Blkr. [In Atlas 113 mm TL.]

group, longer than broad; barbels thin, reaching the second third part of the anal fin; mouth less than twice as broad as long, length contained about 3½ times in length of head; lips thin; chin without conspicuous pores; gill cover divided in two parts by a broad, obtuse ridge inclining towards the base of the pectoral fin: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous. Instead of a dorsal fin there is a single filament, not or a little longer than the eye; pectoral fins slightly obtuse, convex, not or hardly longer than the head, spine very thin, the bony part much shorter than the head, without small teeth or with small teeth that are only visible with the aid of a lens; ventral fins rounded, more than 3 times as short as the pectoral fins; anal fin a little more than 3 times as long as the head, ending before the base of the caudal fin; caudal fin has a deep incision and acute lobes, contained about 6 times in the length of the entire body. Colour of upper part of the body olive, lower part pearly, fins yellowish-hyaline. Body and fins are nearly everywhere densely with dark speckles.

B. 9. D. fil. 1 simpl. P. 1/10. V. 1/5. A. 52 or 53. C. 1/15/1 and shorter ones alongside.

Hab. Sumatra? (Padang?), in rivers.

Length of the only specimen 113‴.

Remark. The specimen described above has been in my possession already for a long time and in former days, without a detailed examination, was placed together with my specimens of Kryptopterichthys bicirrhis. I cannot remember exactly from where I received it, but nevertheless I believe it was sent to me some years ago from Padang by my friend Mr M.Th. Reich.

During a more detailed investigation of my specimens of the mentioned species I found out that the one here described very certainly belongs to a species which differs from Kryptopterichthys bicirrhis and that it neither can be identified as one of the remaining related species. It distinguishes itself mainly by its relatively large head, but also by various other characters found in the almost straight profile, the long barbels, the relatively short pectoral fins, etc. The relative length of the bony part of the pectoral fin spine in Kryptopterichthys can somewhat facilitate the determination of the species. In the species in question that spine is much shorter than the head, whereas in Kryptopterichthys bicirrhis and Kryptopterichthys laïs 295 it is only slightly shorter and in Kryptopterichthys palembangensis even longer than the head. However, I have not mentioned this character in the analytical review of these species, because, as is known, the lengths of the fin spines in the Siluroïds in general, within certain boundaries, within a species can differ quite remarkably.

Hemisilurus Blkr.
Highback

No dorsal fin. Anal and caudal fins not confluent. Two maxillary barbels. Teeth acute, short, the upper jaw teeth multiple-rowed, the vomerine teeth placed in 2 oval, separate groups. Branchiostegal membrane has 9 to 13 rays. Interbranchial membrane with a deep incision. Eyes covered with head skin, placed almost behind the mouth corner. Anterior nostrils tubular. Bone terminal.

Remark. In my earlier description of the species, from which the genus Hemisilurus was taken, I erroneously described 4 barbels. The less good state of preservation of the single specimen then available to me must have misled me in the recognition of the lower jaw barbels. Probably I have taken torn pieces of skin or threads as barbels,

however in a very well preserved specimen, which later came in my possession, I found no trace of lower jaw barbels.

The genus Hemisilurus already by its habitus distinguishes itself from all other genera of Schilbeïnes. One can already recognise it by its high back. More essential generic characters however can be found in the dentition, the absence of the dorsal fin and the presence of only two barbels.

Because of the complete absence of a dorsal fin, Hemisilurus is related to the genera Micronema and Phalacronotus, however, it has a totally different habitus, whereas in the genera Micronema and Phalacronotus the vomerine teeth are placed in an undivided transverse band.

296 Because of the arrangement of the vomerine teeth into two separate groups, Hemisilurus reminds one of the genera Wallago, Belodonthichthys and Pseudosilurus, but apart from the fact that the peculiarities of that arrangement and the size and shape of that of the mentioned genera are different, the absence of the dorsal fin as well as the presence of only two barbels set it apart from them.

The only species of Hemilurus known to me till now are Hemisilurus heterorhynchus and Hemisilurus schilbeides. They differ remarkably from each other and can easily be distinguished by the following characters.

I. Snout nearly truncate. Eyes contained 4⅓ to 5 times in length of head. Barbels reaching the eye. A. 90 to 93.

Hemisilurus heterorhynchos Blkr.

II. Snout very depressed. Eyes contained 2½ times in length of head. Barbels reaching the anal fin. A. 65 to 67.

Hemisilurus schilbeides Blkr.

Hemisilurus heterorhynchos Blkr.
Atl. Silur. tab. XLV fig. 2.
Xenognathic highback

A Hemisilurus with an elongate, compressed body, body width contained about 2½ times in its depth, body depth contained 4⅕ to nearly 5 times in its length without, and 5⅕ to 5¼ times in its length with caudal fin. Head slightly depressed, compressed, contained 6 to 5⅘ times in length of body without, and nearly 7 to 6⅗ times in length of body with caudal fin; depth of head contained 1¾ to 1½ times in its length, width about twice; eyes nearly posterior, eye diameter contained 4½ to 5 times in length of head, distance between the eyes a little more than once to 1½ times their diameter; rostro-dorsal profile concave at the forehead and crown, very convex at the nape. Head shield entirely divided by a longitudinal groove entering the very thin supraoccipital crest; snout nearly truncate, rostral profile very obtusely rounded; anterior nostrils close to the tip of the snout, with well visible small tubes; jaws nearly equal, the upper jaw hardly longer than the lower jaw; mouth terminal. Jaw teeth multiple-rowed, acute, small, nearly equal, dense, upper jaw teeth placed in a curved, nearly rectangular band, lower jaw teeth in a band in the form of a horseshoe; vomerine teeth small, acute, placed in 2 separate, rounded groups, smaller than the pupil; barbels inserted in the vicinity of the nasal tubes, thin, reaching the eye; lips broad, membranaceous; chin with 2 conspicuous, separated pores towards the middle; gill 297 cover divided in two parts by a median, obtuse ridge inclining towards the base of the pectoral fin; humeral bone short, rounded at the top; lateral line straight, simple, characterized

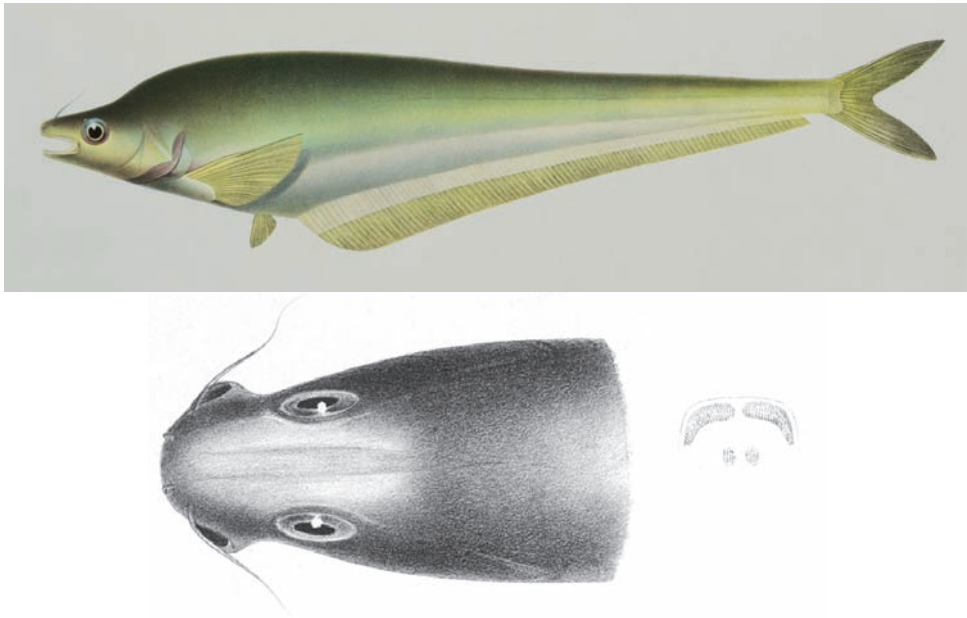

Fig. 75. *Hemisilurus heterorhynchus* Blkr.

by touching small tubes; axillary slime pore not conspicuous. Instead of a dorsal fin there is a small, subcutaneous tubercle; pectoral fins slightly acute or slightly obtuse, not or hardly shorter than the head, spine thin, compressed, the bony part feebly denticulate; ventral fins acute or slightly acutely rounded, more than twice as short as the pectoral fins; anal fin more than 4 times as long as the head, ending before the base of the caudal fin; caudal fin incised nearly upwards from the base, with acute lobes, nearly equal, contained 7⅔ to a little more than 8 times in the length of the entire body. Colour of body dorsally olive, flanks and upper part slightly olive-coloured, lower part pearly. Fins yellowish-hyaline, more or less with dark speckles. Fleshy part of the anal fin silvery or pearly.

B. 12 or 13. D. 0. P. 1/17 or 1/16. V. 1/8. A. 90 to 93. C. 1/15/1 and shorter ones alongside.

Syn. *Wallago heterorhynchos* Blkr, Nieuwe Tient. Vischs. Sumatra, Natuurk. Tijdschr. Ned. Ind. V p. 514.

Hab. Sumatra orientalis (Palembang, Moarakompeh), in rivers.

Length of the 3 specimens 244‴ to 326‴.

Remark. I possess from the species in question three specimens, one caught in Moarakompeh, the two others in Palembang. In both places the species seems to be rare.

Hemisilurus schilbeides Blkr.
Atl. Silur. tab. XLII fig. 4.
Schilbe-like highback

A Phalacron. [Hemisilurus] with an elongate, compressed body, body width contained about 2¼ times in its depth, body depth contained 3¾ to 4¼ times in its length without, and 4½ to a little more than 5 times in its length with caudal fin. Head very depressed, not compressed, acute, contained 6½ to 7 times in length of body without, and 7¾ to 8⅓ times in length of body with caudal fin; depth and width of

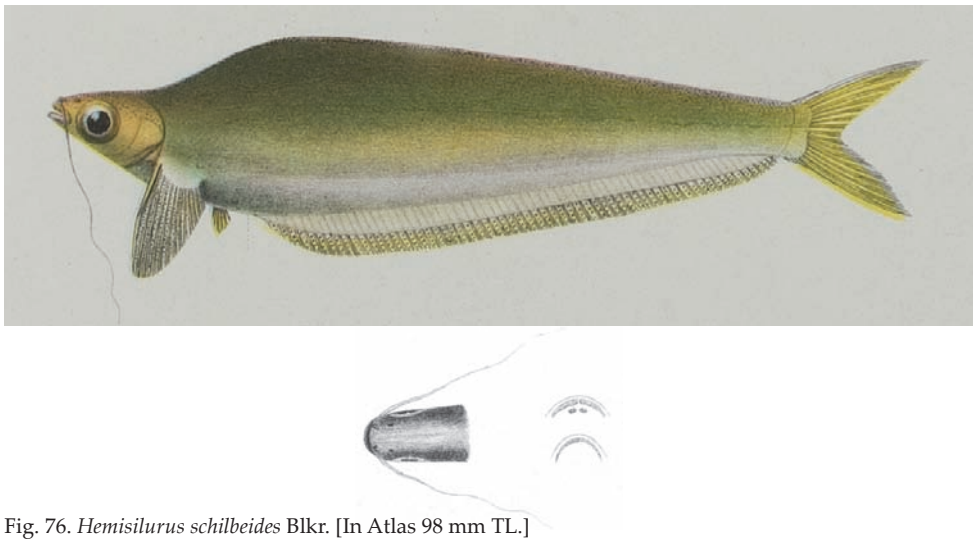

Fig. 76. *Hemisilurus schilbeides* Blkr. [In Atlas 98 mm TL.]

head contained nearly 1½ times in its length, depth of the head above the angle of the mouth contained nearly 3 times in its length; eyes posterior, eye diameter contained about 2½ times in length of head, eyes more distant at the upper than at lower margin, distance between the eyes a little more than once their diameter; rostro-dorsal profile very concave at the head and anterior part of the nape. Head shield entirely divided by a longitudinal groove reaching the triangular, short, acute supraoccipital crest that is traversed by a groove; snout very depressed, rostral profile obtusely rounded; nostrils separate, the anterior nostrils close to the anterior edge of the snout, with short tubes; jaws equal; teeth acute, multiple-rowed, small, nearly equal, upper jaw teeth placed in a crescent-shaped band, lower jaw teeth in a band resembling the form of a horseshoe, vomero-palatine [vomerine] teeth in 2 very small groups, separated only a little; barbels thin, reaching the anterior rays of the anal fin; mouth about twice as broad as long, length contained about 4 times in length of head; lips broad towards the angle of the mouth; chin without conspicuous pores; gill cover without conspicuous ridge: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous. No conspicuous tubercle instead of a dorsal fin; pectoral fins slightly obtuse, convex, longer than the head, spine thin, much longer 298 than the postocular part, posterior side with small teeth that are only visible with the aid of a lens; ventral fins rounded, more than 4 times or about 4 times as short as the pectoral fins; anal fin more than 5 times as long as the head, ending before the base of the caudal fin; caudal fin with a deep incision and acute lobes, the lower one hardly longer than the upper one, contained about 6 times in the length of the entire body. Colour of upper part of the body softly olive-hyaline, lower part pearly. Fins yellowish-hyaline, more or less with dark speckles.

B. 9 or 10. D. 0. P. 1/12. V. 1/5? A. 65 to 67. C. 1/15/1 and shorter ones alongside.

Hab. Sumatra (Palembang), in rivers.
Borneo (Bandjermasin), in rivers.

Length of the 2 specimens 96''' and 99'''.

Remark. This Hemisilurus in various aspects diverges greatly from Hemisilurus heterorhynchus. There is not even a trace of a dorsal fin here, even the dorsal fin knob, which in the other species as well as in the species of Micronema and Phalacronotus indicates an origin of the dorsal fin, is lacking. Moreover, the barbels are extremely long, whereas they are shorter than the head in Hemisilurus heterorhynchus. For the rest the

species in question is just as remarkable because of its very concave profile that reminds one of the genus Schilbe, whereas the rays of the branchiostegal membrane and of the pectoral and the anal fins are less numerous. I was not able to determine the number of pelvic fin rays in my specimen, however, I certainly have not seen more than 6 (1/5). The name of the species I have derived from the similarity in habitus with Schilbe.

I received this species already a long time ago with a number of specimens of Kryptopterichthys laïs, from Banjermassin, and very recently also from Palembang. It seems not nearly to reach the size of Hemisilurus heterorhynchus.

Micronema Blkr.
Smallthread

No dorsal fin. Anal and caudal fins not confluent. Four upper - and lower jaw barbels. Teeth acute, multiple-rowed, the upper jaw teeth placed in a curved band, the vomero-palatal teeth in a transverse, uninterrupted band. Branchiostegal membrane with 12 to 14 rays. Interbranchial membrane with a deep incision. Eyes covered with head skin, placed behind the mouth corner. Anterior nostrils tubular. Lower jaw protruding beyond the upper one.

299 Remark. Apart from the species of Hemisilurus, the Sunda Islands nourish still various other species of Schilbeïnes, in which the dorsal fin is entirely lacking. Of those species till now six have become known to me. They all are related to each other, having a depressed head and snout, eyes posterior, an undivided band of vomerine teeth, a free anal fin, a deeply forked bilobed caudal fin, a concave profile, and, with one exception, the lower jaw bulging before the upper jaw. I would have brought them under one genus, if not 2 of those 6 species, apart from upper jaw barbels possessed lower jaw barbels, which are totally lacking in the four other species. The characters, based on the number of barbels, in the Siluroïds in general are of a higher value than one generally was inclined to accept, as I have shown in various other places, but I admit, in the present case they do not seem to me to possess the usual weight, because they are not accompanied by other characters to which one would credit a generic value.

If I in this paper bring the four-barbelled and two-barbelled species to two differnt genera, it is in this case more for the sake of the consistency in the carrying through of a principle than because I am convinced enough of the naturalness of those two genera.

Thus under Micronema I contain both species with four barbels, which I described already some years ago under the names Silurus micronema and Silurus hexapterus. The barbels in both species are very thin and short and those of the lower jaw even so fine that one does not notice them when one does not carefully search for them. This rudimentary condition of the lower jaw barbels is one more reason why I hesitate to consider the genus Micronema as natural, or rather, why it is doubtful whether Micronema and Phalacronotus can be considered as two different genera.

Although both my species, in general build are very closely related to each other, they still differ essentially. The main characters of these differences become clear from the following scheme.

300 I. Vomerine teeth band straight, short. Head contained 6½ to 7 times in length of body without caudal fin. P. 1/16 or 1/17. A. 74 to 83.

Micronema hexapterus Blkr.

II. Vomerine teeth band crescent-shaped, occupying the entire width of the palate. Head contained about 5⅔ times in length of body without caudal fin. P. 1/12 or 1/13. A. 93.

Micronema typus Blkr.

Micronema typus Blkr.
Atl. Silur. tab. XLIV fig. 2.
Common smallthread

A Micronema with an elongate, compressed body, body width contained about 1¾ times in its depth, body depth contained nearly 4½ times in its length without, and nearly 5 times in its length with caudal fin. Head depressed, acute, contained about 5⅔ times in length of body without, and 6⅖ to 6⅓ times in length of body with caudal fin; depth of head contained about 1⅘ times in its length, width about 1½ times, depth of the head above the angle of the mouth contained about 3 times in its length; eyes posterior, eye diameter contained about 5 times in length of head, distance between the eyes about 2¾ times their diameter; rostro-dorsal profile concave at the head, convex at the nape. Head shield entirely or nearly entirely divided by a longitudinal groove reaching or nearly reaching the thin, lanceolated supraoccipital crest, which is compressed at the base and traversed by a groove; snout very depressed, rostral profile very obtusely rounded; nostrils separate, the anterior nostrils close to the anterior margin of the snout, wide open, oblong or with short tubes; lower jaw protruding a little beyond the upper jaw, small, anterior part acute, not truncate; teeth acute, multiple-rowed, nearly equal, very conspicuous, upper jaw teeth placed in a crescent-shaped band, lower jaw teeth in a band in the form of a horseshoe; vomerine-palatine teeth in a thinner band, nearly parallel to the band of the premaxillary teeth; maxillary barbels thin, reaching posterior part of the eye, lower jaw barbels very thin, inserted on the skin of

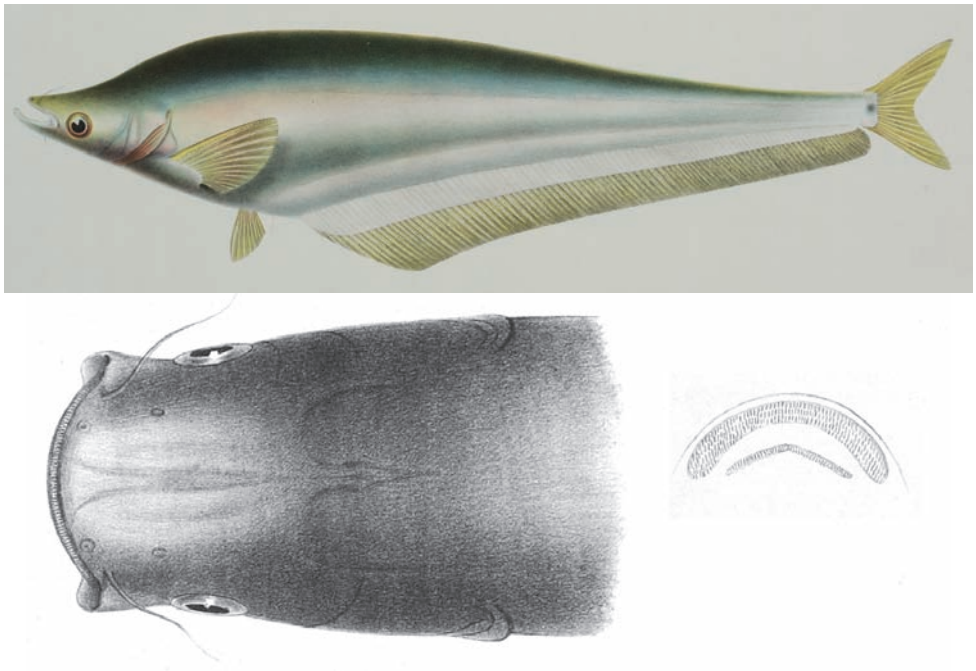

Fig. 77. *Micronema typus* Blkr.

the chin, under the angle of the mouth, not or hardly longer than the eye; mouth about twice as broad as long, length contained about 3½ times in length of head; lips broad towards the angle of the mouth; chin without conspicuous pores; gill cover divided in two parts by a ridge inclining obtusely downwards, posterior part twice or more than twice as broad as anterior part: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axilla with no conspicuous slime pore. Instead of a dorsal fin there is a small, subcutaneous tubercle; pectoral fins slightly acute, convex, not much shorter than the head, spine medium-sized, the bony part a little longer than the postocular part of the head, feebly denticulate; ventral fins slightly acute, convex, more than twice as short as the pectoral fins; anal fin nearly 4 times as long as the head, ending before the base of the caudal fin; caudal fin has a deep incision and acute lobes, contained about 8½ to 9 times in the length of the entire body. Colour of upper part of the body softly olive, lower part pearly. In the middle of the base of the caudal fin is a round, violet, seemingly subcutaneous spot. Fins yellowish-hyaline, more or less with dark speckles.

B. 14. D. 0. P. 1/12 or 1/13. V. 1/8. A.93. C. 1/15/1 and shorter ones alongside.

301 Syn. *Silurus micronemus* Blkr, Verh. Bat. Gen. XXI, I Silur. batav. consp. p. 18.
Limpok Mal. Batav.

Hab. Java (Batavia), in rivers.

Length of the only specimen without caudal fin 326‴ .

Remark. Already 13 years ago in Batavia I discovered in a single specimen the typical species of the genus Micronema. The species is so rare, that during that entire period I did not observe any other specimen.

Micronema hexapterus Blkr.
Atl. Silur. tab. XLIV fig. 1.
Small-headed smallthread

A Micronema with an elongate, compressed body, body width contained 1⅓ times to twice in its depth, body depth contained 5¾ to 5⅓ times in its length without, and 6⅘ to 6⅖ times in its length with caudal fin. Head depressed, acute, contained 6½ to 7⅕ times in length of body without, and nearly 8 to 8⅓ times in length of body with caudal fin; depth of head contained 1⅖ to 1⅗ times in its length, width 1⅓ to 1⅖ times, depth of the head above the angle of the mouth contained 2⅓ to 2½ times in its length; eyes postero-inferior, eye diameter contained 4 to 5 times in length of head, distance between the eyes 2½ to 3 times their diameter; rostro-dorsal profile concave at the head, convex at the nape. Head shield entirely divided by a longitudinal groove reaching the triangular, short, acute, supraoccipital crest that is traversed by a groove; snout very depressed, rostral profile very obtusely rounded; nostrils separate, the anterior nostrils fairly distant from the anterior edge of the snout, with short tubes; lower jaw protruding much beyond the upper jaw, elevated, anterior part nearly truncate; teeth acute, multiple-rowed, nearly equal, very conspicuous, jaw teeth placed in a crescent-shaped band, vomerine-palatine teeth in a thinner, transverse, not curved band; maxillary barbels thin, overreaching the humeral bone or reaching the gill covers, lower jaw barbels very thin, inserted on the skin of the chin, under the angle of the mouth, generally a little longer than the head; mouth about twice as broad as long, length contained about 3 times in length of head; lips broad towards the angle of the mouth; chin without conspicuous pores; gill cover divided in two parts by a ridge inclining obtusely downwards, posterior part twice or more than twice as broad as anterior part: humeral bone very short, obtuse; lateral line straight, characterized by touching small tubes; axilla without conspicuous slime pore. Instead of a dorsal fin there is a small, subcutaneous tubercle; pectoral fins broad, obtuse, rounded, a little longer than the head, spine thin, the bony part hardly or not longer than the postocular part of the head, not or hardly visible small teeth; ventral fins rounded, more than twice as short as the pectoral fins; anal fin about 5 times as long as the head, ending before the base of the caudal fin or nearly touching it; caudal fin with a deep incision and acute lobes, the lower one longer than the upper one, contained 6 to 6½ times in the length of the entire body. Colour of upper part of the body softly olive, lower part pearly. Fins yellowish-hyaline, more or less with dark speckles. No spot on the caudal fin.

Fig. 78. *Micronema hexapterus* Blkr.

B. 12 or 13. D. 0. P. 1/16 or 1/17. V. 1/7. A. 74 to 83. C. 1/15/1 and shorter ones alongside.
Syn. *Silurus hexapterus* Blkr, Vierde Bijdr. ichth. Born. Nat. Tijdschr. N. Ind. II p. 203.
302 *Lais puti* Mal. Bandjermas.
Hab. Borneo (Bandjermasin), in rivers.
Sumatra (Palembang), in rivers.
Length of the 7 specimens 145‴ to 238‴.

Remark. In the specimen from which, in the year 1851, I described this species for the first time, I overlooked the extremely thin and broken lower jaw barbels, although I since have perceived that they are present both there and in both my larger specimens. The species departs in numerous aspects from Micronema typus, so that without any doubt it is a different one. Its characters are mainly found in the vomerine palatal teeth that are straight (not curved) ending acute at both ends, a more slender body, a high strongly bulging lower jaw, a small head, somewhat inferior eyes, longer barbels, shorter pectoral fin spine, more numerous pectoral fin rays, remarkably less anal fin rays, etc.

Phalacronotus Blkr.
Bareback

No dorsal fin. Anal and caudal fins not confluent. Two upper jaw barbels. Teeth acute, multiple-rowed, the jaw teeth placed in a curved band, the vomerine-palatine teeth in a transverse, uninterrupted band. Branchiostegal membrane with 14 to 17 rays. Interbranchial membrane with a deep incision. Eyes covered with head skin, placed behind the mouth corner. Anterior nostrils tubular. Lower jaw longer than the upper one.

Remark. Among the Silurichthyoïds without dorsal fin Phalacronotus is easily recognisable by its many rowed vomerine teeth, which are placed in an undivided transverse band, its very flat snout, its lower jaw that extends before the upper jaw, and the presence of only 2 barbels that belong to the upper jaw. I have already mentioned above, that it only differs from Micronema by the last mentioned character and that one might just as well unite both genera into a simple one.

303 The inexhaustible variety in shape by which nature seems to have wanted to compensate the Silures for the lack of a rich shade of colours, is also apparent in the numerous forms of Schilbeïnes, which populate the rivers of the Sunda islands and of which one had no idea before my investigations. Thus I also possess three Sundanese species of Phalacronotus. These three species are remarkable by having a very slender body, a lower jaw that extends before the upper jaw, hair-fine and very short barbels and moderately developed pelvic fins. These species are Phalacronotus leptonema, Phalacronotus micropogon and Phalacronotus micruropterus.

The characters of the mentioned species mainly come down to the following.

1. Barbels much shorter than the head. Caudal fin bilobed.
   a. Caudal fin contained 6 to 7⅓ times in the length of the entire body.
      † Body depth contained about 5⅔ times in its length without caudal fin. A. 75. Depth of the head contained 1⅘ times in its length.

Phalacronotus leptonema Blkr.

      † Body depth contained 6⅓ to nearly 7 times in its length without caudal fin. A. 79 to 91. Depth of the head contained 2⅕ to 2¼ times in its length.

Phalacronotus micropogon Blkr.

   b. Caudal fin contained 9 to 10 times in the length of the entire body.
      † Body depth contained 4¾ to 5⅓ times in its length without caudal fin. A. 86 to 92.

Phalacronotus micruropterus Blkr.

If Lacépéde has closely investigated the species that he described and depicted under the name of Ompok siluroides, one might presume that he had a species of Phalacronotus before him. In his figure the lower jaw, armed with sharp teeth, apparently protrudes considerably before the upper jaw, something 304 that is not found in any of my species of Kryptopterus or Kryptopterichthys, no more than in Hemisilurus. One therefore might only consider the genera Micronema and Phalacronotus: however, Micronema possesses lower jaw barbels, which are lacking in Phalacronotus. I therefore take Ompok siluroides for a species, belonging to Phalacronotus or at least very closely related to it, but it cannot in any case be one of the species observed by me, if the statements regarding the numbers of fin rays and the shape of the caudal fin are only approximately correct. For the rest Ompok siluroides seems to have originated from the Sunda Islands. To begin with till now none of these forms has become known from outside the Indian archipelago, on the other hand Lacépède found his species among the stuffed fishes, donated by the Batavian Republic to France, thirdly the fact that the name is Ompok apparently a corruption of limpok, sufficiently indicates its Malayan origin. For this reason I

provisionally name the species of Lacépéde Phalacronotus siluroides and let here follow the diagnosis taken from Lacépède's description and figure.

Phalacronotus siluroides Blkr.

A *Phalacronotus* with an elongate, compressed body. Head depressed, acute. Lower jaw protruding beyond the upper jaw. Barbels shorter than the head. Jaw teeth large, acute, unequal. Anal fin not confluent with the caudal fin. Caudal fin entire, convex.

B. 9. D. 0. P. 1/11. A. 56. C. 17.

Syn. *Ompok siluroides* Lac. Poiss. V p. 49.
Ompok siluroide Lac. ib. p. 49, 50, tab. 1 fig. 2.

Hab. Sunda Islands.

Phalacronotus leptonema Blkr.
Atl. Silur. tab. Sul. XLVI fig. 2.
Thin-threaded bareback

A Phalacronotus with an elongate, compressed body, body width contained about 1⅔ times in its depth, body depth contained about 5⅓ times in its length without, and about 6¾ times in its length with caudal fin. Head depressed, acute, contained about 5 times in length of body without, and about 5⅘ times in length of body with caudal fin; depth of head contained about 1⅘ times in its length, width about 1⅗ times, depth of the head above the angle of the mouth contained about 3⅓ times in its length; eyes posterior, eye diameter 305 contained about 5 times in length of head, eyes no more distant at the upper than at lower margin, distance between the eyes about 2½ times their diameter; rostro-dorsal profile of the head concave, of the nape convex. Head shield entirely divided by a longitudinal groove entering the very thin supraoccipital crest; snout much depressed, rostral profile very obtusely rounded; nostrils separate, the anterior nostrils close to the anterior edge of the snout, with short tubes; lower jaw protruding beyond the upper jaw; teeth multiple-rowed, nearly equal, very conspicuous, the upper jaw

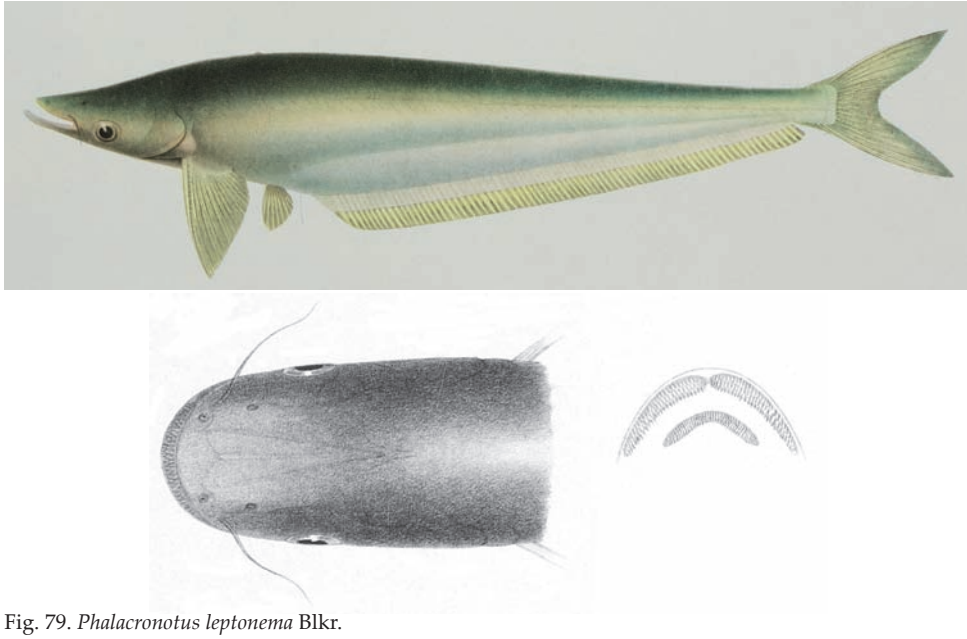

Fig. 79. *Phalacronotus leptonema* Blkr.

teeth placed in a crescent-shaped band, the lower jaw teeth in a band resembling the form of a horse-shoe; vomerine-palatine teeth in a thinner, crescent-shaped band, parallel to the band of the premaxillary teeth; barbels very thin, reaching the eye; mouth much broader than long, length contained about 3 times in length of head; lips broad towards the angle of the mouth; chin without conspicuous pores; gill cover divided in two parts by an obtuse ridge inclining downwards, posterior part more than twice as broad as anterior part: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes forming small branches ventrally; axillary slime pore not conspicuous; Instead of a dorsal fin there is a small, subcutaneous tubercle; pectoral fins slightly acute, not much shorter than the head, spine thin, compressed, the bony part longer than the postocular part of the head, posterior side slightly serrated with hardly visible small teeth; ventral fins slightly acutely rounded, more than twice as short as the pectoral fins; anal fin about 3 times as long as the head, ending before the base of the caudal fin; caudal fin with a deep incision and acute lobes, the lower one a little longer than the upper one, contained about 6½ times in the length of the entire body. Colour of upper part of the body slightly olive, lower part pearly. Fins yellowish-hyaline, more or less with dark speckles.

B. 16. D. 0. P. 1/14. V. 118. A. 75. C. 1/15/1 and shorter ones alongside.

Syn. *Silurus leptonema* Blkr, Diagn. nieuw. Vischs. Sumatra, Nat. T. Ned. Ind. III p. 584.

Hab. Sumatra orientalis (Palembang), in rivers.

Length of the only specimen 268'".

Remark. Phalacronotus leptonema in relationship is intermediate between Phalacronotus micropogon and Phalcronotus micruropterus. The species is less slender than the first mentioned and more slender than the last mentioned of both related species. From the last mentioned it moreover differs by a much more developed caudal fin, a relatively larger head, smaller eyes, much stronger curved bands of premaxillary- and vomerine teeth, a smaller number of anal fin rays, etc. In Phalacronotus micropogon on the contrary the body depth fits 7⅗ to 8 times in its length, the head is remarkably lower (depth 2¼ to 2⅕ in the length) and the anal fin similarly has a few rays more (78-91).

306 *Phalacronotus micropogon* Blkr.
Atl. Silur. tab. XLVI fig. 1.
Short-threaded bareback

A Phalacronotus with an elongate, compressed body, body width contained 1½ to 1⅓ times in its depth, body depth contained 6½ to nearly 7 times in its length without, and 7⅗ to nearly 8 times in its length with caudal fin. Head depressed, acute, contained 4⅗ to 5⅓ times in length of body without, and 5½ to 6¼ times in length of body with caudal fin; depth of head contained 2¼ to 2⅕ times in its length, width about twice, depth of the head above the angle of the mouth contained 3¾ to 4 times in its length; eyes posterior, eye diameter contained 4 to 6 times in length of head, eyes no more distant at the upper than at lower margin, distance between the eyes 1½ to 2½ times their diameter; rostro-dorsal profile concave at the head, convex at the nape. Head shield entirely divided by a longitudinal groove entering the very thin supraoccipital crest; snout much depressed, rostral profile very obtusely rounded; nostrils separate, the anterior nostrils close to the anterior edge of the snout, with short tubes; lower jaw protruding beyond the upper jaw; teeth multiple-rowed, nearly equal, very conspicuous, the upper jaw teeth placed in a crescent-shaped band, the lower jaw teeth in a band in the form of a horseshoe, the vomero-palatine teeth in a thinner, crescent-shaped band, parallel to the band of the premaxillary teeth; barbels very thin, reaching the eye; mouth broader than long, length contained 2⅔ to 2¾ times in length of head; lips broad towards the angle of the mouth; chin without conspicuous pores; gill cover divided in three parts by 2 obtuse, slightly elevated, diverging ridges; humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes forming small branches below; axillary slime pore not

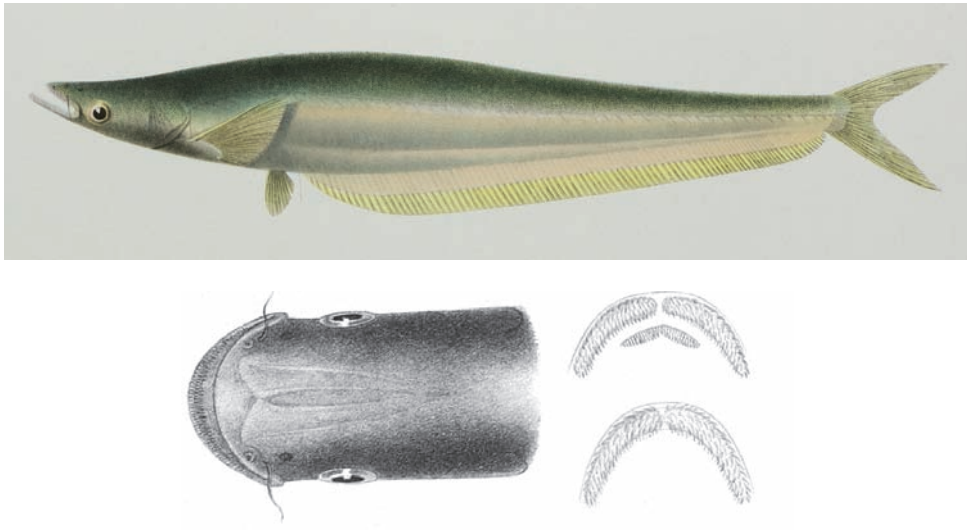

Fig. 80. *Phalacronotus micropogon* Blkr.

conspicuous. Instead of a dorsal fin there is a small, subcutaneous tubercle; pectoral fins acute, convex, contained 1⅓ times to a little more than once in length of head, spine thin, compressed, the bony part longer than the postocular part of the head, posterior side slightly serrated with hardly visible small teeth; ventral fins rounded, about 3 times as short as the pectoral fins. Head contained a little more than 3 to 3½ times in the length of the anal fin; anal fin ending before the base of the caudal fin; caudal fin with a deep incision and acute lobes, the lower one a little longer than the upper one, contained 6 to 7⅓ times in the length of the entire body. Colour of upper part of the body slightly olive, lower part pearly. Fins yellowish-hyaline, more or less with dark speckles.

B. 14 to 17. D. 0. P. 1/14 or 1/15. V. 1/8 or 1/9. A. 78 to 91. C. 1/15/1 and shorter ones alongside.

Syn. *Silurus apogon* Blkr, Derde Bijdr. Ichth. Borneo, Nat. Tijdschr. N. Ind. II p. 67.
Silurus micropogon Blkr, Nat. T. N. Ind. plur. loco

Hab. Borneo (Bandjermasin, Kutei, Pontianak), in rivers.
Sumatra (Palembang), in rivers.

Length of the 11 specimens 118‴ to 320‴.

Remark. When I observed this species for the first time in 1851 and described it on the basis of 4 small specimens that were in a deficient state of preservation, I could not distinguish barbels in those specimens, reason why I named it Silurus apogon. Later, after I had received more better preserved specimens, it appeared to me that 307 the barbels, however extremely thin and hair-like, do indeed exist and I therefore changed the species name to that of "micropogon".

The species is very closely related to Phalacronotus leptonema and distinguishes itself from that species mainly by a still more slender body, and still more flat and lower head and longer mouth slit, whereas moreover the anal fin in all my specimens, both larger and smaller, constantly possess a few more rays.

Phalacronotus micruropterus Blkr.
Atl. Silur. tab. XLV fig. 1. [In the Atlas Ichthyologique this species is considered to be a junior synonym of Micronenus typus Blkr. The figure mentioned was never published.]
Short-finned bareback

A Phalacronotus with an elongate, compressed body, body width contained nearly twice to twice in its depth, body depth contained 5⅓ to 4¾ times in its length without, and nearly 6 to 5⅓ times in its length with caudal fin. Head depressed, acute, contained 5¼ to 5⅔ times in length of body without, and 5⅘ to 6⅔ times in length of body with caudal fin. Depth and width of head contained 1⅔ to 1¾ times in its length, depth of the head above the angle of the mouth contained 2¾ to 3 times in its length; eyes posterior, eye diameter contained 3½ to nearly 4 times in length of head, eyes no more distant at the upper than at lower part, distance between the eyes nearly 1½ to 2 times their diameter; rostro-dorsal profile concave at the head, convex at the nape. Head shield entirely or nearly entirely divided by a longitudinal groove reaching or nearly reaching the very thin supraoccipital crest; snout very depressed, rostral profile very obtusely rounded; nostrils separate, the anterior nostrils close to the anterior edge of the snout, with short tubes; lower jaw protruding beyond the upper jaw; teeth acute, multiple-rowed, nearly equal, very conspicuous, the upper jaw teeth placed in a broad, crescent-shaped band, the lower jaw teeth in a thinner band resembling the form of a horseshoe; the vomero-palatine teeth in a thin, feebly curved band, parallel to the band of the premaxillary teeth; barbels very thin, reaching the eye; mouth much broader than long, length contained 3⅓ to 3½ times in length of head; lips broad towards the angle of the mouth; chin without conspicuous pores; gill cover divided in two parts by a ridge inclining downwards, posterior part about twice as broad as anterior part: humeral bone short, obtuse, rounded; lateral line straight, characterized by touching small tubes; axillary slime pore not conspicuous. Instead of a dorsal fin there is a small, subcutaneous tubercle; pectoral fins slightly acute or slightly obtuse, convex, equalling or nearly equalling the head in length, spine thin, compressed, the bony part longer than the postocular part of the head, posterior side feebly denticulate; ventral fins slightly acutely or sightly obtusely rounded, about 3 times as short as the pectoral fins; anal fin nearly 4 times as long as the head, ending before the base of the caudal fin; caudal fin with a deep incision and acute lobes, the upper one a little longer than the lower one, contained 9 to 10 times in the length of the entire body. Colour of upper part of the body slightly olive, lower part pearly. Fins yellowish-hyaline, more or less with dark speckles.

B. 14 or 15. D. 0. P. 1/13 or 1/14. V. 1/8. A. 86 to 92. C. 1/15/1 and shorter ones alongside.

Syn. *Silurus phalacronotus* Blkr, Vijfde Bijdr. ichth. Borneo, Nat. T. Ned. Ind. II p. 429.

Hab. Sumatra (Palembang), in rivers.
308 Borneo (Sambas, Pontianak, Kahajan), in rivers.

Length of the 5 specimens 137‴ to 255‴

Remark. The species in question, which, as appears from the three above mentioned far removed localities, is spread over entire Borneo and which also lives on Sumatra near Palembang, at first glance can be distinguished from its related species Phalacronotus leptonema and Phalacronotus micropogon by a deeper body, a much shorter caudal fin and head and larger eyes. Moreover its teeth are remarkably smaller and on the upper jaw and the vomer placed in much less curved bands whereas the band of vomerine teeth is also remarkably more slender.

309 *Subfamily VI.*
Plotosichthyoïdei

Two rayed dorsal fins, the posterior dorsal and anal fins confluent with the caudal fin. Skin naked.

Remark. The Plotosichthyoïds because of their fin shape depart so much from the remaining subfamilies of the Siluroïds, that their elevation to a proper subfamily seems justified in every respect.

It distinguishes itself from the remaining subfamilies of the Siluroïds by the presence of two rayed dorsal fins, of which the posterior one is entirely united with the caudal fin.

Only two genera, Chaca and Plotosus, can be brought to this subfamily and these two genera apparently also are types of proper groups, which however will be represented by very few species.

The Chacini are remarkable by the presence of a double anal fin, the anterior anal fin being separated by an empty space from the second, which is entirely united with the caudal fin. The depressed head, the wide transverse mouth slit and the upward directed eyes reminds one of the genera Lophius and Batrachus, but the shape of the pectoral fins and of the gill cover from which the subopercle is lacking, is that of the Silures.

The Plotosini are recognisable, apart from the simple anal fin, by the remarkable branched apparatus, which hangs bunch-like free behind the anus and is present in males as well as in females. They are also distinguished from the Chacini by a totally different dentition. In the Chacines both jaws bear only teeth that are very small and thin and are placed in several rows. In the Plotosines, on the contrary, the teeth are cone-shaped or granular and form, apart from bands or groups in both jaws, also a more or less crescent shaped group anterior on the palate.

The species, now known of both groups, are the ones mentioned below.

310 *Plotosini.*

Plotosus anguillaris Lac.= Plotosus lineatus CV. = Plotosus castaneus CV?	Hab. M. rubro Maur.
	" Hind., Jap., Arch.
	" ind., Pacific Oc.
" limbatus CV. (the same as the proceeding species?)	" Hindost.
" canius Buch = Plotosus unicolor K.v.H. = Plotosus horridus Blkr = Plotosus viviparus Blkr = Plotosus multiradiatus Blkr.	" Bengal, Jav., Born.
" albilabris CV. = Plotosus macrophthalmus Blkr.	" Java, Pin., Malacca
" macrocephalus CV.	" Timor.
" microceps Richds.	" New Holland.
" megastomusRichds.	" New Holland.
" tandanus Mitch.	" New Holland

Chacini.

Chaca lophiodes CV.	" New Guin.? Bengal, Borneo.
" bankanensis Blkr.	" Borneo, Banka.

Plotosus
Lacép. Poss. V p. 129.
Sambilang

Two rayed dorsal fins, one anal fin. The second dorsal, caudal and anal fins confluent. Jaw teeth and vomerine teeth conical, multiple-rowed. Eyes not covered with skin. Eight barbels, nasal, labial [maxillary] and on the lower jaw. The latter all inserted on anterior part of the chin. Branchiostegal membrane with 9 to 12 rays. Gill opening very large beneath, extended upwards to the level of the eyes. Dendritic postanal appendages. Anterior nostrils perforating the edge of the snout or the upper lip.

Remark. The genus Plotosus is easy to recognize by its eel-shaped body, by the presence of a simple anal fin, 311 by the remarkable tree-like organ, which freely hangs down from the body behind the anal opening, and by the cone- or grain-shaped tooth rows in the jaws and on the palate.

The most peculiar thing that the Plotosini offer in their organisation is the dendritic organ, which is lacking in none of the species and in neither of the sexes. The build of that organ gives the impression of an inverted lung, just like the branchial appendage of the Heterobranchoïds. Rich in bloodvessels, which through the branches of the organ that is freely bathed by water, can spread over a large surface and without internal glandular build or drainage tubes it is hard to imagine another reason for the existance of this organ than to bring the bloodmass in contact with the air that is dissolved in the surrounding water. If this supposition is right, than the dendritic organ is nothing else than an additional breathing organ. The name anal gill would then be a very suitable one. Indeed the difference between the anal gill of Plotosus and the branchial appendages of the Heterobranchoïds is essentially no other that the additional breathing organ in Plotosus is situated in such an unusual place and without a clear connection to the real gills.

The number of known species of Plotosus is small. I have subjected the specimens of my cabinet to a further detailed examination of large series and I have reached the conclusion that they can be brought to no more than three species, i.e. Plotosus anguilaris Lac., Plotosus caninus Buch. and Plotosus albilabris CV.

Mr Valenciennes in the large Histoire naturelle des Poissons has described seven species of Plotosus. However, I believe that his Plotosus lineatis, Plotosus castaneus and Plotosus limbatus belong only to a simple species and that is to the oldest known, Plotosus anguillaris Lac. Plotosus canius Buch. CV. and Plotosus unicolor K.v.H. CV. ought to be brought under one name as well. Therefor from the seven species of Mr Valenciennes only four 312 would remain, three of which are in my possession.

Mr Richardson has added to this knowledge that of two other ones, which were named by him Plotosus megastomus and Plotosus microceps, which with a rather large certainty can be regarded as proper species.

Still another species I see figured in Mitchil's Expedition into the interior of Australia (tab. 6 fig. 2), under the name of Plotosus tandanus. This species in habitus greatly resembles Plotosus albilabris CV. but seems to have a still higher head and the nasal barbels so short that they hardly reach the eye.

The present subfamily again makes clear how important the dentition is in the or-

der of the Silures. The dentition of the two large types, the Chacines and the Plotosines, are from an entirely different nature, which is already known. However, little would one suspect, that in the dention of Plotosus excellent characters are found for the determination of the species. This is at least certain regarding Plotosus anguillaris Lac., Plotosus canius Buch. and Plotosus albilabris CV., and I do not doubt that in the remaining known species Plotosus macrocephalus CV., Plotosus microps Richds, Plotosus megastomus Richds and Plotosus tandanus Mitch. one will find characters in the peculiarities of the dentition, different ones for each species. Concerning Plotosus macrocephalus I see nothing at all is mentioned of the dentition. For Plotosus microceps Richds. the dentition is mentioned in some detail, and I read in the description of that species of three rows of cone shaped, truncated teeth in both jaws and of five or six rows of vomerine teeth of which the middle ones are the longest. The dentition of Plotosus megastomus finally, is described by Mr Richardson as follows: in the premaxillaries two small oval square groups blunt cone shaped teeth; the groups of teeth in the lower jaw broader and triangular with the teeth in the outer row cone shaped and the remaining ones granular; the vomerine teeth all granular and placed in a heart shaped group of which 313 the tip is directed forward. Only for Plotosus megastomus the dentition is sufficiently described in enough detail to recognize the character of the species (the heart shaped group of vomerine teeth). For the other species those characters remain to be delivered. Of the species that are in my possession I will describe them below.

Another important character for the arrangement of the species of Plotosus I have found in the nature and position of the nasal openings. The three species of my cabinet can be separated from each other on the basis of this character alone. I cannot determine the situation regarding this character in the other species. Of Plotosus macrocephalus I see nothing mentioned regarding this character in the description or in the figure (CV. Poiss. fig. 449).

Of Plotosus microceps Mr Richardson only noticed the posterior nostrils, and named the anterior ones "imperceptible". In Plotosus megastomus the anterior nostrils are placed near the anterior edge of the snout, just as in Plotosus anguillaris.

The characters found in the length of the barbels, in Plotosus have a less distinct determining value. Their length is not constantly the same in specimens of the same length and in juvenile specimens they are usually longer than in more developed specimens. Plotosus megastomus offers the peculiarity, that the upper jaw barbels on each side are double.

The Plotosines principally feed on gastropods, bivalves and crustaceans. Their dentition is entirely organized for crushing the hard external cover of these animals. As a rule they are found in turbid water, on muddy coasts and in river mouths. It is like this in Plotosus albilabris and Plotosus canius but Plotosus anguillaris rather lives in clear salt water, near or on coral reefs, from which the species owes its clear coloration and its name Sambilang-karang or klip-sambilang. The eggs develop in the belly until near the time they are ripe, at least in Plotosus caninus. When the eggs leave the body, the young fishes are already very developed and move lively in the still ample yolk sacs.

After the reduction of my earlier species to three, they can be separated from each other and the remaining 314 species by excellent characters.

In the following scheme those characters are indicated.

1. All barbels simple, undivided. 1st dorsal fin lower than body depth or not higher.
   A. Anterior nostrils perforating the tip of the snout.
      a. Jaw teeth and vomerine teeth angular, longer than the other teeth, more or less curved. The body of younger fishes has 3 whitish bands on each side from the head to the caudal fin. Head contained 4¾ to 5⅔ times in length of body. Nasal barbels reaching or nearly reaching the eye.

Plotosus anguillaris Lac.

      b. Jaw teeth and vomerine teeth angular, shorter than the other teeth, not curved. Body without bands, at all ages. Head contained 5½ to 6½ times in length of body. Nasal barbels far overreaching the eye.

Plotosus canius Buch.

   B. Anterior nostrils perforating the upper lip.
      a. Premaxillary teeth placed in 2 slightly quadrate or slightly round, nearly touching groups. Body darkish, without bands or spots. Head contained 6 times in length of body. Nasal barbels far overreaching the eye.

Plotosus albilabris CV.

Plotosus anguillaris Lac.

Poiss. V p. 129, 130 tab. 3 fig. 2. Cuv. Règn. anim. II p. 297, Rüpp. N. Wirb. Abyss. Fische Roth. M. p. 76, Cant. Catal. Malay. Fish. p. 264, Peters Fish. Mosamb. Arch. Naturgesch. XXI I, p. 267. Atl. Silur. tab XLVII fig. 2

Eel-shaped Sambilang

A Plotosus with an elongate body, anterior part about as broad as deep, posterior part very compressed, body depth contained 6½ to 8 times in its length. Head convex, slightly depressed, contained 4¾ to 5⅔ times in the length of the entire body; depth of head contained 1⅔ to 1¾ times in its length, width 1½ to 1¼ times; eye diameter contained 5½ to 7 times in length of head, distance between the eyes 2 to 3 times their diameter; snout convex, rostral profile obtusely rounded; nasal barbels placed at a distance of about one eye diameter from each other, in younger fishes overreaching the eye a little, in older fishes reaching the eye, 315 maxillary barbels reaching the gill cover or posterior part of the preopercle, lower jaw barbels close to the mouth, the outer ones a little longer than the inner ones, reaching or nearly reaching the interopercle; nostrils very small, the posterior ones in the form of a fissure, close to the base of the nasal barbel, the anterior ones round, perforating the elevated papilla or nearly tubular, placed at the anterior edge of the snout; lips fleshy, very papillose; upper jaw protruding beyond the lower jaw. Jaw teeth and vomerine teeth conical, slightly obtuse, in anterior part of the jaws generally placed in three rows; upper jaw teeth placed in a nearly crescent-shaped band, with acute angles, divided in the middle, thin, more than 4 times as long as broad, each side with angular teeth or with a curved angular tooth longer than the others; lower jaw teeth placed in a nearly crescent-shaped band, longer than the premaxillary band, divided in the middle, thin, the outer row longer than the inner rows; vomerine teeth multiple-rowed, placed in a group resembling the form of a circle segment, obtuse, teeth in the posterior row generally longer than the other teeth; lateral line sloping downwards anteriorly, then straight, simple, characterized by touching small tubes; axillary slime pore slightly visible. First dorsal fin slightly acutely or slightly obtusely rounded, in young fishes that are not yet older, not much lower than body depth, spine compressed, on both sides serrated, smaller than the rays, generally shorter than the postocular part of the head; pectoral fins slightly acutely or slightly

Fig. 81. *Plotosus anguillaris* Lac. [In Atlas synonymized with *P. arab* Blkr.]

obtusely rounded, contained 1⅖ to 1½ times in length of head, spine compressed, serrated on both sides, not or hardly longer than the dorsal spine; ventral fins rounded, obtuse, 2 to 3 times as short as the head; anal fin a little higher than the second dorsal fin. Colour of upper part of the body and flanks in younger fishes rosy-violet or deep brown-rosy, in older fishes deeply brown-olive or violetish-olive, lower part of the body pearly. Younger fishes have 2 or 3 pearly-rosy bands on each flank, the upper band beginning on the snout, running down above the eyes, close to the dorsal line, and ending on the back of the tail, the median band beginning above the angle of the mouth, running down in the middle of the head and the flanks, below the lateral line, and ending in the middle of the base of the caudal fin, the lower band close to the gastro-anal line and parallel to it. Fins are greenish- or violetish-rosy, more or less with dark speckles.

B. 11 or 12. D. 1st 1/4 or 1/5. P. 1/10 or 1/11. V. 1/11 or 1/10. D. 2nd 85 + C. 10 + A. 70 = 165 to D. 2nd 103 + C. 10 + A. 76 = 189.

Syn. *Vollersvischje, Ikan Binara* Valent. Ind. Amb. III p. 502 fig. 496.
Sambilang Ren. Poiss. Mol. I tab. 3 fig. 19.
Silurus arab Forsk. Descript. animal. XVI No. 3G.
Platystachus anguillaris Bl. Ausl. Fisch. VIII p. 61 tab. 373 fig. 1, Bl. Schn. Syst. posth. p. 373 tab. 74. Shaw. Gen. Zool. V p. 30 tab. 99.
Aalförmige Plattlieb Bl. Ausl. Fisch. VIII p. 61 tab. 373 fig. 1.
Platyste anguillé Bl. ibid. tab. 373 fig. 1.
Plotose anguillé Lac. Poiss. V p. 129, 130 tab. 3 fig. 2.
Ingeelee Russ. Fish. Corom. II p. 51 fig. 166.
Petit Machoiran Comm. ap. CV. Poiss. XV p. 306
. . . . . Voy. Krusenst. tab. 60 fig. 12, 13.
Plotosius ikapor Less. Voy. Coq. Zoöl II p. 132 tab. 31 fig. 8.
Plotose ikapor Less. ibid. Dict. Class. Hist. Nat. XV p. 435.
Plotosus marginatus Benn. Life of Raffles Catal. zoöl. spec. p. 691.
316 *Plotosus malignus* Ehr.
Plotosus vitiatus Swains. Nat. Hist. Fish. Amph. II p. 307.
Plotosus lineatus CV. Poiss. XV p. 306. Richds. Rep. 15h Meet. Brit. Assoc. Fish. Chin. Jap.

p. 286, T. Schleg. Faun. Jap. Poiss. p. 228 tab. 104 fig. 3, Blkr, Verh. Bat. Gen. XXI Sil. bat. consp. p. 4, 17, 57.
Plotosus castaneus CV. Poiss. XV p. 312.?
Plotose rayé CV. Poiss. XV. p. 306.
Plotosus castaneoides Blkr, Bijdr. ichth. Riouw, Nat. T. Ned. Ind. II p. 490.
Boa or *Buja* Arab.
Koomat Abyssin.
Akegedou Tamul.
Yen-ting, Gan-ting, Om-ting Chin.
Sambilang karang Mal. Bat.
Similang karong Mal. Strait of Malacc. acc. to Cant.
Ika-por Wageese. acc. to Lesson.

Hab. Java (Batavia, Bantam), in sea.
Sumatra (Telokbetong, Priaman, Trussan, Tiku, Sibogha), in sea.
Batu, in sea.
Nias, in sea.
Bintang (Rio), in sea.
Banka (Muntok, Maruwang), in sea and in brackish water.
Celebes (Makassar, Manado), in sea.
Sangi, in sea.
Batjun (Labuha), in sea.
Buro (Kajeli), in sea.
Ambon, in sea.
Ceram (Wahai), in sea.

Length of more than 100 specimens 55‴ to 220‴.

Remark. The large distribution of this species from the Red Sea to Japan and the Society islands, i.e., across half the circumference of the earth, and its frequent occurrence at various places, have made it familiar already for a long time, a familiarity to which certainly have contributed the dangerous wounds, often inflicted by its sharp and brittle dorsal and pectoral fin spines.

I do not object to the idea that to the above mentioned extensive synonymy can be added Plotosus castaneus CV. and Plotosus limbatus CV. and that these are only to be considered as 317 nominal species, representing older age stages of Plotosus anguillaris Lac.

Plotosus anguillaris is figured very well recognisable in the works of Valentyn and Renard. Valentyn seems to have had little knowledge of this species, because, although he says that it "has a rather bad and dry taste", he does not mention its dangerous spines, the wounds of which often cause such violent infections that since long have been considered poisonous by many indigenous people. Indeed, other writers Forskål, Bloch, Lacépède and Russell do not mention it either. Bloch already mentioned the branched appendage behind the anal opening and was of the opinion that it serves, just like the brood pouch in the needle fishes, for the incorporation of the eggs, an idea that is already unacceptable because the appendage is found in females as well as in males.

Lesson was the first to mention the dangerousness of the wounds, which can be inflicted by the spines of the Sambilang-karang. It is very certain that these wounds, when they are deep, can become very dangerous, however, I myself have often been wounded by the dorsal and pectoral spines of this species, without serious symptoms of infection have followed. In a few cases however I removed shortly after the wound-

ing by means of an incision the tips of the spines, which were left in the wounds. Each time I was wounded by these spines, a heavy bleeding followed that was difficult to staunch. This was seldom the case in woundings by fin spines of Silures of other genera, which often fell to my share.

In Batavia Plotosus anguillaris occurs only from time to time. It seems to be a migratory fish that visits the north coast of Java now and then in very large schools when they are still young. In Batavia I have seen it various times brought to the market by the thousands. However, the individuals always were of a juvenile age. I only received adult specimens from the Moluccans and from Sumatra, Singapore and Riouw.

318 *Plotosus canius* Buch.
Gang. Fish. p. 142, 374 tab. 26 fig. 45 CV. Poiss. XV p. 315,
Blkr Verh. Bat. Gen. XXV Nal. ichth. Beng. p. 125, Kner Ichth. Beitr. Sitzungsber. Kais. Akad. Wiss. XVII p. 157. Atl. Silur. tab. XLVII fig. 2.
Unicoloured Sambilang

A Plotosus with an elongate body, anterior part broader than deep, posterior part very compressed, body depth contained 7½ to 12 times in its length. Head convex, depressed, contained 5½ to 6½ times in the length of the entire body; depth of head contained 2¼ to 1¾ times in its length, width 1⅕ to 1⅖ times; eye diameter contained 7 to 11 times in length of head, distance between the eyes 2⅓ to 4 times their diameter; snout convex, rostral profile obtusely rounded; nasal barbels placed at a distance of more than one eye diameter from each other, reaching the gill covers or the scapular bone; maxillary and outer lower jaw barbels reaching the gill covers or the base of the pectoral fin; lower jaw barbels close to the mouth, inner ones shorter than the outer ones; nostrils wide open, conspicuous, the posterior ones close to the base of the nasal barbel, in the form of a fissure, the anterior ones with short tubes, placed at the anterior edge of the snout; lips fleshy, papillose; upper jaw protruding beyond the lower jaw; upper jaw teeth conical, obtuse, set in three to four rows at anterior part of the jaw, placed in a slightly curved band, with acute angles, divided in the middle, about 4 times as long as broad. The teeth in the front and back rows are larger than the other teeth. There are no larger, curved angular teeth; lower jaw teeth placed in a nearly crescent-shaped band, much longer than the premaxillary

Fig. 82. *Plotosus canius* Buch.

band, set in four to five rows in anterior part of the jaw. The teeth in the outer row are conical, obtuse, larger, those in the inner rows grain-like; vomerine teeth grain-like, placed in a group resembling the form of a circle segment, set in four to six rows in the middle of the segment, the teeth in the posterior row larger than the other teeth; lateral line sloping downwards anteriorly, then straight, simple, characterized by touching small tubes; axillary slime pore well visible. First dorsal fin acutely rounded, a little or not lower than body depth, spine robust, compressed, serrated on both sides, smaller than the rays, not to nearly twice as short as the postocular part of the head; pectoral fins slightly acutely or slightly obtusely rounded, contained 2 to 1⅔ times in length of head, spine robust, compressed, serrated on both sides, not or a little shorter than the dorsal spine; ventral fins obtuse, rounded, much shorter than the pectoral fins; second dorsal and anal fins are of nearly equal heigth at posterior part, anterior part of the anal fin is higher than the dorsal fin. Colour of upper part of the body and fins olive-dark or blackish, lower part of the body more softly coloured, throat and belly pearly, lips whitish.

B. 11 to 13. D. 1st 1/5 or 1/4. P. 1/11 to 1/12. V. 1/11 to 1/12. D. 2nd 129 + C. 10+ A. 106 = 245 to D. 2nd 143 + C. 10 + A. 118 = 271.

Syn. *Plotosius canius* Buch. Gang. Fish. p. 142, 374 tab. 15 fig. 44.
Plotose cani CV. Poiss. XV p. 315.
Plotosus unicolor K.v.H. CV. Poiss. XV p. 316, Blkr, Verh. Bat. Gen. XXI Silur. batav. consp. p. 58.
Plotose unicolore CV. Poiss. XV p. 316.
Plotosus viviparus Blkr, Verh. Bat. Gen. XXI. Sil. bat. consp. p. 59.
Plotosus horridus Blkr, ibid. p. 59.
Plotosus multiradiatus Blkr, ibid. p. 60.
319 *Kani magur* Bengal.
Ikan Sambilang betul Mal. Batav.

Hab. Java (Batavia, Samarang, Surabaja, Pasuruan), in sea and in brackish water.
Madura (Kammal), in sea.
Singapura, in sea.
Banka (Pangkalpinang), in brackish water.
Sumatra (Palembang), in rivers.
Borneo (Bandjermasin, Singkawang), in rivers and in brackish water.
Celebes (Makassar), in sea.
Bengal (Calcutta), in the river Hooghly.

Length of the 27 specimens 135''' to 550'''.

Remark. A detailed comparison of Plotosus canius Buch. with equal sized specimens of Plotosus unicolor K.v.H., have not showed me differences that give the right to consider them as belonging to two different species. The slight differences in the length of the barbels, in the number of fin rays and the relative heights of body and head are not sufficient for this, as they, following comparisons of sufficient series of specimens, can all be reduced to differences caused by differences in age.

The species primarily feeds on shells, gastropods and crustaceans, and reaches a size of at least 700 mm. In Batavia it is little wanted as food, and only eaten by natives and Chinese people. The native people ascribe to its flesh the power to restore the lagging menstruation.

Plotosus albilabris CV.
Poiss. XV p. 316, Cant. Cat. Mal. Fish. p. 265,
Blkr Bijdr. ichth. Singap. Nat. Tijdschr. N. Ind. III p. 70.
White-lipped Sambilang
Atl. Silur. tab. XLVIII fig. 1.

A Plotosus with an elongate body, anterior part hardly or not broader than deep, posterior part very compressed, body depth contained 7 to 8 times in its length. Head not depressed, very convex, contained about 6 times in the length of the entire body; depth of head contained 1⅔ to 1½ times in its length, width 1½ to 1¼ times; eye diameter contained 4 to nearly 6 times in length of head, distance between the eyes a little more than once to 1½ times their diameter; snout very convex, rostral profile obtusely rounded; nasal barbels reaching or overreaching the gill cover; maxillary barbels reaching or nearly reaching the gill cover; lower jaw barbels close to the mouth, the outer ones longer than the inner ones, reaching or nearly reaching 320 the base of the pectoral fin; nostrils wide open, round, not tubular, the posterior ones perforating the skin a little behind the base of the nasal barbel, the anterior ones placed below, in the upper lip; the anterior nostrils can be closed by a small valve; lips fleshy, papillose; upper jaw protruding beyond the lower jaw; upper jaw teeth placed in 2 slightly quadrate, nearly touching groups, about as broad as long, the teeth conical, obtuse, short, each group having 2 or 1 teeth at the front that are much longer than the other teeth and slightly acute; lower jaw teeth placed in 2 triangular bands, nearly touching at the base, about twice as long as broad, the teeth in the outer row conical, obtuse, larger than the others, the other rows grain-like; vomerine teeth placed in a group resembling the form of a circle segment, grain-like, set in four to five rows in the middle of the segment, the teeth in the posterior row larger than the other rows; lateral line sloping downwards anteriorly, then straight, simple, characterized by touching small tubes; axillary slime pore well visible. First dorsal fin acutely or obtusely rounded, a little or not smaller than body depth, spine robust, compressed, serrated on both sides, not or a little shorter than the postocular part of the head, smaller than the first ray; pectoral fins

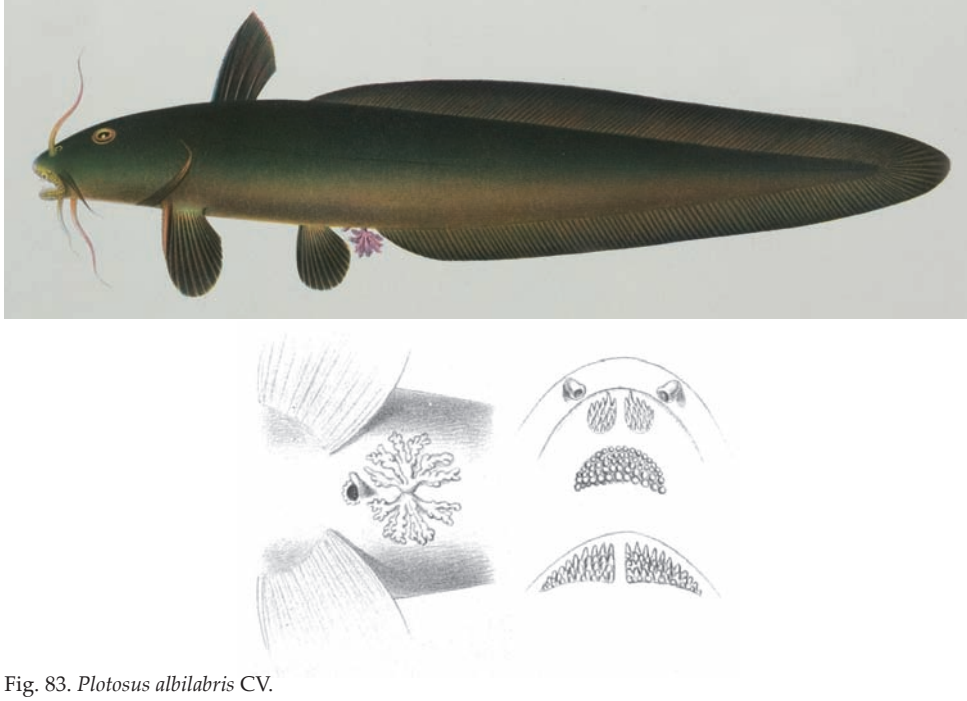

Fig. 83. *Plotosus albilabris* CV.

obtusely or slightly acutely rounded, contained 1⅓ to nearly 2 times in length of head, spine robust, compressed, serrated on both sides, not or a little shorter than the dorsal spine; ventral fins obtuse, rounded, shorter than the pectoral fins; posterior part of second dorsal and anal fins of nearly equal heigth, anterior part of the second dorsal fin higher than the anal fin. Colour of upper part of the body deep brown-dark or olive-dark or blackish-dark, lower part whitish or gray. All fins or only the dorsal ones dark, the others frequently orange, barbels darkish or yellowish, lips white.

B. 9 to 11. D. 1st 1/4 or 1/5. P. 1/13 ve1 1/12. V. 1/11 or 1/12. D. 2nd 103 + C. 10 + A. 90 = 203 to D. 2nd 111 + C. 10 + A. 95 = 216.

Syn. *Plotose à lèvres blanches* CV. Poiss. XV p. 316.
Plotosus macrophthalmus Blkr, Verh. Bat. Gen. XXI, I Silur. bat. consp. p. 56.
Ikan Sambilang Mal. Batav.
Similang Mal. Strait of Malacc. acc. to Cant.

Hab. Java (Batavia), in sea.
Bintang (Rio), in sea.
Biliton (Tjirutjup), in sea.
Singapora, in sea.
Celebes (Bulukomba), in sea.

Length of the 11 specimens 109‴ to 353‴

Remark. Earlier I regarded this species as a species of its own under the name Plotosus macrophthalmus. Since then it appeared to me not to differ from Plotosus albilabris CV., at least not from the species, which has been described by Mr Cantor under the same name.

Plotosus albilabris CV. is remarkable by the placing of the anterior nostrils in the upper lip between the lip pappilae, and 321 by the arrangement of the premaxillary teeth in two square or roundish groups, its strongly curved profile and large eyes. Maybe once the species are better known one will find cause to erect a proper genus for it on the basis of the characters taken from the dentition and the position of the anterior nostrils.

Plotosus macrocephalus CV.
Poiss. XV p. 317 tab. 449. [Atl. Silur. tab XLVII fig. 1.]
Large-headed Sambilang

A Plotosus with an elongate body, posterior part very compressed, body depth contained 8½ to 9? times in its length. Head convex, contained about 4 times in the length of the entire body; depth of head contained about 1½ times in its length, width about 1¼ times; eyes placed about halfway length of head,

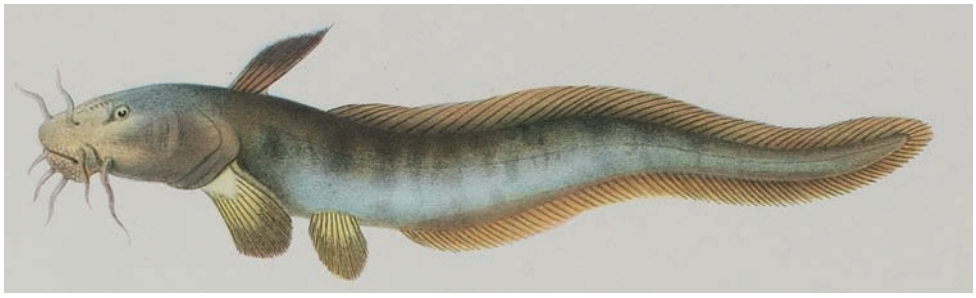

Fig. 84. *Plotosus macrocephalus* CV.

facing upwards, diameter contained 9 times in length of head, distance between the eyes about 2½ times their diameter; lips very fleshy and papillose; nasal and outer lower jaw barbels longer than maxillary and outer [inner] lower jaw barbels, more than twice as short as the head.

D ^{2a} 96 + C. 11 + A. 95 = 202.

Syn. *Plotose à grosse tête* CV. Poiss. XV p. 317 tab. 449.

Hab. Timor.?

Length of the described specimen 18 Parisian inches.

Remark. I only know this species from the description and figure in the large Histoire naturelle des Poissons. It seems to be recognisable mainly by its large head. Regarding its dentition and anterior nostrils no particularities are mentioned neither in the description nor in the figure.

322 *Chacini*

Chaca CV.

Two separate rayed dorsal and anal fins, the posterior dorsal and anal fin fused with the caudal fin. Jaw teeth multiple-rowed, small. No vomerine teeth. Eyes entirely covered. Eight nasal, labial and lower jaw barbels, the outer lower jaw barbels inserted on the throat behind the angle of the mouth. Branchiostegal membrane with 7 rays. Gill opening ending under the humeral bone. No dendritic postanal appendages.

Remark. Just like Plotosus by its bunch-like appendages, this genus is equally sharply charcterized in the large series of the Siluroïds by a second anal fin, whereas both genera are not less sharply characterised as a subfamily because of the presence of a second rayed dorsal fin and the connection of that fin and of the second anal with the caudal fin.

Chaca forms a link between the Plotosichthyoïds and the Bagrichthyoïds and more especially a transition to the Pimelodini, which type, except for the vertical fin system, it even more resembles than the type of the Plotosines,

Until my investigations only a simple species of Chaca was known. I discovered a second species and described it under the name of Chaca bankanensis. Both species seem to occur in the Indian archipelago, but Chaca lophioides I have not seen myself until now. The following characters seem to make the distinction of both species easy.

I Barbels on the lower lip, many cirri on back and flanks.

Chaca lophioides CV.

II Barbels on the lower lip, no cirri on back and flanks.

Chaca bankanensis Blkr.

323 *Chaca bankanesis* Blkr.

Bijdr. ichth. Banka, Nat. T. Ned. Ind. III p. 455, Achtste Bijdr. Ichth. Borneo Nat. T. Ned. Ind. VIII p. 165. Atl. Silur tab. XLVII fig. 1. [fig. 3.]

Bankanese Chaca

A Chaca with anterior part of the body much depressed, posterior part compressed, body depth contained 10 to 6 times in its length, greatest width nearly 4 to 3½ times. Head much depressed, contained 3⅓ to 3½ times in length of body. Width of head contained a little more than once to 1⅕ times in its length, 3⅔ to 4 times in the length of the entire body, depth contained 4 times to a little more than twice in its length; eyes entirely covered, diameter contained 16 to 19 times in length of head, distance between the eyes 7 to 9 times their diameter. Head shield covered by a glandular skin, glabrous, anterior part angulary forked, the anterior half only divided by a longitudinal groove (median fontanel). A posterior lateral fontanel, small, is very close to the posterior edge of the shield. Supraoccipital crest very short, touching the thin, elongate first interspinal bone; second interspinal bone triangular, emarginate at the top, embracing the first interspinal bone; snout most depressed, rostral profile very obtuse, nearly truncate; nostrils separate, the posterior ones round, not tubular, placed fairly far before the eyes but much nearer to the median line of the head than to the anterior nostrils. Anterior nostrils nearly tubular, close to the

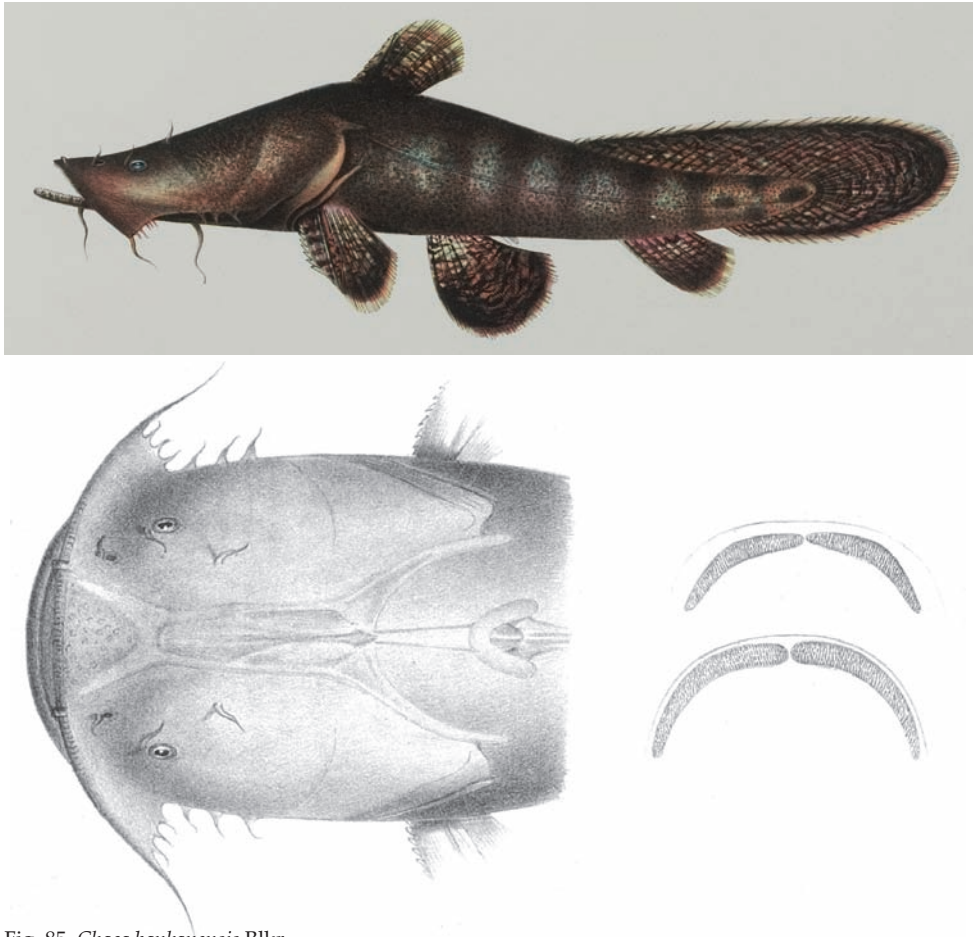

Fig. 85. *Chaca bankanensis* Blkr.

anterior edge of the snout, with small lobes or short, cutaneous tentacles: on each side 2 preocular ones, close to each other, a simple interocular one, many postmaxillary-opercular ones, placed in rows, and a few very short ones, only visible with the aid of a lens, few, scattered to the chin; upper jaw much shorter than the lower jaw; premaxillary bones broad, the maxillary bones prolonged far beyond the premaxillary bones, ending behind the eye; teeth multiple-rowed, small, premaxillary teeth placed in a curved, angular band, lower jaw teeth in a band in the form of a horseshoe; 8 true barbels, the nasal ones hardly or not longer than the eye, the maxillary or labial ones hardly or not shorter than the snout, the lower jaw barbels thin, not or hardly shorter than the labial ones, the inner lower jaw barbels inserted on the anterior part of the chin, at a distance of more than the length of the snout from each other, the outer ones inserted after the angle of the mouth, under the preopercle; suprascapular bone, with a thin ascending arm, reaching the supraoccipital crest; skin on the entire body glandular, with conspicuous small glands; lateral line simple, anterior part sloping most conspicuously downwards, the elevated, posterior part straight, interrupted, little conspicuous; axillary slime pore not conspicuous. First dorsal fin slightly obtuse, convex, lower than body depth, spine thick, lower than the rays, about 4 times as short as the head, anterior side towards the top bidentate, posterior side glabrous; pectoral fins twice or more than twice as short as the head, spine very broad, longer than the dorsal spine, the upper part with a ridge, lower part rounded, convex, tumid, anterior side armed with several robust, curved teeth, posterior side glabrous; ventral fins obtuse, rounded, twice or nearly twice as short as the head; first anal fin inserted after the beginning of the second dorsal fin, obtuse, rounded, no or a little higher than long at the base; second dorsal fin less than length of head, the first ray beginning confluent with the head, long before the third posterior part of the body, without the caudal fin twice as long but not or hardly higher than the second anal fin without caudal fin, with a ridge before the first ray, prolonged nearly above the anus; caudal fin not distinct from the second dorsal and second anal fins, rounded at the tip, obtuse, middle rays contained 6 to 6½ times in the length of the entire body. Body violetish-olive-coloured, irregularly, nearly transversely, broadly clouded with dark. Barbels have dark and orange rings. Fins darkish or violetish, all with white or yellow edges. The first dorsal, pectoral and ventral fins are reticulated with a deeper dark, the second dorsal, caudal and anal fins have oblique, transverse dark bands and are reticulated with a bluish colour.

324 B. 6. D^{1st} 1/4. P. 1/4. V. 6 (fiss.). A^{1st} 8 (3 simpl. 4 fiss. + 1 simpl.) D. 2^{nd} 23 simpl. + C. 11 + A. 2^{nd} 11 simpl. or subdivid. = 45 to D. 2^{nd} 24 + C. 11 + A, 2^{nd} 12 = 47.

Syn. *Puting-Bliong* Djambinese.

Hab. Sumatra (Djambi), in rivers.
Borneo (Bandjermasin), in rivers.
Banka (Marawang), in rivers.

Length of the 6 specimens 58‴ to 181‴.

Remark. Chaca bankanensis can easily be distinguished from Chaca lophioïdes because the barbels on the lower jaw as well as the skin flaps on the back and the flank below and above the lateral line are lacking. Judging from the existing descriptions and figures of Chaca lophioïdes, its head relative to the body length is broader, the eyes are smaller and nasal barbels would be absent, but this requires confirmation because in Chaca bankanensis, if searched carefully they are clearly recognisable, but they easily escape attention. Moreover, the pectoral fins in Chaca lophioïdes would fit 10 times in the total body length, whereas this length in Chaca bankanensis only contains that of the pectoral fins 8 to 8½ times. In Chaca lophioïdes moreover, according to Mr Valenciennes, the pectoral fins would possess one and the anal fin two rays more than Chaca bankanensis.

Concerning the shape of the intestines, it does not differ from that described by Mr Kner of his Chaca lophioïdes. In the stomach of one of my specimens I found a whole specimen of Panchax Buchanani CV., thus it appears that Chaca feeds on small fishes and crustaceans.

My two largest specimens were caught in the Djambi river, where the natives know the species by the name of Poeting-bliong and fear the wounds of its fin spines as poisonous. I received them for he first time after the printing of the first pages of this work, reason why they are not mentioned under the fishes of Sumatra.

325 *Chaca lophioides* CV.
Zoöl. Voy. Ind. orient. Bélanger. p. 368, Poiss. Tab. 4 fig. 2.
Hist. nat. Poiss. XV p. 330 tab. 451. and maybe Chaca lophioides Kner Sitzungsber. Kais. Akad. Wiss. XVII p. 100 tab. 1 fig. 2-6?
Seadevil-like Chaca

A Chaca with a head width contained about 3½ times in the length of the entire body. No nasal barbels? Pectoral spine contained 10 times in length of body. Second dorsal fin beginning a little before the third posterior part of the entire body. Lower jaw has barbels or several short, cutaneous lappets at the ventral periphery. The back, tail and flanks above and below the lateral line have short, cutaneous lappets, placed in longitudinal rows. Eyes dot-like.

B. 7. D. 1^{st} 1/4. P. 1/5. V. 6. A. 1^{st} 10. D^{2nd} 25 + C. 10 +A^{2nd} 12 = 47.

Syn. *Platystacus chaca* Buch. Gang. Fish. p. 140, 374 tab. 28 fig. 43.
Brachystacus chaca J. Van der Hoeven Handb. Dierk. ed 2^{a} II p. 280.

Hab. Borneo (v.d. Hoev.), N. Guinea (Kner)?, Bengal (Buch. al.).

Remark. The above mentioned characters are taken from the figure and the description of the species by Mr Valenciennes. From these I have only mentioned those points in which my Chaca bankanensis differs from Chaca lophioïdes. Mr Kner in his Ichthyologische Beitrage (Sitzungsber. math. naturw. Classe der Kais. Akad. Wissensch. XVII p. 100, 101) has given a new description of Chaca lophioïdes. If that description taken from specimens originating from Borneo or New Guinea, indeed concerns Chaca lophioïdes CV. and not any other proper species, Chaca bankanensis differs by still more other characters from Chaca lophioïdes and in any case from the species described by Mr Kner as Chaca lophioïdes.

According to Mr Kner in his species the distance from the snout to the first dorsal fin would occupy more than ⅓ of the total body length. In my specimens of Chaca bankanensis that length is less than ⅓ of that the total body. The distance from the tip of the snout to the base of the pectoral fin spine in Chaca bankanensis would fit 4 times in the total body, in Chaca lophioïdes only 3⅓ times. In this species the inner lower jaw barbels would be longer than the upper jaw barbels and in length would even be surpassed by the outer (most posterior) 326 lower jaw barbels. Moreover the anterior anal fin would have 6 to 7 all undivided rays. When I compare the skeleton of the head, as figured by Mr Kner with that of Chaca bankanensis, then I perceive only as different that the 2^{nd} inter spinal bone in Chaca lophioïdes is more squarish than triangular and that the posterior lateral, as well as the depression for for the supraoccipital crest are remarkably larger.

In my opinion it deserves to be investigated in more detail whether the species of Mr Kner represents a proper species. I also feel doubts with regard to the habitat as far as it concerns New Guinea. I do not know any fresh water Siluroïd occurring more easterly than Java or Borneo and even of the sea Siluroïds, with the exception of Plotosus anguillaris, I do not know any species occurring more easterly in the Indian archipelago than Celebes.

327 FAM. II. ASPREDINOIDEI
FLATSPINE FISHES

Siluri with simple gills, without appendages. Rudimentary opercular bones, united, immobile. Premaxillary bones longitudinally articulated. A simple, rayed dorsal fin. Body naked.

Remark. The principal character for determining the Aspredinoïds as a family is found in the withering of the bony elements of the gill cover, which are tightly connected to each other and immovable. I do not know this exclusively American family from nature and therefore I am not capable to spread a brighter light over it.

Meanwhile it appears to me it needs confirmation that Aspredo verrucosa CV. belongs to it. Very certainly this species belongs to a genus very different from Aspredo and thus Mr Kner has justly separated it from Aspredo under a proper generic name (Bunocephalus). Mr Kner who had the privilege to investigate the species from nature, neither in his description, nor in that of a second species that he brings to Bunocephalus, mentions of the nature of the gill cover bones, which I suspect to be of a quite other nature than those of Aspredo.

As I cannot make a decision on this matter, I mention here both species of Bunocephalus, although it seems to me that this genus might be placed better in the family of the Siluroïds and in that family under the group of the Tricomycterini, close to Brontes, Astroblepes and Nematogenys.

Of the Aspredinoïds only very few species are known, even when one would bring the genus Bunocephalus Kner to it. The rivers of America, especially of Central - and South America, till now are so little explored that one may suspect that new investigations will lead to the discovery of various new species. Probably it then will also become apparent 328 that the real Aspredinoïds belong to more than a simple genus and it seems to me even already now, that Aspredo tibicen Temm., because of its nasal- or snout spines and its numerous chin barbels, belongs to a genus differing from Aspredo.

Moreover, the little knowledge of the genus Bunocephalus Kner that one possesses until now indicates that also both species referred to it belong to entirely different types.

If Bunocaphalus indeed can be considered to belong to the Aspredinoïds, than it is necessary any way to split the family into two very different groups, which I propose to name Aspredini and Bunocephalini and which can be charaterised as follows.

Aspredini. Tail thin, tail and anal fin very long (more than 4 times as long as the head).

Bunocephalini. Tail and anal fin short (shorter or hardly longer than the head).

As yet to the Aspredini can only be brought the genera Aspredo and Aspredinichthys, which are characterised as follows:

Aspredo. Art. L. CV. partly. 6 or 8 barbels (upper jaw barbels generally bifid). Snout spineless.

Aspredinichthys. Blkr. Many lower jaw barbels. Snout aculeate.

The three known species of Bunocephalus belong to two genera as well. Already a superficial contemplation of the figures of Bunocephalus Kner and Platycephalus verrucosus Bl. makes one become aware of such large differences in habitus of the entire body and the build of the dorsal fin that one involuntary thinks of two different genera, although as yet they are placed by Mr Kner in his genus Bunocephalus.

The name Bunocephalus might be retained for the genus discovered by Mr Kner, whereas the since long known species of Bloch and Gronovius, which in my opinion differ specifically could be referred to my genus Bunocephalichthys. The principal characters of these two genera can be given in a few words, i.e.

Bunocephalus 329 Kner in part. Dorsal fin rudimentary, with two rays, placed before the ventral fins. Tail compressed, higher than the head.

Bunocephalichthys Blkr. Dorsal fin, well developed with many rays, placed opposite the ventral fins. Tail cylindrical, much lower than the head.

The few until now known species of the Aspredini and Bunocephalini are the following.

Aspredo	laevis CV. = Silurus aspredo = Platystacus laevis Bl.	Hab.	Guyana.
"	filamentosus CV.	"	Guyana.
"	sicuephorus CV.	"	La Mana.
"	sexcirrhis CV. = Platystacus cotylephorus Bl. = Silurus hexadactylus Lac.	"	Guyana.
Aspredinichthys tibicen Blkr = Aspredo tibicen Temm.		"	Guyana.
Bunocephalus	hypsiurus Kner.	"	Rio Branco.
Bunocephalichthys verrucosus Blkr = Bunocephalus verrucosus Kner. = Aspredo verrucosus CV. = Platystacus verrucosus Bl.		"	S. Am.
"	Gronovii Blkr = Aspredo cauda subrotunda etc. Gron. Mus. ichth. II N. 153 tab. 5 fig. 3.	"	S. Am.

330 FAMILY III. LORICARIOIDEI
ARMOURED FISHES

Siluri with simple gills, without appendages, preopercles immobile, body surrounded with an armour of scales, an inferior mouth, a simple or double dorsal fin. Pseudobranchiae. No swim bladder.

Remark. I mention this entirely American family here only to make the list of Silures, now known to science, complete.

Mr Kner, in two important articles on the Loricarins and Hypostomids, included in the 6th and 7th volume of the "Denkschriften der mathemathisch-naturwissenschaftl. Classe der kaiserl. Akademie der Wisschenschaften (Vienna 1853, 1854)" has split the family of the Loricarioïds in the two mentioned principal groups and referred to them the genera Loricaria Auct., Hemiodon Kner, Acestra Kner, Sisor Buch., Hypotomus Ag., Chaetostomus Kner and Ancistrus Kner.

I have already explained above the reasons why I cannot consider the genus Sisor to belong to the Loricarioïds, and why I referred it to the Siluroïds.

The remaining genera mentioned above, are characterised by Mr Kner in the following way.

Phalanx I. Loricarini. One dorsal fin.

Loricaria Auct. Body depressed, broader than high. Tail very flat. Premaxillary and lower jaw teeth.

Hemiodon Kner. Body very depressed. Lower jaw teeth. Premaxillary bones rudimentary, edentate.

Ancestra Kner. Body elongate, nearly cylindrical. Premaxillary and lower jaw teeth inserted on a broad base. Anal fin placed opposite the dorsal fin.

Rhinilepis Ag. Body short. Shields placed almost in the form of scales. Jaw teeth placed in a simple row, simple, hooked at the tip. B.3.

331 Phalanx II. Hypostomini. Two dorsal fins.

Cohort a. *Inermes* or *Clypeati* Kner. Interopercle spineless.

Hypostomus Ag. Premaxillary and lower jaw teeth. Caudal fin with equal lobes or with a prolonged inferior lobe.

Cohort b. *Ancistrini* or *Lictores* Kner, Interopercle very mobile, armed with a band of needle-points.

Chaetostomus Kner. Anterior mouth flap large, lobed in the middle, prolonged.

Ancistrus Kner. Anterior mouth flap short.

The species that till now, as far as I can ascertain, have become known, are.

Loricaria	cataphracta L.	Hab.	S. Am.
"	vetula L.	"	S. Am.
"	nudiventris CV.	"	S. Am.
"	anus CV.	"	S. Am.

"	acuta CV.	" S. Am.
"	maculata Bl.	" S. Am.
"	laeviuscula CV.	" S. Am.
"	rostrata Spix.	" S. Am.
"	brunea Hanc.	" S. Am.
"	platyura Müll. Trosch.	" S. Am.
"	scolopacina De Filipp.	" S. Am.
"	macrodon Kner.	" S. Am.
"	nudirostris Kner.	" S. Am.
"	barbata Kner.	" S. Am.
Hemiodon?	platycephalus Kner.	" S. Am.
"	depressus Kner.	" S. Am.
"	acipenserinus Kner.	" S. Am.
Acestra	acus Kner.	" S. Am.
"	oxyrhyncha Kner.	" S. Am.
Rhinelepis	strigosa CV.	" S. Am.
"	aspera Spix.	" S. Am.
"	genibarbis CV .	" S. Am.
"	histrix CV.	" S. Am.
332 "	acanthicus CV.	" S. Am.
Hypostomus	plecostomus CV.	" S. Am.
"	punctatus CV.	" S. Am.
"	verres CV. (the same species as Hypost plecostomus CV?)	" S. Am.
"	Commersonii CV.	" S. Am.
"	emarginatus CV.	" S. Am.
"	Robinii CV.	" S. Am., Trin.
"	granosus CV.	" S. Am.
"	serratus CV.	" S. Am.
"	itacua Val.	" S. Am.
"	barbatus CV.	" S. Am.
"	guttatus CV.	" S. Am.
"	guacharote CV.	" Porto Rico.
"	erinaceus CV.	" S. Am.
"	bufonius CV.	" S. Am.
"	Temminckii CV.	" S. Am.
"	calamita CV.	" S. Am.
"	squalinus Schomb.	" S. Am.
"	horridus Heck.	" S. Am.
"	cochliodon Kner.	" S. Am.
"	pantherinus Kner.	" S. Am.
"	auroguttatus Natt.	" S. Am.
Chaetostomus	loborhynchos Heck.	" S. Am.
Ancistrus	duodecimalis Kner. = Hypostoma duodecimalis CV., etc.	" S. Am.
"	cirrhosus Kner.	" S. Am.
"	nudiceps Kner. = Hypostomus nudiceps Müll. Trosch.	" S. Am.
"	dolichopterus Kner.	" S. Am.
"	gymnorhynchus Kner.	" S. Am.
"	bufo Kner.	" S. Am.
"	mystacinus Kner.	" S. Am.
"	pictus Kner.	" S. Am.
"	brachyurus Kner.	" S. Am.
"	scaphirhynchus Kner.	" S. Am.
"	longimanus Kner.	" S. Am.
"	gibbiceps Kner.	" S. Am.
"	lituratus Kner.	" S. Am.

333 FAMILY IV. HETEROBRACHOIDEI
STRANGE-GILLS

Siluri with a respiratory system composed of branches and an accessory apparatus, dendritic or tubiform, opercular bones articulated, mobile, dorsal fin simple or double, skin naked.

Remark. The family of the Heterobranchoïds is a very natural one and characterised by accessory breathing organs, which are built in such a way that the fishes that have them, in the breathing apparatus can take up and retain a quantity of water, which makes it possible to live outside the water without their respiration being restricted.

The heterobranchoïds are totally structured for living a part of their lives out of the water. The force with which the gill opening can be closed already makes it easy to retain the gathered water between the gill plates.

The genera Heterobranchus and Clarias on each side [of the head] possess an additional branchial cavity, which stretches out far under the skull roof, can be closed with membranous gill plates, and in which two dendritic bunch of grape-like organs are found, which originate from the gill arches and lie entirely free in the gill cavity, where they are washed by the water that is found therein. This additional gill cavity is built in such a way, that the water contained in it can serve on the one hand to keep the dendritical appendages and the real branchial plates moist, and on the other hand, to permit the admission of air to replace the depleted oxygen content of the water.

In Saccobranchus or Heteropneustes a different arrangement is found, but the purport is comparable. The accessory gill cavity here lies not under the skull roof and does not possess bunch of grape-like gill arch appendages, but expands itself like a long tube between the muscle 334 mass on both sides of the back. The gill arches lie close to each other and can easily close the entrance to the respiration tube and open it again. Therefore here as well, the water, to the same effect as in Heterobranchus and Clarias, can be kept in the branchial cavity and be mixed with fresh air, when the fishes are found out of the water.

For the rest the genera Heterobranchus, Clarias and Saccobranchus in their organisation have so many points of similarity that their natural relationship cannot be doubted. If one sees the head of Saccobranchus, without the body, then one is tempted to take it for the head of Heterobranchus or Clarius, so large is the similarity in shape, organisation of the head shield, mouth and barbels and dentition. One even finds in Saccobranchus the angular incision in the anterior edge of the tooth bands of the lower jaw. In fin shape the differences are also essentially less large than would appear at first glance. Pectoral fins, pelvic fins, anal fin and caudal fin offer no essential differences, and concerning the dorsal fin the differences can be reduced to a larger or smaller length of the rayed dorsal fin and its replacement by a more or less developed adipose fin. Indeed, while in Clarias almost the entire length of the back is occupied by a very developed rayed fin, one finds in Heterobranchus that fin still occupies almost the entire back, but it is separated in a rayed and a ray-less part. Both parts in the archipelagic species are already remarkably less developed than in the Egyptian species. However, in Saccobranchus one finds a similar but even less developed fin, as the rayed

part is shortened to only a few rays and separated by an empty space from the adipose fin, and the adipose fin itself is so little developed, that it is easily overlooked as it is reduced to a skin seam which imperceptibly merges with the back line. In my specimens from Calcutta however, this seam is clearly recognisable as an adipose fin, especially when ones hold them against the light.

335 The dorsal fin system of Saccobranchus therefore is nothing else than a small change from that in Heterobranchus.

Although now Saccobranchus, because of concurrence in important characters with Heterobranchus and Clarias can be placed in the same family, it still differs so considerably from it by the structure of its breathing apparatus, that one has a cause to split the family in two groups, which I propose to call Heterobranchini and Saccobranchini and which can be separated from each other on the basis of peculiarities in the build.

The Hetreobranchines belong to the old world, where their distribution range comprises the whole of Africa, South Asia and the Sunda islands.

The Saccobranchines seem to be restricted to Bengal and Hindustan.

The species till now known from both groups are the following.

Heterobranchini

Heterobranchus Geoffroyi CV.		Hab. Nile.
" longifilis CV.		" Nile.
" senegalensis CV.		" Senegal.
" laticeps Peters.		" Mossamb.
" tapeinopterus Blkr.		" Born., Banka.
Clarias Hasselquistii CV.		" Nile.
" lazera CV.		" Nile.
" syriacus CV.		" Syria.
" senegalensis CV.		" Senegal.
" capensis CV.		" Cape of Good Hope.
" batrachus CV = Clarias magur CV. = Clarias marpus CV = Clarias Dussumierii CV.? = Clarias punctatus CV = Clarias		
" pulicaris Richds.		" Asia., Austral. Sunda Isl.
" mossambicus Paten.		" Mossamb.
" hexacinnus Richds.		" China.
" abbreviatus CV.		" China.
" Nieuhofii CV = Clarias pentapterus Blkr.		" Java, Sum. Born. Banka. Bilit
336" jagur CV = Cossyphus ater Macb Cl ?		" Beng, China.
" leiacanthus Blkr.		" Sumatra.
" melanoderma Blkr = CIarias melanosoma Blkr.		" Java, Sum., Bank., Born.

Saccobranchini.

Saccobranchus fossilis Blkr = Silurus fossilis Blkr.		" Beng. Hind.
" singio CV. = Silurus singio Buch.		" Beng. Hind.

The Heterobranchoïds therefore are amply represented in the Indian archipelago, since of the 21 now known species 7 and thus ⅓ occur in the Sunda Islands.

Heterobranchus Geoffr.
Treegill fish

Accessory [gill] branches placed on each side in two branching groups. Double dorsal fin, the anterior rayed, the posterior adipose. Jaw teeth and vomerine teeth multiple-rowed, the vomerine teeth placed in a transverse, curved band. Branchiostegal membrane with 8 to 13 rays.

Remark. The genus Heterobranchus until my investigations was only known from Africa. There it is found in the Nile as well as in the Senegal and later Mr Peters found it also in Mosambique. However, not a simple form of Heterobranchus has become known from entire Asia and therefore I was not a litte amazed to recover the genus in the Indian archipelago. At first I received it from the island of Banka, and since then, in the same species, from Borneo. Probably it also lives on Sumatra and Biliton, islands of which the fresh water fauna shows such a large similarity with those of Borneo and Banka.

From Africa till now four species of Heterobranchus were made known. Both species from the Nile are distinguished from the archipelagic ones by a much higher adipose fin. The species from Senegal I only found described from a skull, and the species from Mossambique I find only mentioned by name.

The archipelagic species in a few words can be characterised as follows.

337 I. Adipose dorsal fin much lower but longer than the rayed dorsal fin, confluent with the base of the caudal fin.

Heterobranchus tapeinopterus Blkr.

Heterobranchus tapeinopterus Blkr.
Nieuwe Bijdr. Ichthyol. Banka Nat. Tijdschr. Ned. Ind. III p. 732.
Low-finned treegill fish
Atl. Silur. tab. XLIX fig. 1.

A Heterobranchus with an elongate body, anterior part cylindrical, posterior part compressed, body depth contained 9½ to 8 times in its length without, and 11 to 9½ times in its length with caudal fin. Head depressed, convex, length until the top of the gill cover contained 6¾ to 5⅔ times in length of body without, and 7¾ to 6⅔ times length of body with caudal fin, length of the head until the top of the supraoccipital crest contained 5¾ to 5⅔ times in length of body without, and 6¾ to 6⅖ times length of body with caudal fin; width of head contained 1¼ times to a little more than once in its length until the top of the gill cover, depth 1½ to 1⅔ times. Head shield has a width between the eyes contained a little more than twice in its length until the top of the supraoccipital crest. The occipital, oval fontanel entering the base of the supraoccipital crest is much less than twice as short as the oblong, heart-shaped frontal fontanel; supraoccipital crest triangular, acute, hardly or not longer than basal width. Head shield glabrous or slightly scabby, with many small granules, eyes covered with head skin, diameter contained 18 to 15 times in length of head until the top of the gill cover, distance between the eyes about 6 times their diameter; posterior nostrils oblong, open, anterior nostrils close to the anterior edge of the snout, tubular; nasal and inner lower jaw barbels reaching or overreaching a little the base of the pectoral fin, maxillary and outer lower jaw barbels reaching or a little overreaching the tip of the pectoral fin; upper jaw hardly protruding beyond the lower jaw; mouth hardly curved, its width contained about 1⅔ times in length of head until the tip of the gill cover; lips fleshy, the lower lip with well visible pores ventrally; teeth small, acute, multiple-rowed, pre-

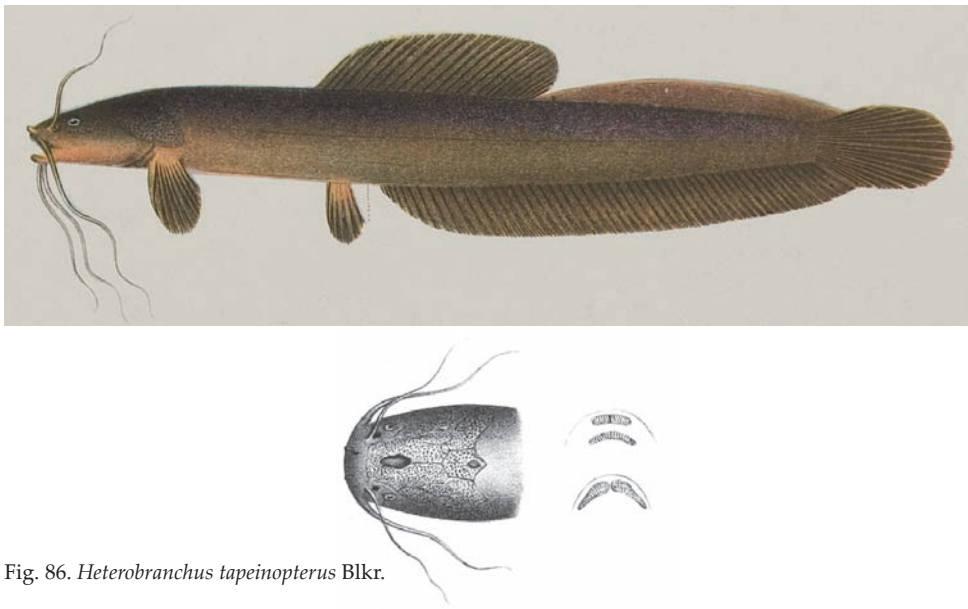

Fig. 86. *Heterobranchus tapeinopterus* Blkr.

maxillary teeth placed in 2 oblong, touching groups, nearly twice as long as broad, hardly curved, the lower jaw teeth in 2 curved bands, about twice as long as broad at the base, touching, deeply cut out angularly at the anterior edge; vomerine teeth placed in a nearly crescent-shaped band, sometimes bi- to quadripartite; the upper pharyngeal teeth set in 2 oval, separated groups, the lower pharyngeal teeth in 2 nearly three-edged groups, nearly twice as long as broad at the base, nearly touching; lateral line simple, characterized by nearly touching small tubes, straight; axillary slime pore not conspicuous. Rayed dorsal fin beginning behind the tip of the pectoral fin, nearly touching the adipose dorsal fin and a little shorter than it, about twice as low as body depth; adipose dorsal fin more than 4 times as low as body depth, joined with the base of the caudal fin; pectoral and ventral fins slightly acutely or slightly obtusely rounded, pectoral fins contained a little more than once to 1⅓ times in length of head until the top of the gill cover, ventral fins nearly twice to twice. Pectoral spine thick, shorter than the postocular part of the head, posterior side serrated with conspicuous teeth; anal fin contained about twice in the length of the entire body, beginning before the middle of the rayed dorsal fin, not or a little smaller than the 338 rayed dorsal, posterior part confluent with the caudal fin; caudal fin obtuse, rounded, contained 6¾ to a little more than 6 times in the length of the entire body; colour of the body dark, fins orange-dark.

B. 8. D. 1/23 to 2/25-0, P. 1/18. V. 1/5. A. 1/48 to 1/50, C. 18 to 22.

Hab. Banka (Toboali, Marawang), in rivers.
Borneo (Sambas), in rivers.

Length of the 5 specimens 68‴ to 124‴

Remark. I discovered this species in the year 1852, when H.L. van Bloemen Waanders sent me a specimen from Banka Island. Since then I received some other specimens from Banka and from the west coast of Borneo. The species is easily recognisable by the union of both the low adipose fin and the anal fin with the caudal fin, by the number of fin rays, the length of the barbels, the fontanels, the implantation of the anal fin before the middle of the rayed dorsal fin, etc.

In my earlier, above mentioned description of this species as a result of a printing error the number of branchiostegal rays is mentioned as 2 instead of 8.

Clarias Gron.
Harmouth

Accessory [gill] branches placed in 2 branching groups on each side. A simple dorsal fin, rayed, occupying the entire back. Jaw teeth and vomerine teeth multiple-rowed, the vomerine teeth placed in a transverse band. Branchiostegal membrane with 7 to 9 rays.

Remark. The genus Clarias in essence does not differ from Heterobranchus unless by the fact that the entire dorsal fin is rayed and the last rays extend up to the caudal fin or are united with it. The species are restricted to Africa, South America and the Indian archipelago and in general resemble each other very much. Various species are even difficult to characterize sharply 339 and I also believe that more species have been erected on the basis of uncertain characters than exist in nature.

Several of the characters that are used to make the distinctions, have only a relative value.

For example the barbels as a rule in young specimens are larger than in older ones, just as is the case in many genera of the Siluroïds and also in the genus Plotosus.

The supraoccipital crest offers good characters, but one should keep in mind, that in general that crest in young specimen is more acute than in older ones, so that differences of this kind sometimes only become apparent when one compares specimens of equal length.

In a similar way the relative lengths of body and head differ remarkably in specimens of different ages, moreover it has to be taken into account that the tail, just like in many eel-like fishes, sometimes more or less stays back in development, reason why the mentioned relative measurements sometimes change very much.

Even the shape of the vomerine tooth band in a given species of Clarias is not constantly the same. The process, which in some species runs from the middle from the posterior edge of that band, in some specimens is only little or hardly visible, and even sometimes in one specimen that band is divided into two bands whereas in others both halves are tightly connected.

In the numbers of fin rays one neither has certain characters and even the characteristic feature found in the being united or not united of the vertical fins, can only be applied with cautiousness.

I have found good, more absolute characteristic features in the shape of the forehead fontanel, in the length and in the armament of the pectoral fin spine, and in the place of implantation of the anterior most dorsal fin ray.

After those characters, in relation to the others, the species of my collection can be brought in the following scheme.

340 I. Vertical fins separate.

A. Anterior part of the pectoral spine is armed with large teeth.

a. Supraoccipital crest very obtusely rounded, not angular. Heart-shaped frontal fontanel less than twice as long as the occipital fontanel.

Clarias melanoderma Blkr.

B. Pectoral spine glabrous or scabby, with small teeth. Occipital fontanel about twice as short as the frontal fontanel. Length of head until the top of the supraoccipital crest contained 4 to 4⅖ times in the length of the entire body. Supraoccipital crest triangular.
   a. Pectoral spine scabby, longer than the postocular part of the head.

Clarias batrachus CV.

   b. Pectoral spine glabrous or slightly scabby, much shorter than the postocular part of the head.
   Length of the head until the top of the supraoccipital crest contained 4⅘ to 5⅔ times in the length of the entire body.
      † Supraoccipital crest rounded in the form of a crescent.

Clarias leiacanthus Blkr.

      † Supraoccipital crest triangular, slightly acute.

Clarias Teysmanni Blkr.

II. Vertical fins joined.
   A. Pectoral spine slightly glabrous or slightly scabby, much shorter than the postocular part of the head. Occipital fontanel not or not much shorter than the frontal fontanel. Supraoccipital crest rounded in the form of a crescent. Head until the top of the supraoccipital crest contained 6⅓ to 7 times in the length of the entire body.

Clarias Nieuhofii CV.

341 *Clarias melanoderma* Blkr.

Verh. Bat. Gen. XXI, I Silur. batav. consp. p. 54. Atl. Silur. tab. XLIX fig. 2.

Black harmouth

A Clarias with an elongate body, anterior part cylindrical, posterior part compressed, body depth contained a little more than 7 to 5½ times in its length without, and 8½ to 6 times in its length with caudal fin. Head very depressed, length until the top of the gill cover contained 5⅓ to 5¾ times in length of body without, and 6 to 6⅗ times in length of body with caudal fin, length of the head until the tip of the supraoccipital crest, head length contained a little more than 4 to 4¼ times in length of body without, and 4½ to 5 times in length of body with caudal fin. Width of head fits ⅞ to $^{6}/_{7}$ times in its length until the tip of the gill cover, depth 1⅕ to 1⅓ times; distance between the eyes contained 2¼ to 2⅙ times in length of head shield until the tip of the supraoccipital crest; the occipital, oval fontanel is much less than twice as short as the heart-shaped frontal fontanel, which is divided in two unequal parts by a transverse crest; supraoccipital crest in younger and adult fishes very obtuse, rounded in the form of a crescent. Head shield slightly glabrous or slightly scabby, with many small granules; eyes free, diameter contained 10 to 12 times in length of head until the tip of the gill cover, distance between the eyes 6 to 7 times their diameter; posterior nostrils round, with valves at their bottom and top, anterior nostrils close to the anterior edge of the snout, tubular; nasal barbels overreaching the posterior fontanel or tip of the supraoccipital crest; maxillary barbels overreaching the tip of the pectoral fin; outer lower jaw barbels longer than the inner lower jaw barbels, overreaching the base of the pectoral fins; upper jaw protruding beyond the lower jaw; mouth a little curved, its width contained about twice in length of head until the tip of the gill cover; lips papillose, the lower lip with 4 very conspicuous pores ventrally; teeth small, acute, multiple-rowed; premaxillary teeth placed in 2 hardly curved, oblong-quadrate bands, about twice as long as broad, touching, lower jaw teeth in 2 curved bands, about twice as long as broad at the base, touching, cut out angularly at the anterior edge;

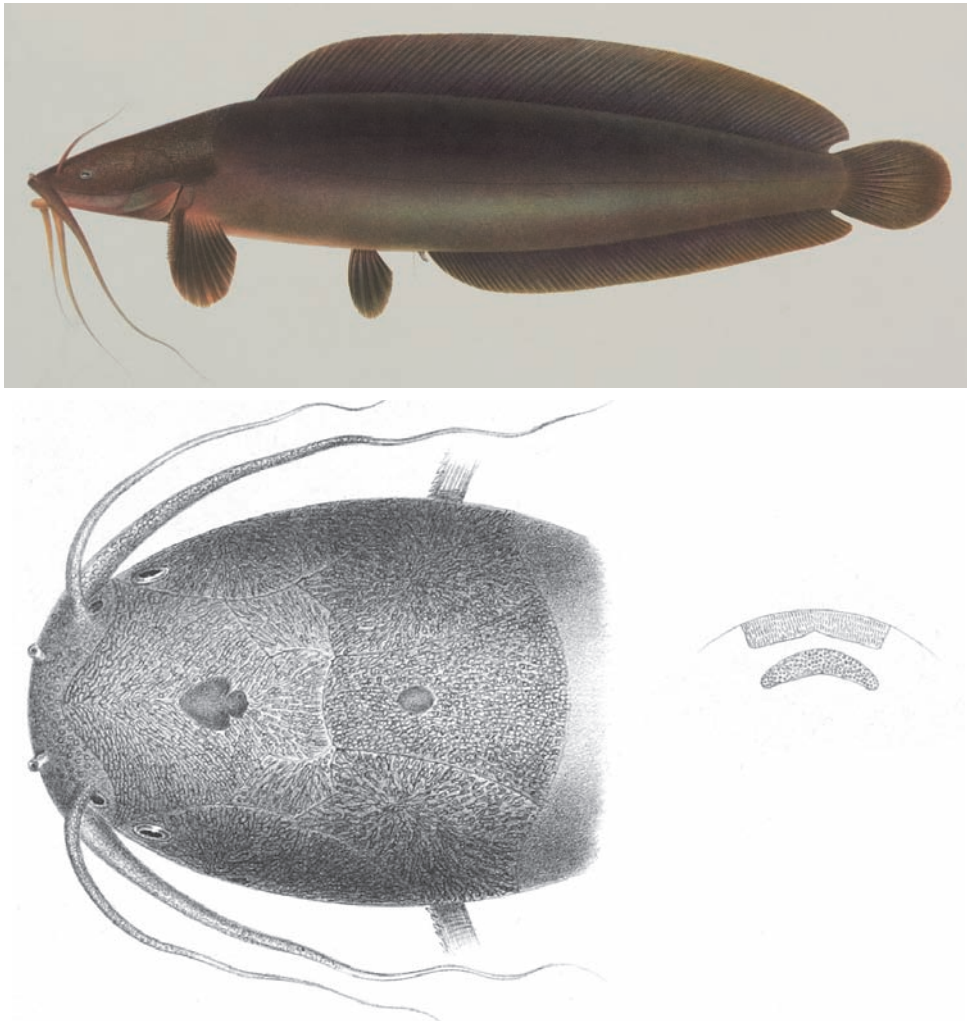

Fig. 87. *Clarias melanoderma* Blkr.

vomerine teeth placed in a nearly crescent-shaped band, undivided, not prolonged at the middle of posterior part but sometimes divided; the upper pharyngeal teeth set in 2 oval-rounded, separated groups; the lower pharyngeal teeth in 2 elongate-obliquely triangular groups, more than twice as long as broad at the base, not touching; lateral line simple, characterized by touching small tubes, anterior part sloping downwards, further on straight; axillary slime pore not conspicuous. Rayed dorsal fin beginning above the tip of the pectoral fin, about twice as low as body depth, posterior part obtuse, rounded, generally hardly or not joined with the base of the caudal fin; pectoral and ventral fins slightly acutely or slightly obtusely rounded, pectoral fins contained a little more than once to 1¼ times in length of head until the tip of the gill cover, ventral fins 1¾ times to twice. Pectoral spine thick, shorter than the rays, anterior side serrated with large teeth; anal fin contained about twice in length of body without caudal fin, nearly twice as small as the dorsal fin, posterior side obtuse, rounded, hardly or not joined with the base of the caudal fin; caudal fin obtuse, rounded, contained 7½ to 6⅔ times in the length of the entire body. Body and unpaired fins blackish-dark, sometimes variegated

with irregular, deeply black spots. Lower part of the body sometimes has scattered, saffron-yellow small drops. Paired fins darkish.

B. 8 or 9, D. 68 to 72. P. 1/9. V. 1/5. A. 52 to 61. C. 20 (to be filled out later).

Syn. Kabos of Aelquabben Nieuh. Gedenkw. Zee- en Lantr. p. 272.
Clarias melasoma and *Clarias melanosoma* Blkr, Zesde Bijdr. ichth. Born. Nat. T. Ned, Ind. III p. 427.
342 *Leleh* Palembang.
Wiru Mal. Batav.

Hab. Java (Batavia, Kediri), in rivers and swamps.
Sumatra (Palembang, Telokbetong, Solok), in rivers.
Banka (Marawang, Toboali), in rivers.
Borneo (Prabukarta), in river Kusan.

Length of the 10 specimens 170 "' to 340"'.

Remark. Clarias melanoderma in Batavia is much less common than Clarias batrachus CV. It is easily recognisable by its black coloration, high body, very blunt supraoccipital crest and especially by its large pectoral fin spine teeth, which, in comparison with those of the remaining species are very strongly developed.

It seems to me that Nieuhof's "Kabos or Aelquabben" concerns the species in question, primarily on the basis of the black spots he mentions of that fish. He says about it: "Kabos is more a species of aelquabben, as the previous one" (Bontael [piebald eel] or Clarias Nieuhofii CV.) "although a little larger: because these are over two feet long and very fat. The skin is smooth as well, and without scales and of a brownish colour: however the belly is more pale, with black spots. The head is blunt, and the eyes are places anteriorly. They taste salted and baked, very well."

The assertion of Nieuhof that his Kabos or Aelquabben becomes larger than his Bontael, is to be understood in the sense that he had not seen enough full grown specimens of the Lindi (Clarias Nieuhofii) as this species attains at least the same length as Clarias melanoderma. The Leleh (Clarias batrachus) on the contrary stays within smaller sizes than the Winroe and the Lindi.

In two of my medium sized specimens of Clarias melanoderma the band of vomerine teeth is dual, in the middle separated by a toothless groove (just like in Clarias capensis CV.). In one of those specimens the last dorsal fin ray and the last anal fin ray is completely united with the caudal fin as well, however in the other specimen the dorsal and anal fin are separate from each other [= from the caudal fin] by a deep cut and rounded, just like in the remaining normal specimens.

343 From this it appears that the mentioned peculiarities can only be used as specific characters with caution and that they have in the species in question no specific value but must be explained as individual variation.

Clarias batrachus CV.
Poiss. XV p. 285, Atl. Silur. tab. L fig. 2.
Frog-like harmouth

A Clarias with an elongate body, anterior part cylindrical, posterior part compressed, body depth contained 7½ to nearly 6 times in its length without, and 8¾ to 6¾ times in its length with caudal fin. Head very depressed, length until the top of the gill cover contained 4⅝ to 5 times in length of body without, and 5¾ to a little more than 6 times in length of body with caudal fin, length of the head

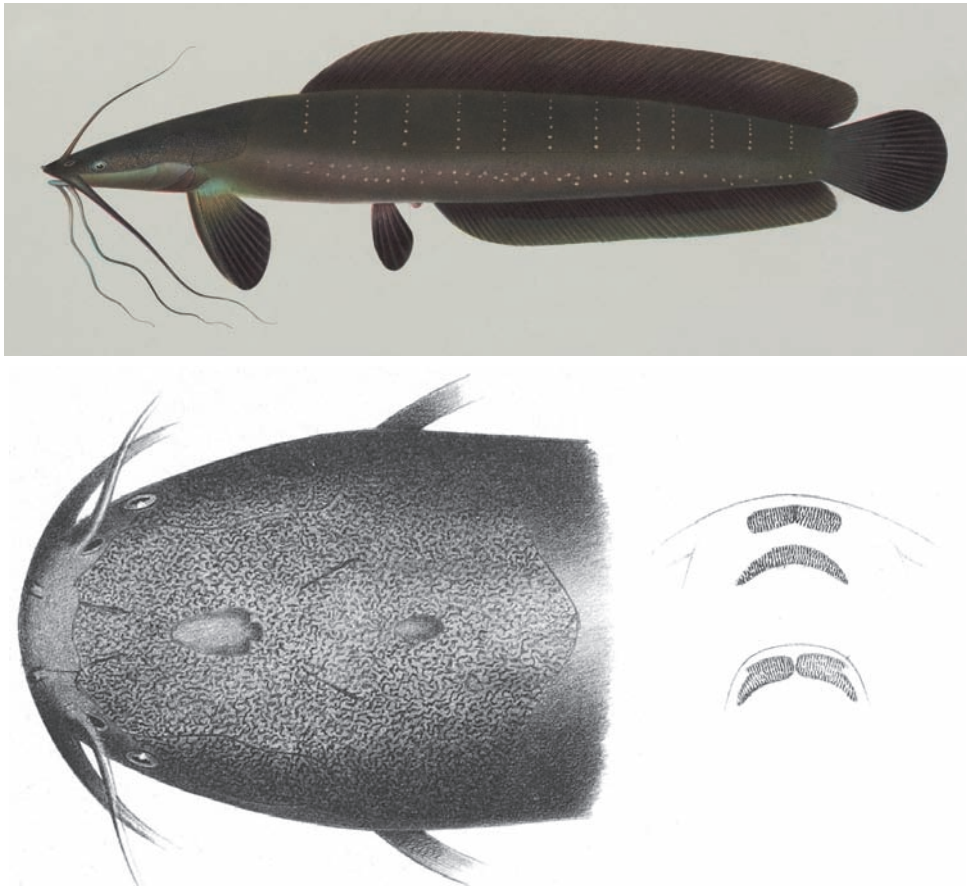

Fig. 88. *Clarias batrachus* CV.

until the tip of the supraoccipital crest contained 3⅔ to 3½ times in length of body without, and 4 to 4⅖ times in length of body with caudal fin; width of head contained nearly once to once in its length until the tip of the gill cover, depth 1⅘ to 1½ times; distance between the eyes contained 2 to 2⅖ times in length of head shield until the tip of the supraoccipital crest; the occipital, oval fontanel twice or more than twice as short as the elongate-heart-shaped frontal fontanel; supraoccipital crest in younger fishes triangular, acute, rounded, in older fishes slightly obtusely rounded; head shield in younger fishes slightly glabrous, in older fishes granulated; eyes free, diameter contained 9 to 14 times in length of head until the tip of the gill cover, distance between the eyes 5 to 8 times their diameter; posterior nostrils oblong, with valves at their bottom and top, anterior nostrils close to the anterior edge of the snout, tubular; nasal and inner lower jaw barbels reaching or slightly overreaching the gill covers or the base of the pectoral fin; maxillary and outer lower jaw barbels reaching or slightly overreaching the middle or the tip of the pectoral fin; upper jaw protruding beyond the lower jaw; mouth a little curved, its width contained twice to 2½ times in length of head until the tip of the gill cover; lips papillose, the lower one with 4 very conspicuous pores beneath; teeth small, acute, multiple-rowed, the premaxillary teeth placed in 2 slightly quadrate groups, nearly twice as long as broad, touching, hardly curved; lower jaw teeth in 2 elongate-triangular, curved bands, more than twice as long as broad at the base, touching, cut out angularly at the anterior edge; the vomerine teeth placed in an undivided, nearly crescent-shaped band, sometimes equipped with a triangular, short process

in the middle of the posterior margin; upper pharyngeal teeth set in 2 rounded, separate groups; the lower pharyngeal teeth in 2 elongate-obliquely triangular groups, more than twice as long as broad at the base, touching; lateral line simple, characterized by touching small tubes, anterior part sloping downwards, then straight; axillary slime pore not conspicuous; dorsal fin beginning approximately above the tip of the pectoral fins, about twice as low as body depth, posterior side obtuse, rounded, hardly or not joined with the base of the caudal fin; pectoral fins acutely rounded, contained a little more than once to 1⅓ times in length of head until the tip of the gill cover, ventral fins obtuse, rounded, contained about twice in length of head until the tip of the gill cover; pectoral spine robust, longer than the postocular part of the head (until the tip of the gill cover), in young fishes conspicuously serrated, in older fishes hardly; anal fin contained about twice in length of body without caudal fin, smaller than the dorsal fin, posterior part obtuse, rounded, hardly or not confluent with the base of the caudal fin; caudal fin obtuse, rounded, contained 7 to 8 times in the length of the entire body. Colour of body blackish-dark, 344 blackish-olive or violetish-olive, lower part of the head and belly whitish. Back and flanks generally have whitish or yellowish points placed in 9 to 14 transverse rows, and at the bottom of the flanks in 2 irregular, longitudinal rows. Fins violetish- or orange-olive-coloured, barbels towards the top violet-dark. Iris with a double blue and golden ring.

B. 7 to 9. D. 62 to 76. P. 1/8 to 1/11. V. 1/5. A. 47 to 58. C. 18 to 22 inclusive of the shorter simple rays alongside.

Syn. *Mustela* Bont. Histor. nat. med. Ind. orient. Fig. p. 18 (pessima).
Silurus batrachus Bl. Ausl. Fisch. XI p. 44 tab. 370 (mediocris), Bl. Schn. Syst. posth. p. 386, and maybe Linn, Gm. Syst. nat. ed. 13th p. 1355.?
Froschwelsch. AusI. Fische 1.c.
Grenouiller Bl. ibid.
Black-fish Al. Russ. Hist. of Aleppo (edit. britt.) p. 73 litt. a tab. 12 fig. 1 (edit. lugd. bat.). tab. 6 fig. 3-5. Cop. Enc. méth. Ichth. fig. 247?
Clarias Gronov. Zoophylac. p. 100 tab. 8a fig. 3-5?
Marpoo Russ. Fish. Corom. II p. 53 fig. 168?
Macropteronotus batrachus Lac. Poiss. V p. 84, 85.
Maropteronotus grenouiller Lac. ibid.
Maropteronotus magur Buch. Gang. Fish. p. 146, 347, tab. 26 fig. 45.
Carias marpus CV. Poiss. XV p. 280?
Harmouth marpoo CV. ibid.
Clarias magur CV. Poiss. XV. p. 283, Blkr, Verh. Batav. Gen. XXV Nalezing. Ichth. Beng. p. 124.
Harmouth magur CV. Poiss. XV p. 282.
Clarius Dussumieri CV. Poiss. XV p. 283?
Harmouth de Dussumier CV. ibid?
Clarias punctatus CV. ibid. p. 285, Blkr, Verh. Bat. Gen. XXI Sil. batav. consp. p. 53. Cant. Cat. Mal. Fish. p. 263.
Harmouth ponctué CV. Poiss. XV. p. 285.
Haemouth grenouiller CV. Poiss. ibid. p. 285.
Clarias pulicaris Richds. Zool. Voy. Sulphur. p. 135 tab. 62 fig. 5-6.
T*oeli* Tranquebar.
Simak il aswad, Siloor Syr.
Magur Beng.
Tang-sa, Tang-sih, Tang-sat Chinese.
Ikan Leleh Mal. Sundan. and Javan.

Hab. Java (Batavia, Bekassi, Tandjong-east, Tjampea, Buitenzorg, Serang, Bantam, Dano, Tjibiliong, Perdana, Tjandjur, Tjipanas, Bandong, Cheribon, Samarang, Ambarawa, Wonosobo, Lesti, Ngantang, Bator, Grati), in rivers, lakes and swamps.
Bali (Boleling), in rivers.
Sumatra (Lahat), in rivers.

345 Banka (Toboali, Marawang), in rivers.
Biliton (Tjirutjup), in rivers.
Borneo (Sambas), in rivers.
Bengal (Calcutta), in the river Hooghly.
Length of more than 50 specimens 95‴ to 410‴.

Remark. Among the freshwater Silures of the Indian archipelago there are a few, which occur on its islands as well as on the Asian continent, like Bagarius Buchanani Blkr, Glyptosternon platypogon Blkr, Wallago Russelli and Pseudosilurus bimaculatus Blkr.

In Clarias batrachus I believe to have a fifth species which has South Asia and the Sunda islands as a common motherland. I now take this species to be the same as the one that is described by Mr Valenciennes under the name of Clarias punctatus. The yellow skin-spots easily get lost by preservation in arak and a few specimens do not or not clearly show these spots even in fresh state. The very numerous specimens of the Leleh which I have observed, indeed show numerous small changes, not only with regard to the mentioned spots, but also, although within certain margins in the lengths of the barbels, the roughness of the head shield, the relative lengths of head and body and the number of fin rays, and even in the shape of the band of vomerine teeth.

I possess two specimens of Macropteronotus magur Buch. from Calcutta, with a length of 208 and 227 mm. I have compared these specimens with similar sized Javanese specimens of Clarias punctatus CV. and I could not find differences to which a specific significance can be attached. Thereby I have gotten the certainty that Clarias punctatus CV. is no other species than Clarias magur CV.

This result led me to a more detailed comparison of my specimens with the descriptions given by Mr Valenciennes of Clarias Dussumierii and by Mr Richardson of Clarias pulicaris, and I now am inclined to presume that these species neither differ essentially from Clarias punctatus or Clarias magur.

If the opinion expressed above is right, than no less than 346 five nominal species from the system should be dropped and the species name of Bloch as the oldest of the six should be retained. The species then would not be restricted to just the Indian archipelago but even inhabit a large part of South Asia and expand in the west to Syria and in the east to China, a distribution area that can be considered very large for a freshwater fish and yields little to that of Silurus glanis L.

It seems to me that Bontius gave the first figure of Clarias batrachus under the name of Mustela. That figure is very deficient, as was to be expected in those days.

The figures given later by Gronovius, Bloch, Russell and Buchanan are much better and bear, regarding the more or less exactness, the traces of the dates, on which they were published.

However, the best figure by far is that, which is published by Mr Richardson in the Zoology of the journey of the Sulphur, and leaves very little to be desired.

The Leleh on Java is a very common distributed fish. Like his generic relatives, it preferably inhabits swamps and ditches or canals, but also visits lakes and rivers. It is common, in the hills as well as in the lower areas and feeds on small fishes and crustaceans as well as on animal excrements. Rain worms are a preferred food for it and it is with this that the children of the natives often catch it with the angling rod. In Batavia

it is often brought to the market in proahs full, simultaneous with proahs full with the Betok (Anabas scandens CV.), Tambakkan (Helostoma Temmincki CV.), Gaboes (Ophicephalus striatus Bl., Ophicephalus lucius K.v.H. and Ophicephalus micropeltes K.v.H.) and other swamp fishes.

The natives do not despise it, though on the tables of the Europeans it is never or very rarely found.

347 *Clarias leiacanthus* Blkr.

Vijfde Bijdr. Ichth. Born. Nat. Tijdschr. Ned. Ind. II p. 430. Atl. Silur. tab. L fig. 1.

Smooth-spined harmouth

A Clarias with an elongate body, anterior part cylindrical, posterior part compressed, body depth contained 6 to 6⅘ times in its length without, and 8 to 6⅘ times in its length with caudal fin. Head very depressed, length until the tip of the gill cover contained 5½ to 6 times in length of body without, and 6½ to 6⅚ times in length of body with caudal fin, length of the head until the top of the supraoccipital crest contained 4 to 5 times in length of body without, and 4⅘ to 5⅔ times in length of body with caudal fin. Width of head contained nearly once in its length until the tip of the gill cover, depth nearly twice to 1½ times; distance between the eyes contained a little more than twice the length of the head shield until the tip of the supraoccipital crest; occipital, oval fontanel twice or more than twice as short as the elongate-heart-shaped frontal fontanel, which is divided in two unequal parts by a transverse crest that is interrupted in the middle; supraoccipital crest in younger fishes slightly acutely, in older fishes obtusely rounded; head shield slightly glabrous or slightly scabby, with many small granules; eyes free, diameter contained 12 to 14 times in length of head until the tip of the gill cover, distance between the eyes 7 to 9 times their diameter; posterior nostrils round or oblong, with valves dorsally and ventrally, anterior nostrils close to the anterior edge of the snout, tubular; nasal and inner lower jaw barbels nearly reaching or a little overreaching the base of the pectoral fin; maxillary and outer lower jaw barbels barbels nearly reaching or a little overreaching the tip of the pectoral fin; upper jaw protruding beyond the lower jaw; mouth a little curved, its width contained nearly twice in length of head until the tip of the gill cover; lips papillose, the lower lip with 4 very conspicuous pores ventrally; teeth small, acute, multiple-rowed, the premaxillary teeth placed in 2 slightly quadrate groups, much less than twice as long as broad, touching, hardly curved, the lower jaw teeth in 2 curved, elongate-triangular bands, about twice as long as broad at the base, touching, cut out angularly at the anterior edge; vomerine teeth placed in an undivided band in the form of a circle segment, which in older fishes is equipped with a short, obtuse process in the middle of posterior margin; the upper pharyngeal teeth set in 2 slightly rounded, separated groups, the lower pharyngeal teeth in 2 elongate-obliquely triangular groups, more than twice as long as broad at the base, touching; lateral line simple, characterized by touching small tubes, anterior part sloping downwards, further on straight; axillary slime pore not conspicuous. Dorsal fin beginning above or hardly behind the tip of the pectoral fin, about twice as low as body depth, posterior part obtuse, rounded, hardly or not joined with the base of the caudal fin; pectoral and ventral fins slightly acutely rounded, pectoral fins contained 1⅓ to 1⅕ times in length of head until the tip of the gill cover, ventral fins twice to 2⅓ times. Pectoral spine medium-sized, shorter than the postocular part of the head, anterior side entirely or nearly entirely glabrous; anal fin contained more than twice in the length of the entire body, about twice as small as the dorsal fin, posterior part obtuse, rounded, hardly or not joined with the base of the caudal fin; caudal fin obtuse, rounded, contained 6½ to 7⅔ times in the length of the entire body. Colour of body violetish-dark, lower part of the head and belly only gray or gray-rosy. Flanks sometimes have yellowish points placed in transverse series. Fins dark, barbels generally blackish-dark or violetish-dark towards the base.

B. 9. D. 76 to 78. P. 1/9. or 1/8. V. 1/5. A. 60 to 62. C. 19 to 21.

Hab. Sumatra (Benculen), in rivers.
Banka (Marawang), in rivers.

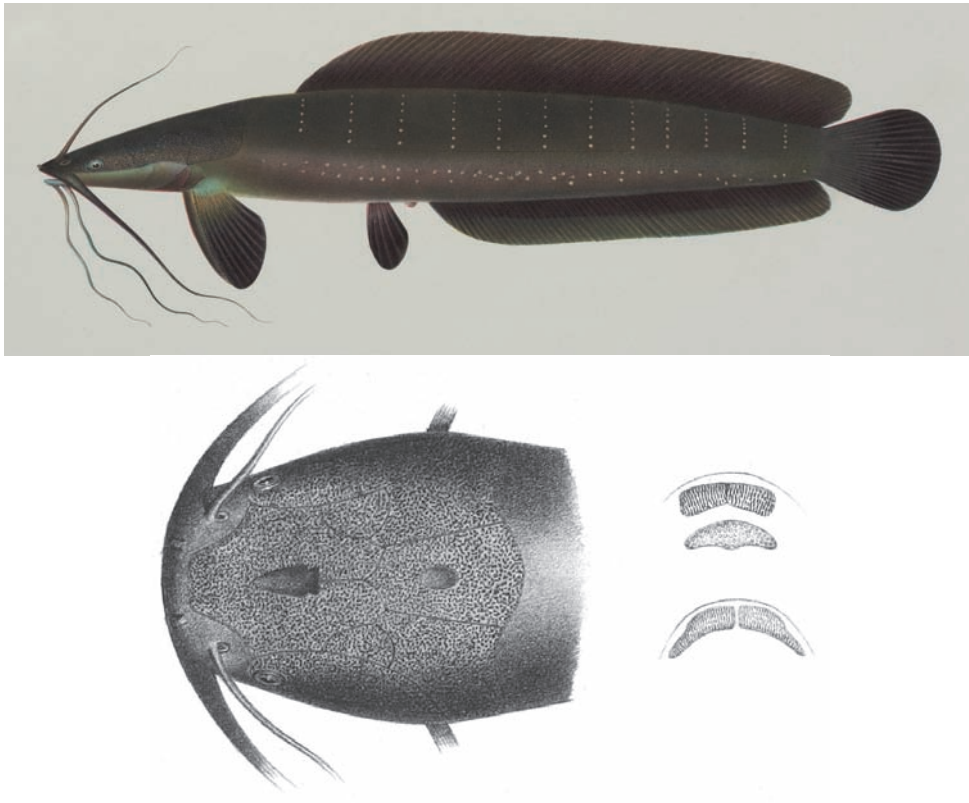

Fig. 89. *Clarias leiacanthus* Blkr.

348 Nias, in rivers.
Borneo (Sinkawang, Sambas, Kahajan), in rivers.
Length of the 6 specimens 160′′ to 330′′.

Remark. Apart from the Leleh, the Wiroe and the Lindi, the Sunda islands nourish other species of Clarias, which till now are not or very little known. To these species the species in question belongs, which does not seem to occur on Java. In relationship it stands between Clarias Nieuhofii and Clarias batrachus. From Clarias Nieuhofii it differs by less slender forms, a relatively larger head, the caudal fin not or hardly united with dorsal and anal fin, remarkably less numerous dorsal- and anal fin rays, etc. From Clarias batrachus on the contrary it differs by a relatively shorter head, a more bluntly rounded supraoccipital crest, a remarkably weaker and shorter and on the anterior border smoother or hardly palpable rough pectoral fin spine, broader groups of premaxillary teeth, etc.

Clarias Teysmanni Blkr.
Descript. Spec. piscium. javan. Nat. Tijdschr. Ned. Ind. XIII p. 344.
Atl. Silur. tab. LI fig. 1.
Teysmann's harmouth

A Clarias with an elongate body, anterior part cylindrical, posterior part compressed, body depth contained 8 to a little more than 7 times in its length without, and 9⅓ to 8¼ times in its length with caudal fin. Head strongly depressed, length until the tip of the gill cover contained 5⅓ to 6⅙ times in length of body without, and 6¼ to 7 times in length of body with caudal fin, length of the head until the tip of the supraoccipital crest contained 4¾ to nearly 5 times in length of body without, and 5⅗ to 5⅔ times in length of body with caudal fin. Width of head contained about once in its length until the tip of the gill cover, depth about twice; distance between the eyes contained about 2¼ times in length of head shield until the tip of the supraoccipital crest. The occipital, oval fontanel is about twice as short as the oblong-heart-shaped frontal fontanel, which is divided in two unequal parts by a transverse septum; supraoccipital crest in younger and older fishes triangular, slightly acutely rounded at the top. Head shield slightly glabrous or slightly scabby, with many small granules; eyes free, diameter contained 10 to 11 times in length of head until the top of the gill cover, distance between the eyes 5 to 6 times their diameter; posterior nostrils oblong, with valves at their ventral and dorsal margin; anterior nostrils close to the anterior edge of the snout, tubular; nasal and inner lower jaw barbels nearly reaching or a little overreaching the base of the pectoral fin; maxillary and outer lower jaw barbels nearly reaching or a little overreaching the top of the 349 pectoral fin; upper jaw protruding beyond the lower jaw; mouth a little curved, its width contained about twice in length of head until the top of the gill cover; lips papillose, the lower one with 4 well visible pores ventrally; teeth small, acute, multiple-rowed, the premaxillary teeth placed in 2 slightly quadrate groups, much less than twice as long as broad, touching, hardly curved; the lower jaw teeth in 2 curved, elongate-triangular bands, about twice as long as broad at the base, touching, cut out angularly at the anterior edge; the vomerine teeth placed in an undivided, fairly thin, nearly crescent-shaped band; the upper pharyngeal teeth set in 2 slightly round, separated groups;

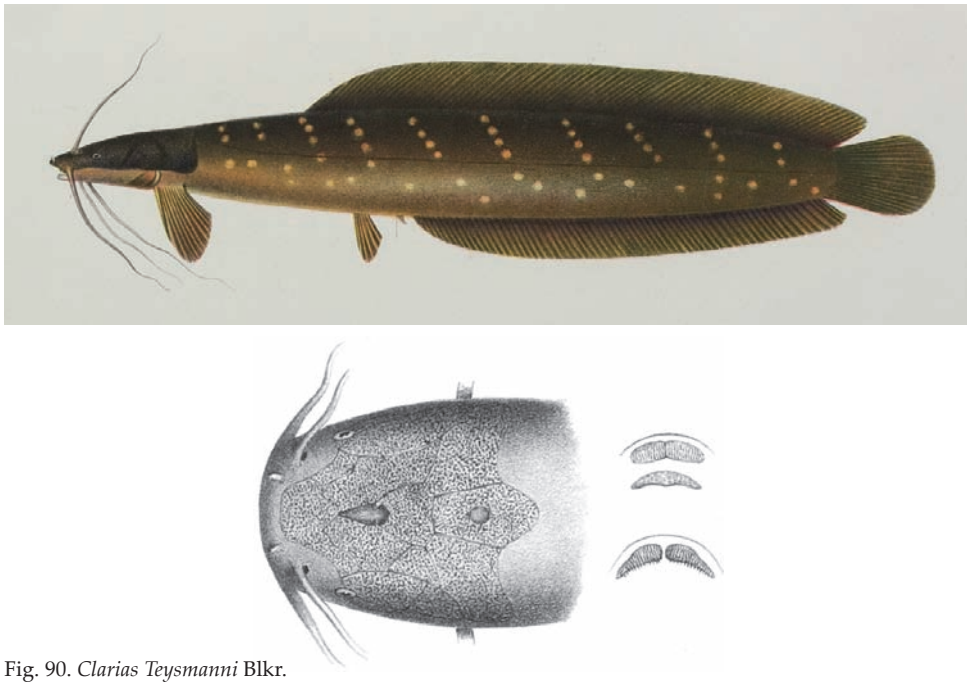

Fig. 90. *Clarias Teysmanni* Blkr.

the lower pharyngeal teeth in 2 elongate-obliquely triangular groups, more than twice as long as broad at the base, nearly touching; lateral line simple, characterized by touching small tubes, anterior part sloping downwards, further on straight; axillary slime pore not conspicuous; dorsal fin beginning behind the tip of the pectoral fin, about twice as small as body depth, posterior part obtuse, rounded, not or hardly joined with the base of the caudal fin; pectoral and ventral fins slightly acutely rounded, pectoral fins contained 1½ to 1⅓ times in length of head until the tip of the gill cover, ventral fins twice to a little more than twice. Pectoral spine thin, shorter than the postocular part of the head, anterior side slightly scabby, not dentate; anal fin contained more than twice in the length of the entire body, less than twice as small as the dorsal fin, posterior part obtuse, rounded, hardly or not confluent with the base of the caudal fin; caudal fin obtuse, rounded, contained 6¾ to 7⅓ times in the length of the entire body. Colour of body deeply olive, only lower part of the head and belly rosy-pearly. Back and flanks have saffron-yellow or orange small drops, partly placed in 11 to 13 simple, transverse, oblique rows, and partly scattered. Unpaired fins and barbels orange-olive-coloured, paired fins orange.

B. 9. D. 70 to 74. P. 1/7 to 1/9. V. 60 to 63. C. 19 to 21.

Hab. Java (Tjikoppo, Pondokgedeh), in mountain rivers.

Length of the 2 specimens 110''' and 203'''.

Remark. Clarias Teijsmanni, mentioned in honour of the meritorious botanist Mr J.E. Teijsmann, who sent me the first specimen which was caught in mountain streams of the Gedeh and Pangerango, in relationship stands between Clarias Nieuhoffi and Clarias leiacanthus. From the first mentioned it is readily recognisable by its less slender body, relatively larger head and separated unpaired fins and other characters. Also from Clarias leiacanthus it is rather easy to differentiate as in Clarias leiacanthus the body is less slender, the supraoccipital crest is much more blunt, the pectoral fin spine on its front edge is completely smooth, etc.

Clarias fuscus CV.
Poiss. XV p. 284.
Brown harmouth

A Clarias with a head length until the top of the supraoccipital crest contained 4⅔ times in length of body with caudal fin. Width of head amounting to more than $^5/_7$ times head length. Head shield feebly granulated. Vomerine teeth small, multiple-rowed, acute. Pectoral spine dentate. Vertical fins not joined. Colour of the body black.

D. 67. A. 48.

350 Syn. *Macropteronotus fuscus* Lac. Poiss. V p. 88 tab. 2 fig. 1?.
Macropteronotus brun Lac. ibid.
Harmouth brun CV. Poiss. XV p. 284.

Hab. Sumatra, China?

Length of the described specimen 9 Parisian inches.

Remark. Although I am inclined to accept, that the species, indicated above after the description Mr Valenciennes gave of it, is the same as my Clarias melanoderma, the shortness and the lack of details of that [Valenciennes'] description do not allow one to gain certainty about it. The described characters agree rather well with those of Clarias melanoderma. If the opinion of Mr Valenciennes that Lacépède's Macropteronotus fuscus is the same as his Clarias fuscus, is right, and the figure of Lacépède with regard to head shield, barbels and pectoral fin spines is only a slightly fair representation of nature, Clarius fuscus would differ from Clarias melanoderma by a more

acute supraoccipital crest, shorter barbels and not or not visibly serrated pectoral fin spines. However, regarding these last ones, Mr Valenciennes distinctly indicates they are serrated, but as is said that "le bord de son épine pectorale n'est pas plus fortement dentelé que dans la seconde espèce" one must know the nature of the armament of the pectoral fin of that "second species" in order to get an idea of that armament in Clarias fuscus.

This second species of Clarias described by Mr Valenciennes in the large Histoire naturelle des Poissons is Clarias lazera CV. of which I see no peculiarities mentioned concerning the pectoral fin spine. However, if Mr Valenciennes with the second species refers to the second Indian species described by him, which I think is probable, it must be Clarias magur, which I consider to be the same as Clarias batrachus CV. and Clarias punctatus CV., and then Clarias melanoderma definitively must be a species different from Clarias fuscus, as exactly the extremely large teeth on the pectoral fin spines are one of the principal characters of Clarias melanoderma. The blunt supraoccipital process then would be the only character, 351 by which, judging fron the description, Clarias fuscus would differ from Clarias batrachus.

Therefore with regard to Clarias fuscus an incertainty remains which has led me to mention it provisionally under the name Mr Valenciennes has given it.

Clarias Nieuhofii CV.
Poiss. XV p. 287. Blkr, Verh. Bat. Gen. XXI Sil. Bat. consp. p. 55.
Atl. Silur. tab. L fig. 2. [tab. LI fig. 2.]
Nieuhof's harmouth

A Clarias with an elongate body, anterior part cylindrical, posterior part compressed, body depth contained 8 to 9⅓ times in its length without, and 9 to 10⅓ times in its length with caudal fin. Head very depressed, length until the tip of the gill cover contained 7 to 9 times in length of body without, and 8 to 10 times in length of body with caudal fin, length of the head until the tip of the supraoccipital crest contained 5½ to 6⅓ times in length of body without, and 6⅓ to 7 times in length of body with caudal fin. Width of head contained about once in length of head shield until the tip of the gill cover, depth 1⅔ to 1½ times; distance between the eyes contained 2¼ to 2⅖ times in length of head shield until the tip of the supraoccipital crest; the occipital, oval fontanel is not or generally a little shorter than the heart-shaped frontal fontanel, which is divided in two unequal parts by a transverse crest; supraoccipital crest in younger and adult fishes very obtusely rounded in the form of a crescent. Head shield slightly glabrous or slightly scabby, with many small granules; eyes free, diameter contained 11 to 13 times in length of head until the tip of the gill cover, distance between the eyes 6 to 7 times their diameter; posterior nostrils oblong-round, with valves at their ventral and dorsal margin, anterior nostrils close to the anterior edge of the snout, tubular; nasal barbels overreaching or nearly reaching the posterior fontanel, maxillary and outer lower jaw barbels barbels overreaching or nearly reaching the tip of the pectoral fin, inner lower jaw barbels overreaching or nearly reaching the base of the pectoral fin; upper jaw protruding beyond the lower jaw; mouth hardly curved, its width contained 1¾ to 2 times in length of head until the tip of the gill cover; lips papillose, the lower one with 4 generally well visible pores beneath; teeth small, acute, multiple-rowed; the premaxillary teeth placed in 2 oblong-quadrate groups, hardly or much less than twice as long as broad, touching; the lower jaw teeth in 2 curved bands, nearly twice as long as broad at the base, touching, cut out angularly at the anterior edge; the vomerine teeth placed in a band in the form of a circle segment, which is sometimes equipped with a short process in the middle of posterior margin; the upper pharyngeal teeth set in 2 round, separated groups; the lower pharyngeal teeth in 2 elongate-obliquely triangular groups, more than twice as long as broad at the base, nearly touching; lateral line simple, characterized by touching small tubes, anterior part sloping downwards, further on straight; axillary slime

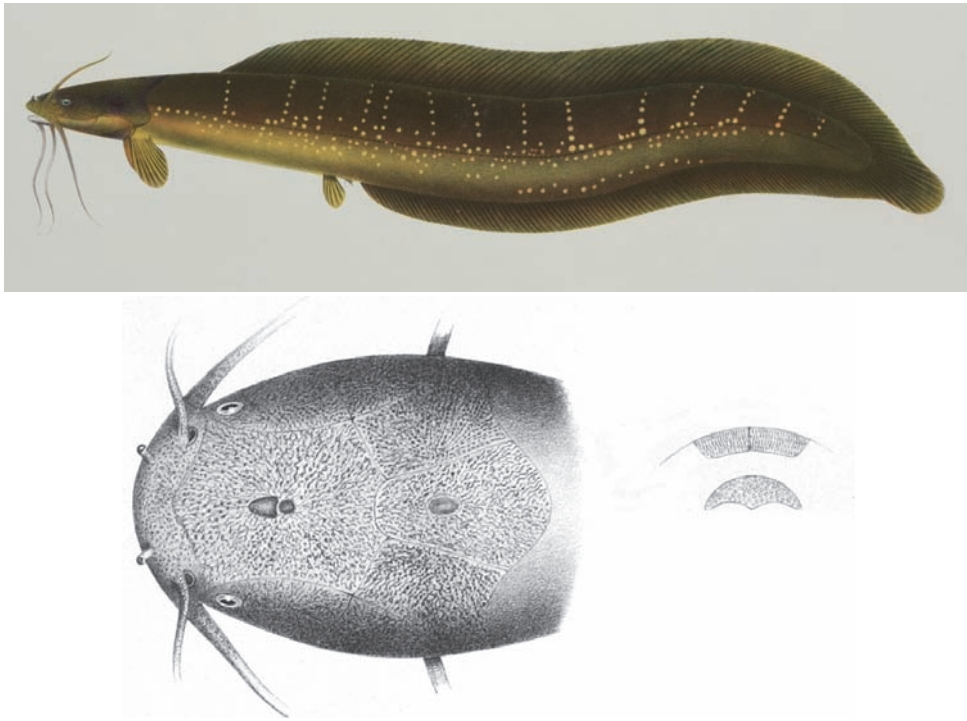

Fig. 91. *Clarias Niehofii* CV.

pore not conspicuous. Dorsal fin beginning after the tip of the pectoral fin, anterior part more than twice, posterior part less than twice as small as body depth, the posterior ray along its entire length united with the caudal fin; pectoral fins rounded, contained 1½ to 1¾ times in length of head until the tip of the gill cover, spine medium-sized, much shorter than the postocular part of the head, without or with hardly visible small teeth; ventral fins rounded, twice or less than twice as short as the pectoral fins; anal fin more than half the length of the entire body, smaller than the dorsal fin, the posterior ray united with the caudal fin in its entire length; caudal fin obtuse, rounded, contained 352 8 to nearly 11 times in the length of the entire body, The body has a blackish or beautiful deep olive colour. Lower part of the head and belly orange or pearly-rosy. Back and flanks generally have saffron-yellow or orange-saffron-yellow small drops, scattered, placed in 13 to 20 simple, transverse rows, the bottom rows joined with a simple or double irregular, longitudinal row of small drops of the same colour. Unpaired fins orange-olive-coloured, with orange edges. Pectoral and ventral fins violetish, or orange, or softly yellowish-rosy, or dark-orange.

B. 8 or 9. D. 87 to 106. P. 1/9. V. 1/4 or 1/5. A. 69 to 95. C. 11 to 16.

Syn. *Bontael of negenoogen* Nieuh. Gedenkw. Lant- en Zeereize p. 271.
Lampreta indica seu Enneophtalmus Will Ichth. App. p. 4. tab. 6. fig. 2.
Harmouth de Nieuhof CV. Poiss. XV p. 257.
Clarias pentapterus Blkr, Vierde Bijdr. Ichth. Born. Nat. T. Ned. Ind. II p. 206.
Lindi Mal. Batavia.

Hab. Java (Batavia, Bekassi), in rivers and swamps.
Sumatra (Palembang), in rivers.
Banka (Marawang), in rivers.
Biliton (Tjirutjup), in rivers.
Borneo (Pengaron, Bandjermasin, Kahajan, Pontianak, Sambas), in rivers.

Length of the 22 specimens 170″ to 490″.

Remark. science owes the first knowledge of the Lindi to Joan Nieuhof, in who's figure the species is sufficiently recognisable. From his description proper however, the species would be less easy recognisable, as it is restricted to the following words [translated]: "Nine eyes or piebald eel is a genus of burbot. They are more than one foot long, have a smooth skin, and are fat like an eel; but have a different shape. On the body they have a brownish colour, they have purple fins under the body, and several yellow spots on the dorsal part of the body; as if they contain poison. The head resembles a slug with horns, The fins are poisonous just like those of a shaft fish: one has to be careful with these. They like stagnant water and pools, are eaten stewed and are not unpleasant."

The Lindi is easy to recognize by its slender body, relatively short head and united ventral fins. Mr Valenciennes was the first one who gave a more satisfactory description of it, but taken only from a single specimen with a length of 15 (Parisian?) inches, in which the colours were badly preserved and the tail shorter than in 353 my specimens, as length of head till the gill opening is said to fit only 8 times, and [length of head] till the end of the supraoccipital crest only 6 times in the total length.

The Lindi, although in Batavia much less common than Clarias batrachus CV., is brought to the market much more frequently than the Wiroe (Clarias melanoderma Blkr). It offers many variations, which are only individual. The colouration varies from beautiful olive green to black and the yellow spots sometimes are totally lacking. The relative heights of the body and the relative lengths of the head are also subject to remarkable differences, although in the specimens in my possession they are restricted to the margins indicated in the description.

Written in Batavia from June to September 1857.

354 POSTSCRIPT

By overland mail of August 1858 I received the II[e] Abtheilung der "Ichthyologiche Beiträge" of Mr Kner, placed in the October issue 1857 of the Sitzungsberichte der mathemat. naturw. Classe der kais. Akademie der Wissenschaften, and in this year also published separately in Vienna.

To my regret I received this work, which exclusively deals with Silures, after this [my] work had been printed up to this postscript, so that I was unable to profit from it during the preparation of my work. The work [of Kner] almost exclusively deals with South American Siluroïds of the subfamilies of the Bagrichthyoïds and Silurichthyoïds and notably from the genera Phractocephalus, Bagrus, Arius, Galeichthys, Platystoma, Astrophysus, Cetopsis, Pimelodus, Callophysus, Auchenipterus, Centromochlus, Trachelyopterus, Ageneiosus and Hypophthalmus.

The aforementioned genera, in this [Kner's] work mostly have the meaning given to them by Valenciennes, while the genera Astrophysus and Centromochlus are new.

The contribution in question of Mr Kner is a confirmation of my belief, expressed in the preceding work, that the rivers of South America feed many species as yet unknown to science. Not less than 19 species have been described as new therein, and if one keeps in mind that those species were brought together by only one naturalist (J. Natterer) already several years ago, one may presume, that further investigations of the drainage areas of South America by more zoologists will lead to the discovery of numerous new forms.

355 The new species of Mr Kner are the following.

Bagrus reticulatus Kner.
" goliath Heck. Mss.
" punctulatus Kner.
" piramuta Kner.
Platystoma sturio Kner.
Asterophysus batrachus Kner.
Cetopsis gobioides Kner.
Pimelodus ornatus Kner.
" multiradiatus Kner.
" breviceps Kner.
Pimelodus ceratophysus Kner.
" laticaudus Heck. Mss.
Auchenipterus thoracatus Kner.
Centromochlus megalops Kner.
" aulopygius Kner.
Trachelyopterus taeniatus Kner.
Ageneiosus dentatus maybe a new spec.? Kner.
" quadrifilis Kner.
Hypophthalmus fimbriatus Kner.

These species, judging from the descriptions and figures of Mr Kner, might be placed as follows in the classification of the Siluroïds proposed by me.

Bagrus reticulates has the 6 barbels, the dentition and the skin covered head shield of Galeichthys (p. 54 [61]), however the 12 branchiostegal rays of this species, its elongated and thin tail and the network of veins, which is spread all over the body, in relation with its occurrence in the rivers of South America, makes one think of the type of a genus of its own. The more so one is compelled to think of a separate genus when one reads that in Bagrus goliath Heck. Kner, a species closely related to Bagrus reticulates, the band of vomerine teeth has two side branches, which belong to the palate, which possibly is also the case in the other species. I provisionally name this type Piratinga, after the Brasilian name of the first mentioned of the two species.

Bagrus punctatus Kner seems to belong to still another type, the characteristics of which are the extremely broad premaxillary and lower jaw tooth bands, the undivided transverse band of the vomerine teeth, the widely separated nostrils and at least 8 or 9 branchiostegal rays. Moreover that species has 6 tape-like, flat 356 barbels and a skin-covered head shield. One could give the name Platynemathichtys to this type.

The fourth new species of Bagrus from Mr Kner, Bagrus piramuta, also seems to belong to a genus, just like the one mentioned, which in relationships stands in between Galeichthys Baird and Platystoma Ag. I will provisionally name it Piramuta, after the Brazilian name of the species.

the dentition of Bagrus mesops Val. on p. 56 [66] placed by me with a question mark in the genus Selenaspis, has become known in more detail and it appears that this species cannot belong to that genus but rather has to be classified under Netuma, although the external barbels of the lower jaw seem to be implanted below or behind the mouth corner. The number of branchiostegal rays of that species is not mentioned.

The new species of Platystoma, described by Mr Kner, probably will need a new genus, both because of the peculiar shape of the snout, the ventrally indented and far posterior placed anterior lower jaw barbels, and the small number of branchiostegal rays (9). This genus might be named Platystomatichthys.

Astrophysus or Asterophysus Kner is a very natural genus of the Ariodonts, characterized by the eyes placed above a very wide mouth cleft, a protruding lower jaw, 6 barbels, the palatine tooth plates of Arius Blkr (which however are armed with small teeth), a small gill opening, a small number of branchiostegal rays (4 or 5), and [skin] covered eyes.

Astrophysus to me seems to be the analogous genus in South America of the genus Batrachocephalus from South Asia and the Indian archipelago.

According to Mr Kner Cetopsis gobioides has many rows of teeth in the lower jaw, so that the diagnosis, on p. 226 [257], has to be changed accordingly.

Pimelodus ornatus Kner in my opinion is a Rhamdia.

Pimelodus multiradiatus Kner also seems to be a Rhamdia and is remarkable because of its 10 dorsal fin rays.

357 Pimelodus breviceps Kner on the contrary fits entirely in my diagnosis of Pseudopimelodus, to which genus Pimelodus laticaudatus Heck. seems to belong as well.

Auchenipterus thoracathus Kner and Auchenipterus ceratophysus Kner, belong to my genus Trachycorystes.

The genus Centromochlus Kner is very much related to Trachycorystes Blkr but differs by its exceptionally short, as it were, rudimentary anal fin, a bilobed caudal fin, a smaller number of branchiostegal rays (5 to 6), etc.

Of both new species of Ageneiosus erected by Mr Kner, Ageneiosus dentatus according to himself is still uncertain. It belongs indeed to the genus Ageneiosus, but his second species Ageneiosus quadrifillis does not. This can be brought under a genus of its own in the Eunanemins, which is distinguishable from all other Pimelodonts by its 4 barbels by which it fulfils a link in the large row of the Pimelodonts, which in the Ariodonts is taken by the genera Helicophagus and Pangasius. This genus might be named Tetranematichthys. According to Mr Kner the species moreover differs from the other Ageneiosus species by the swimbladder that is not enclosed in a bony casing and not constricted. Judging from the figure it has a clearly expressed Schilbe-like ha-

bitus. Tetranematichthys and Hypophthalmus indeed form a transition to the Schilbeïds of the Silurichthyoïds.

The species described or elucidated by Mr Kner in his above mentioned work, classified according to my arrangement can be summed up as follows.

Ariodontes.

Phractocephalus hemiliopterus Val. Kner, Blkr.
Piratinga reticulata Blkr = Bagrus reticulatus Kner.
" goliath Blkr = Bagrus goliath Heck. Kner.
Platynematichthys punctulatus Blkr = Bagrus punctulatus Kner.
Piramutana piramuta Blkr = Bagrus piramuta Kner.
Netuma? mesops Blkr = Selenaspis? mesops Blkr earlier = Bagrus mesops Val. Kner.
358 Netuma? proops Blkr = Bagrus proops Val. Kner.
Selenaspis flavescens Blkr = Bagrus flavescens Val. Kner.
" Herzbergii Blkr = Bagrus Herzbergii Val. Kner.
" luniscutis Blkr = Arius luniscutis CV. Kner.
Guiritinga Commersonii Blkr = Bagrus Commersonii Val. Kner.
Sciades pictus Blkr = Bagrus (Sciades) pictus Müll. Trosch., Kner.
Cephalocassis rugispinis Blkr = Arius rugispinis CV. Kner.
Arius quadriscutis CV. Kner, Blkr.
Ariodes clarias Blkr = Pimelodus Blochii Val.
Ailurichthys Gronovii Baird Gir. = Galeichthys Gronovii CV. Kner.
Platystomatichthys sturio Blkr = Platystoma sturio Kner.
Platystoma Vaillantii Val. Kner.
" platyrhynchos CV., Kner.
" lima Ag. Kner.
" planiceps Ag., Kner.
" fasciatum Val. Kner.
Astrophysus batrachus Kner.

Pimelodontes.

Rhamdia ornata Blkr = Pimeloclua ornatus Kner.
" maculata Blkr = Pimelodus maculatus Lac. Kner.
" multiradiata Blkr = Pimeloclus multiradiatus Kner.
" pati Blkr = Pimelodus pati Val. Kner.
" sapo Blkr = Pimelodus sapo Val. Kner.
" Sebae Blkr = Pimelodus Sebae Val., Kner.
" gracilis Blkr = Pimelodus gracilis Val. Kner.
Pinirampus pinirampus Blkr = Pimelodus pinirampus Ag. Kner.
Pseudopimelodus breviceps Blkr = Pimelodus breviceps Kner.
" laticaudus Blkr = Pimelodus laticaudus Heck. Kner.
" bufonius Blkr = Pimelodus bufonius Val. Kner.
" raninus Blkr =: Pimelodus raninus Val. Kner.
Pimelodus furcifer Val. Kner.
Callophysus ctenodus Müll. Trosch. Kner.
Auchenipterus nodosus Müll. Trosch. Kner.
Trachycorystes maculosus Blkr = Auchenipterus maculosus Val. Kner.
" ? punctatus Blkr = Auchenipterus punctatus Val. Kner.
" thoracatus Blkr = Auchenipterus thoracatus Kner.
" ceratophysus Blkr = Auchenipterus ceratophysus Kner.

Centromochlus megalops Kner.
" aulopygius Kner.
Euanemus nuchalis Blkr = Auchenipterus nuchalis Val. Kner.
359 Ageneiosus militaris Va1., Kner.
" brevifilis Val. Kner.
" dentatus Kner.
Tetranematichthys quadrifilis Blkr = Ageneiosus quadrifilis Kner.

Anodontes.

Hypophthalmus fimbriatus Kner, Blkr.
" Spixii Val. Kner = Hypophthalmus edentulus Spix, Blkr.

Silurichthyoidei.

Cetopsis gobioides Kner.
" coecutiens Ag. Kner.
" candiru Ag. Kner.
Trachelyopterus taeniatus Kner.

During the printing of this part I again received some collections, which enabled me to insert in the text some additions, while on the other hand no mention could be made of others on the pages that had already been printed. I owe new collections to the following persons

Dr. A.J. Anderson, physician at the Kokos-islands.	From	Kokos Island
S.H.A. Begemann, Officer of health 3rd class, at present at Java.	"	Banka.
F.W. Dolge, Officer of health 1st class in Muntok.	"	Banka.
G.J. Filet, Officer of health 2nd class, at present in Batavia.	"	West Borneo
G.F.J. Hies, Officer of health 2nd class, at present at Java.	"	West sumatra
E.A. Lange, Acting Officer of health 2nd class, Inspector of hospitals in the outer regions.	"	East-Sumatra.
T.A.W. Van Ophuijsen, Assistant-resident of Benkoelen.	"	West-Sumatra
J.J.W.E. Van Riemsdijk, Officer of health 3rd class, at Bankalis"	"	East-Sumatra.
G.C. Schonk, Resident of Banjoemas, at Banjoemas.	"	South Java.
Dr. F. Schonck, Acting Officer of health 2nd class (since then passed away)	"	West Sumatra
F.J.P. Storm van 's Gravesande, General tax collector in Batavia.	"	East Sumatra

I also received collections from persons who had sent me specimens before: e.g. of:
360

Dr. J.W.E. Arndt, Officer of health 2nd class, at present at Timor-koepang.	From	Central Java
Dr. O. Brummer, Officer of health 2nd class at Atapoepoe.	"	Timor.
E.A.W. Ludeking, Officer of health 2nd class at Fort de Koek.	"	West Sumatra.
Á.J.F. JANSEN, Resident van Manado, Ridder der Orde van den Nederlandsche Leeuw en Kommandeur der Spaansche Orde van Isabella la Catolica, at Manado.	"	North- Celebes.
D.C. Noordziek, Assistant-resident tin Patjitan.	"	South Java.
J.G.C. Ross, Owner of the Kokos-islands.	"	Kokos-Island.
J.H.A.B. Sonnemann Rebentisch Officer of health 1st class t Sinkawang.	"	West-Borneo.
P.L. Van Bloemen Waanders, Assistant-resident at Boleling.	"	Bali.
H.D.A. Van der Goes, Resident of Banda and Head of the Commission for New Guinea.		

The new collections have not enriched my cabinet much as far as the Silures are concerned. I was able to insert at the end of the Bagrichthyoïds a description of a new species from Palembang, Cephalocassis Stormei, but I could not mention this species on p. 28, 31, etc. The column Sumatra on p. 39-41 has to be changed accordingly, moreover in it should also be mentioned Pseudosilurus leiacanthus Blkr, Chaca bankanensis Blkr and Clarias leiacanthus Blkr, which I have also received from Sumatra since the printing of these pages. The number of species iof Silures in that column has to be increased to 50, so that at according to our present knowledge Sumatra has 5 Silures more than Java and 17 more than Borneo. Because we now know that Pseudosilurus leiacanthus occurs on Sumatra, the only species mentioned on p. 43 as indigenous for Banka has to be cancelled.

When I offer with the work above the first part of my Prodromus, I want to comply with the request of many ichthyologists, made known to me, to publish a list of the by this time rather numerous ichthyological contributions that I have published, with a mention also of 361 the periodicals in which they have been placed. The contributions are mentioned below.

In the *Natuur- en Geneeskundig Archief voor Nederlandsch Indië, edited by P.J. Godefroy, M.J.E. Müller, P.A. Fromm and P. Bleeker.* Batavia. 1846-1848.

1. Overzigt der Siluroriden, welke te Batavia voorkomen. Jaarg. III 1846 p. 135-184.
2 Siluroideorum bataviensium species nuperrime detectae. Jaarg. III p. 284-293.
3 Pharyngognathorum Siluroideorumque species novae javanenses. Jaarg. IV 1847 p 155-169.

In the *Journal of the Indian Archipelago and Eastern Asia. Singapore* 1848-1849.

4 A Contribution to the Ichthyology of Sumbawa. Vol. II 1848 p. 632-540.
5 A Contribution to the knowledge of the ichthyological fauna of Celebes. Vol. III 1849 p. 65-74.

In the *Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen edited by P. Bleeker. Batavia* Vols XXI-XXVI 1846-1857.

6 Siluroideorum bataviensium conspectus diagnosticus. Dl. XXI, I 1846-1847 p. 1-60.
7 Labroideorum ctenoideorum bataviensium diagnoses et adumbrationes. ib. p. 1-33.
8 Nieuwe bijdrage tot de kennis der Siluroïden van Java. ib. p. 1-12.
9 Overzigt der te Batavia voorkomende Gladschubbige Labroïden, met beschrijving van 11 nieuwe species. Dl. XXII 1849 p. 1-64 (1847).
10 Bijdrage tot de kennis der Percoïden van den Malayo-Molukschen Archipel, met beschrijving van 22 nieuwe soorten. ibid. p. 1-64 (Sept. 1848).
11 Bijdrage tot de kennis der Scleroparei van den Soenda-Molukschen Archipel, ib. p. 1-10. (Febr. 1849).
12 Bijdrage tot de kennis der Blennioïden en Gobioïden van den Soenda-Molukschen Archipel, met beschrijving van 42 nieuwe soorten. ibid. p. 1-40. (Aug. 1848).
13 Bijdrage tot de kennis der ichthyologische fauna van het eiland Bali met beschrijving van eenige nieuwe species. ib. p. 1-11 (Novemb. 1848).
14 Bijdrage tot de kennis der ichthyologische fauna van het eiland Madura, met beschrijving van eenige nieuwe soorten. ibid. p. 1-16. (Decemb. 1848).
15 Bijdrage tot de kennis der Sciaenoïden van Soenda-Molukschen Archipel, met beschrijving van 7 nieuwe soorten. ibid. Dl. XXIII 1850 p. 1-31. (Aug. 1849).

16 Bijdrage tot de kennis der Sparoïden van den Soenda-Molukschen Archipel, ibid. p. 1-16. (Decemb. 1849).
362 17 Bijdrage tot de kennis der Maenoïden van den Soenda-Molukschen Archipel. ibid. p. 1-13 (January 1850).
18 Bijdrage tot de kennis der Visschen met Doolhofvormige kieuwen van den Soenda-Molukschen Archipel. ibid. p. 1-15. (Febr. 1850).
19 Bijdrage tot de kennis der Chaetodontoïden van den Soenda-Molukschen Archipel. ibid. p. 1-31. (December 1849).
20 Bijdrage tot de kennis der Teuthiden van den Soenda-Molukschen Archipel. ibid. p. 1-13. (Maart 1850).
21 Bijdrage tot de kennis der Notacanthini van den Soenda-Molukschen Archipel. ibid. p. 1-6 (Maart 1850).
22 Bijdrage tot de kennis der ichthyologische fauna van Midden- en Oost-Java, met beschrijving van eenige nieuwe species. ibid. p. 1-23. (Febr. 1849).
23 Bijdrage tot de kennis der Makreelachtige visschen van den Soenda-Molukschen Archipel. ibid. p. 1-93. Okt. 1850 Aanhangs. Decemb. 1850, Maart l852).
24 Bijdrage tot de kennis der Snoekachtige visschen van den Soenda-Molukschen Archipel. ib. p. 1-28 (Novemb. 1850. Aanhangs. Maart 1852).
25 Bijdrage tot de kennis der Chirocen troïdei, Lutodeiri, Butirini, Elopes, Notopteri, Salmones, Echeneoldei en Ophidini van den Soenda-Molukschen Archipel. ibid. p. 1-32 (Jan. 1851. Aanhangs. 1851).
26 Bijdrage tot de kennis der Haringachtige visschen van den Soenda-Molukschen Archipel, ibid. p. 1-52. (Decemb. 1851. Aanh. Mei 1852).
27 Bijdrage tot de kennis der Pleuronecteoïden van den Soenda-Molukschen Archipel. ibid. p. 1-32. (Decemb. 1850. Aanh. Jan. 1851, Aanh. 2. Maart 1852).
28 Bijdrage tot de kennis der Blootkakige visschen van den Soenda-Molukschen Archipel ibid. p. 1-26. (Aug. 1850. Aanh. Maart 1852).
29 Bijdrage tot de kennis der Balistini en Ostraciones van Indischen Archipel ibid. p. 1-38 (Mei 1851. Aanhangs. Novemb. 1851).
30 Bijdrage tot de kennis der Plagiostomen van den Indischen Archipel. ibid. p. 1-92. (Juny 1851, Aanhangs. 1852).
31 Bijdrage tot de kennis der Muraenoïden en Symbranchoïden van den Indischen Archipel. Dl. XXV p. 1-62. (Sept. 1852).
32 Aanhangsel op de Bijdrage tot de kennis der Muraenoïden en Synbranchoïden van den Indischen Archipel. ib. p. 63-76. (Sept.-Decemb. 1853).
33 Bijdrage tot de kennis der Troskieuwige visschen van den Indischen Archipel. ibid. p: 1-30. (Aug. 1853).
34 Nalezingen op de ichthyologie van Japan, ibid. p. 1-56. (January 1853).
35 Nalezingen op de ichthyologische fauna van Bengalen en Hindostan. ibid. p. 1-166. (Jun.-Sept. 1853. Aanh. Maart 1854).
36 Nieuwe Nalezingen op de ichthyologie van Japan. ibid. Dl. XXVI 1857. p. 1-132 (Jan.-February 1854).
37 Bijdrage tot de kennis der Sphyraenoïden van den Indischen Archipel. ibid. XXVI p. 1-22. (Sept. 1854).

363 In the *Nova Acta Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum.* Vo1. XXIV.

38 Over eenige nieuwe soorten van Notopterus van den Indischen Archipel. Vol. XXIV P. I. p. 1-14. (49-52). (Decemb. 1851).

In the *Verhandelingen der Koninklijke Akademie van Wetenschappen te Amsterdam.* 4e. 1853-1855.

39 Bijdrage tot de kennis der ichthyologische fauna van Japan I, 1853 p. 1-16 (Dec. 1851).
40 Over eenige visschen van Van Diemensland Dl. II 1855. p. 1-30. (July 1854).

Published seperately.

41 Reis door de Minahassa en den Molukschen Archipel, gedaan in de maanden September en Oktober 1855 in het gevolg van den Gouverneur Generaal A.J. Duymaer van Twist. Batav. 1856. 2 Deelen Roy. 8°.

In the *Natuurkundig Tijdschrift voor Nederlandsch Indië, published by de Natuurkundige Vereeniging in Nederlandsch Indië,* edited by *P. Bleeker. Batavia* 5°. 1850-1858. *Dl. I-XVII.*

42 Bijdrage tot de kennis der ichthyologische fauna van Borneo, met beschrijving van 16 nieuwe soorten van zoetwatervisschen. Dl. 1. 1850 p. 1-16 (Maart 1850).
43 Over eenige nieuwe soorten van Scleroparei van den Indischen Archipel. ibid. I p. 17-27 (Aug. 1850).
44 Over twee nieuwe soorten van Callionymus van den Indischen Archipel. I p. 28-32 (Aug. 1850).
45 Over eenige nieuwe soorten van Belone en Hemiramphus van Java, I p. 93-95 (uit het 24e Dl. Verh, Bat. Gen. van kunst. en wetensch.) .
46 Over drie nieuwe soorten van Tetraödon van den Indischen Archipel. I p, 96-97 (uit id.).
47 Faunae ichthyologicae Javae insularumque adjacentium genera et species novae, I p. 98-108 (uit het 23e Dl. Verh. Bat. Gen. van kunst. en wet).
48 Visschen van Banka. I p. 159-161 (Okt. 1850).
49 Visschen van Borneo. I p. 161-162.
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59 Nieuwe bijdrage tot de kennis der Percoidei, Scleroparei, Sciaenoïdei, Sparoïdei, Maenoïdei, Chaetodontoïdei en Scomberoidei van den Soenda-Molukschen Archipel. II p. 163-179.
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