EAFFRO OCCASIONAL PAPER 7

A translation of certain extracts from :

"Les genres des poissons d'eau douce de l'Afrique"

(The genera of freshwater fish from Africa)

by M. POLL (1957)

Ann. Mus. Roy. Congo Belge. Ser. 8°, Zool. 54: 1-191

translated by M.J. Mann (Fisheries Research Officer)

E.A.F.F.R.O.

P.O. Box 343,

Jinja, Uganda.

December, 1967.

CONTENTS

(Sections typed in lower case are not included in the translation)

Translator's introduction

At present there is no convenient key in English for the identification of the species of freshwater fish from the East African political region which includes Kenya, Tanzania and Uganda. Whilst Boulenger (1909-16), Lockley (1949), Copley (1952 and 1958) and Greenwood (1953-1958 and 1966) give keys on descriptive data relevent to this fauna, their accounts do not give complete coverage for the region. Norman's (c 1944) draft synopsis of the orders, families and genera of recent fishes unfortunately excludes the Ostariophysi and the Cichlidae, thus does not cover 12 of the most important families of African freshwater fish. Moreover Norman's key employs, for the remaining families and genera, detailed anatomical characters which are not convenient to use in the field.

However Dr. Max Poll (1957) of Tervuren has produced two very useful keys to the families and genera of freshwater fish from Africa, which form an excellent basis for the specific identification of freshwater fish from the East African region. But, being produced in French, Poll's paper is not a familiar work of reference to many East African ichthyologists and the purpose of this translation is to attract attention to the value of Poll's original paper in French, rather than to provide a complete alternative English language version. Thus this translation covers only certain extracts from the original text, and ·· the keys especially, frequent reference must be made to Poll's (Dupond's) gures as well as to the annotations on respective families and genera. Careful reference must a· o be made to the section on the diagnostic characters of fish since the accepted definition of certain characters e.g. lateral line scale counts in cichlids, differs between English and Continental authorities.

The translator is extremely grateful for Dr. Poll's permission to reproduce this translation for limited circulation, and also for his assistance in correcting typographical errors and providing additional data to the original text, which can be obtained from the Head of the Department of Vertebrates, Musee Royal de l'Afrique Centrale, Tervuren, Belgium at a price of 160 Belgian francs (surface post).

Boulenger, G.A. (1909-16) Catalogue of the freshwater fishes of Africa in the British Museum (Natural History) Vols. I-IV, Brit. Mus. Nat. Hist., London.

Copley, H. (1952) The game fishes of Africa. H.F. & G. Witherby, Ltd., London.

Copley, H. (1958) Common freshwater fishes of East Africa. H.F. & G. Witherby Ltd., London.

·eenwood, P.H. (1953) The fishes of Uganda. Part I. Uganda J.19 (2) : 137-155.

Greenwood, P.H. (1956) The fishes of Uganda. Part II. Uganda J. 20, (2) : 129-165.

Greenwood, P.H. (1957) The fishes of Uganda. Part III. Uganda J. 21 (1) : 47-80.

Greenwood, P.H. (1958) The fishes of Uganda. Part IV. Uganda J. 21 (2) : 191-219.

Greenwood, P.H. (1958) The fishes of Uganda. (Parts I-IV). The Uganda Society, Kampala, Uganda.

Greenwood, P.H. (1966) The fishes of Uganda. (Parts I-IV). 2nd. edn. The [illegible] Uganda Society, Kampala, Uganda.

Lockley, G.J. (1949) The families of freshwater fishes of Tanganyika Territory, with a key for their identification. E.Afr. Agric. J., 14 (4) : 212-218.

Norman, J.R. (c 1944) A draft synopsis of the orders, families and genera of recent fish and fish-like vertebrates. (unpublished MS. British Museum Natural History).

Poll, M. (1957) Les genres des poissons d'eau douce de l'Afrique. Ann. Mus. Roy. Congo Belge. Ser. 8°, Zool., 54 : 1-191.

INTRODUCTION

The object of this paper is to facilitate the identification of the families and genera of African freshwater fish known to date from the vast zoogeographical Ethiopian region south of the Sahara. This Ethiopian region really stretches over the whole of Africa with the exception of North Africa (Morocco, Algeria, Tunisia) whose fauna has mainly European affinities. (Only the endemic Cichlid genera from Lake Nyasa cannot be determined from this work. The key for the identification of these fish can be found in the excellent monograph by Trewavas, 1935: "The Cichlid Fishes of Lake Nyasa" Ann.Mag.Nat.Hist. (10) 16 : 65-118). The keys are convenient and are designed to simplify the identification as far as possible. Certain of these keys are original, while others have been constructed from the works of several other ichthyologists: Boulenger, Pellegrin, Regan, Trewavas, Myers, Daget, Greenwood, as well as my own earlier publications.

The majority of genera already described (but not the sub-genera) have been taken into consideration and an effort has been made to place them on a level with modern nomenclature. The division of genera is a matter of personal preference and not all genera have the same importance or the same value. Some genera noted here may not survive in the future, as can be judged by the minor importance of certain diagnostic characters. Nevertheless, no other difficulty should appear in the use of the keys since they use only simple and clearly visible external character and are intentionally only a summary of particular characters, such as skeletal forms which are usually more satisfactory indicators in the consideration of generic differences amongst vertebrates. On the other hand, certain genera (such as Barbus) are clearly heterogeneous and have already been divided into several sub-genera. No account has been taken of them here, not because they are unjustified, but because of the lack of clarity and uniformity which has typified these sub-divisions to date.

Although it is possible to simplify the identification of families and genera, identification at a specific level is a much more complicated procedure, (except of course in the case of monotypic genera) and necessitates recourse to numerous publications and collections for comparison. In the majority of cases it is impossible to attempt s specific identification with only the aid of simplified keys and without the aid of figures or detailed descriptions. Amongst the monotypic genera which comprise a single species, it goes without saying that the identification of these species results *ipso facto* from the identification of the genus to which they belong.

In the identification keys we will note not only the names of species belonging to monotypic genera but also those of bi-specific or tri-specific genera, together with an indication of their general geographical distribution, which is usually sufficient to enable specific identification to be made. The maximum length of the genus which is often very useful in identification is also noted. These maximum lengths are only given approximately since the known values are certainly only approximate themselves.

It is important not to forget that this study is only concerned with the families and genera of freshwater fish. However, certain of them penetrate into brackish waters and although the identification of these fish is possible, identification will not be possible for fish, from brackish waters, which are of marine origin.

Although the habitat of the fauna considered in the keys has been well defined, the reader should not be surprised to find certain marine fish whose presence is possible in freshwaters far from the sea. This is the case amongst the following fish which are classified, after Myers, as sporadic inhabitants [of freshwaters] and whose affinities with the marine fauna are indisputable.

.../...

Amongst the Elasmobranchiata the shark Carcharias zambesensis has been observed in the Zambezi up to 120 miles from the coast, and the saw-fishes or Pristidae, large specimens of which are caught at Matadi, are well-known for their ability to penetrate into rivers. There are also certain unidentified species of Trygon. These are not true freshwater fish but are marine species which migrate occasionally into fresh waters (including probably Carcharias zambesensis whose specific identity is doubtful since it is really only a marine fish).

The Elopidae (tarpons) must be included in the same category since they are also euryhaline although only to a slight degree; hardly penetrating to the limit of brackish waters.

The Salmonidae obviously count either as anadromous or permanent freshwater species but they are essentially a holarctic (northern hemisphere) family. The European trout Trutta trutta occurs in Algeria and Morocco and has been established, as has its relative the American trout Trutta irideus, in various regions of Africa where the climate, according to altitude or latitude has permitted its introduction. However, we have not taken into account either the freshwater fauna north of the Sahara, or any of the introduced species.

Amongst the sub-order Siluri (cat-fish) besides the species belonging to definite freshwater families, there are some families whose presence in the rivers or close to river-mouths is either fortuitous or the result of a particular euryhaline ability. Such is the case of Plotosus anguillaris (Plotosidae).

The Ariidae (= Tachysuridae) are catfish which clearly have a marine origin, since the majority of the species are uniquely marine. Certain species occasionally penetrate into brackish waters and river mouths, but others such as Arius gigas are exclusively freshwater inhabitants. Thus, this genus must be taken into consideration in this study.

The Scombresocidae, Centrarchidae, Scorpididae, Sciaenidae, Pristipomatidae, Sparidae, Carangidae, Bothidae, Atherinidae, Mugilidae, Polynemidae, Sphyraenidae and Blenniidae will not be considered here as freshwater fish since their movement into freshwaters in Africa is only rare and these populations occur only in inland waters near the coast. They are sometimes of importance in Madagascar and in some islands of the western Indian Ocean where they are found in freshwaters, but in Africa they hardly penetrate into the rivers.

In conclusion, we have included in our list of African freshwater fish only those families which comprise at least one endemic freshwater species which are dependent upon freshwaters and which do not return to the sea for reproduction, or, those families which, like the Anguillidae, possess catadromous representatives which reproduce at sea after having undergone a long growth period in freshwaters where their presence is not uncommon.

The African fish fauna does not include any anadromous fishes. These families, such as the Petromyzontidae, Acipenseridae, Salmonidae and Clupeidae are confined to the temperate or cold regions of the globe. It must be concluded that warm and poorly oxygenated freshwaters do not suit them.

The freshwater fish of Africa belong to thirty-eight families which are numerically very dissimilar. Certain families comprise a single genus or even a single species, while others comprise several dozen genera and even several hundred species.

In all, the freshwater fish fauna of Africa comprises two hundred and thirty-three different genera.

.../...

Almost all the genera have been figured from nature or after various authors particularly Boulenger. His magnificent figures in "Poissons nouveaux du Congo" which appeared in the Ann. Mus. Congo have been widely used, and the Trustees of the British Museum have also authorised the reproduction of several figures from his "Catalogue of Freshwater Fishes of Africa". It is perhaps surprising to learn that certain genera have never been figured and that it has not been possible to figure several other genera because of the lack of any specimens in our collection. The figures of entire fish have been supplemented by numerous detailed figures which should greatly assist in the use of the keys.

All the figures have been produced by that excellent artist Dupond who has lavished all his care and ability upon them.

We should thank our respected and distinguished colleague, Dr. Trewavas of the British Museum (Natural History) for her kind advice.

We should thank also the editors of this work: The Trustees of the "Bulletin Agricole du Congo Belge" and of the "Musee Royal du Congo Belge", for whom this work has been produced.

In honour of all those who study the fish fauna of African inland waters.

THE GENERAL GEOGRAPHICAL DISTRIBUTION OF THE AFRICAN FISH FAUNA

The freshwater fish of Africa north of the Sahara have not been taken into consideration in this study which covers the freshwaters of the remainder of the African continent, called the Ethiopian region. The fish of North Africa (Morocco, Algeria and Tunisia) show clear palaeartic, hence European affinities.

In these north African freshwaters occur representatives of the families: Clupeidae (Alosa), Salmonidae (Trutta), Cyprinidae (Barbus, Varicorhinus, Leuciscus = Phoxinellus, Cobitis), Clariidae (Clarias), Anguillidae (Anguilla), Cyprinodontidae (Cyprinodon, Tellia), Syngnathidae (Syngnathus), Mugilidae (Mugil), Serranidae (Atherina), Gasterosteidae (Gasterosteus), Blenniidae (Blennius).

These are, either palae-arctic families unknown in the African-Ethiopian region, e.g. Salmonidae and Gasterosteidae, or cosmopolitan marine families with species which have adapted to freshwaters, e.g. Clupeidae, Syngnathidae, Mugilidae, Serranidae, Gobiidae, Atherinidae and Bleniidae, or else freshwater families which are widely distributed in both Asia and Africa, e.g. Cyprinidae, Clariidae, Cyprinodontidae and Cichlidae. Certain genera of Cyprinidae and all the genera of Cyprinodontidae are clearly palae-arctic. Only the genera Barbus, Varicorhinus, Clarias, Hemichromis, Astatotilapia, and Tilapia are represented in the tropical African Ethiopian region but Barbus and Clarias are perhaps of European origin.

In the vast Sahara desert fish are not completely absent, even in the remote central areas, such as Touat, Tassili, Tibesti, Borkou and Ennédi.

Found there are some representatives of the following families: Cyprinidae (Labeo, Barbus, Barilius), Clariidae (Clarias) and Cichlidae (Tilapia, Astatotilapia).

This implies the permanence of rivers or other water sources, and the esixtence in the past, perhaps not so long ago, of a hydrographical system whose fauna had close affinities with the Ethiopian fish fauna. Amongst all the examples, there is not a single genus of purely palae-arctic origin still surviving in the desert.

The Ethiopian fish fauna is thus distributed across the whole of Africa south of North Africa (but including the Nile) but only assumes any importance south of the Sahara. It comprises 38 families listed below in the general table of classes, orders and families: [not given here]

Twelve of these families belong only to Africa: Protopteridae, Polypteridae, Cromeriidae, Kneriidae, Phractolaemidae, Pantodontidae, Mormyridae, Gymnarchidae, Citharinidae, Amphiliidae, Mochocidae and Malapteruridae. Most of these families comprise only a few species or even only a single species. Only the families Mormyridae, Citharinidae and Mochocidae are well represented and their numerous species are particularly varied in the Congo basin.

Sixteen families have a much wider distribution than Africa: the Characidae have also some representatives in tropical America and their abundance on both sides of the Atlantic contrasts with their total absence in other parts of the world, posing a zoogeographical problem which has not been explained other than by Wegener's theory of continental origins. The Osteoglossidae occur in the tropical regions of all four continents; they are the relics of an earlier more general distribution. The Notopteridae, Cyprinidae, Cobitidae, Bagridae, Schilbeidae, Clariidae, Synbranchidae, Anabantidae, Osphronemidae, Ophiocephalidae and Mastacembelidae are common to Africa and Asia (sometimes including Europe). They provide evidence of a considerable faunal exchange during a recent geological period (the end of the Tertiary), since which the subsequent effects of isolation have only been feeble. The Nandidae, Cichlidae and Cyprinodontidae are common to the tropics of America, Africa and Asia. It is probable that their incomplete restriction to freshwaters is the cause of this wide distribution.

Finally, ten families are represented in Africa, by immigrants of a clearly marine origin. This is also the cause of their simultaneous presence in numerous widely separated areas. They are the Clupeidae, Ariidae, Galaxiidae, Anguillidae, Ophichthyidae, Syngnathidae, Centropomidae, Eleotridae, Gobiidae and Tetraodontidae.

* * *

The vast area of Ethiopian Africa has already been subdivided into several zoogeographical regions and sub-regions by Boulenger and Pellegrin, based on the fact that the distribution of the fish fauna is far from uniform.

Inter-tropical west and central Africa is certainly the richest part of the continent from the point of view of the number of families, genera and species of fish and the two previous authors have called it, after Sclater the "région mégapotamique" from the fact that it is in this part of the African continent that most of the large rivers are found.

Within the limitations given by Pellegrin it comprises several sub-regions:-

(1) "sub-région mégapotamique sus-équitoriale" that is to say all the major rivers situated north of the equator including the basins of Chad and the Nile.

(2) "sub-région mégapotamique équitoriale" to the south of the previous area, covering the Congo basin (but not Lake Tanganyika), but including the Ogooué, Cameroun, and the rivers of Angola.

(3) "sub-région mégapotamique sous-éequitoriale" covering the Zambesi with the exception of Nyasa and the upper Shire but including the closed Ngami basin.

(4) "sub-région mégalimnique équitoriale" comprising the Great Lakes: Victoria, Tanganyika and Nyasa.

.../...

All the rest of Africa, to the east of the Nile and the Great Lakes, to the south of both the Zambesi and the rivers of Angola, is considered by Boulenger and Pellegrin to be two regions - the "région australe" and the "région orientale" both possessing a very poor fish fauna.

The zoogeographical significance of these regions will be discussed later and we shall see that these divisions are too superficial.

The "région mégapotamique intertropicale" possesses not only the most varied fish fauna, but also, without exception, all the endemic African families: Protopteridae, Polypteridae, Cromeriidae, Kneriidae, Phractolaemidae, Pantodontidae, Mormyridae, Gynmarchidae, Citharinidae, Amphiliidae, Mochocidae and Malapteruridae. These families are not necessarily exclusively distributed in this sub-region, but here are diversified to the maximum degree. Except the Cromeriidae and the Gymnarchidae (which only comprise one or two species), these endemic African families also have representatives in the Congo basin.

The other Ethiopian families of freshwater fish (but not necessarily endemic) are also all present in the "région mégapotamique", with the single exception of the Galaxiidae. Certain are ubiquitous families while others are very localised. Several families, such as the Gymnarchidae, Cromeriidae, Osteoglossidae, Cobitidae, Ariidae, Nandidae, Osphronemidae, Anguillidae, Ophichthyidae, Synbranchidae, Syngnathidae are completely lacking in the Congo basin.

With the exception of the first four of these families they are all marine forms which have adapted to freshwaters. Their absence in the Congo basin is probably related to the fact that the lower part of the river of this basin, interrupted by rapids, is hardly accessible to migrants of marine origin. Nevertheless, some other families of marine origin: Clupeidae, Eleotridae and Tetraodontidae have succeeded in colonising the central basin of the Congo.

The "région mégapotamique" is not uniformly populated and this is already apparent from what we have just said concerning the fish fauna of the Congo. Moreover, the Congo basin harbours numerous endemic genera and species which do not exist at a more northerly latitude in tropical Africa, and vice-versa. Thus, it appears justifiable to sub-divide the "région mégapotamique" into at least two parts: a "zone sus-équitoriale", and a "zone équitoriale" including the Congo basin, a conclusion reached by Pellegrin in 1927. However, we shall see that this distinction must be reconsidered.

* * *

The river basins of the "zone sus-équitoriale" include the Nile and the rivers of West Africa as far as the Niger. It is remarkable that the Nile, which runs towards the north and which at present does not possess hydrographical connection with the other basins of the "sus-équitoriale" zone which run to the west, has certain faunal similarities with these western basins. Certainly the nilotic and western "sus-équitoriale" faunas are quite different according to the number of species, but the simultaneous presence is noted in both areas of the Osteoglossidae, Cromeriidae, Gymnarchidae, and of genera such as Hyperopisus (Mormyridae), Siluranodon (Schilbeidae), Clarotes (Bagridae) and Mochocus (Mochocidae), which are all represented by at least one identical species in both areas. These facts, as well as the presence of several species common to the Nile basin and the west African "sus-équitoriale", but belonging to some more widespread African genera, can only be explained by faunal exchanges, which must have taken place at a relatively recent period, since the effect of subsequent geographical separation has not yet shown any results.

.../...

If the dessication of north Africa has now reached a point which prevents any hydrographical confluence, then we are correct in believing that intercommunication was possible before the desert reached its present extent, an event which all palaeontologists admit took place in the recent Pleistocene. The Nile communicated with Chad and the latter with the Niger. Their faunas prove this beyond doubt and the resulting faunal exchanges are not very ancient.

On the whole, these exchanges seem to have taken place between east and west since tropical west Africa remains, despite everything, rich in species, genera and even families which do not occur in the Nile basin, e.g. the Polypteridae which are more varied both specifically and generically in west Africa, and the existence of the Phractolaemidae and Pantodontidae only in west Africa. Amongst other families, at both generic and specific levels the nilotic fauna is far less varied.

Altogether, the nilotic and nigerian fish faunas differ almost as much as the nigerian and congolese faunas for example.

These and other facts reduce the importance of the zoogeographical frontier which certain authors trace between the basins of the Nile-Chad-Niger and the Congo.

* * *

The Congo basin does not contain any family which is absent further north, but contains numerous genera which must be considered endemic. Amongst these the most characteristic are: Genyomyrus (Mormyridae), Clupeopetersius (Characidae), Mesoborus, Belonophago, Eugnathichthys, Phagoborus (Citharinidae), Leptocypris (Cyprinidae) Gnathobagrus (Bagridae), Clariallabes, Channallabes (Clariidae), Teleogramma, Heterochromis, Steatocranus (Cichlidae), etc. In addition, the numerous endemic species of the Congo basin make up the richest and most varied fauna of the whole of Africa.

Certain very characteristic faunal elements of the Congo basin are found in the neighbouring basin of Gabon and particularly the Ogooué: Protopterus dolloi (Protopteridae), Stomatorhinus, (Mormyridae), Xenomystus (Notopteridae), Bryconaethiops (Characidae), Atopochilus (Mochocidae), Hemistichodus (Citharinidae), etc. These are some faunal similarities which result from occasional hydrographical confluences between the two basins.

A certain number of faunal types from the fish population of the Congo are common to the fish fauna of the African "sus-équitoriale" but only to the western basins such as the Niger, with the exclusion of the Nile. This is the case with the Phractolaemidae, the Pantodontidae and a certain number of genera such as Hepsetus and Bryconaethiops (Characidae), Garra and Chelaethiops (Cyprinidae); the genus Polypterus, the majority of whose species are western and central, can also be included. Regarding the Nile it is clear that the Polypteridae are of western origin.

Such affinities also reduce the distinction often made between the "sus-équitoriale" and "congolaise équitoriale" sub-regions.

This is even more true when some affinities are found between the fish fauna of the Congo and the Nile; affinities different to those shown between the Congo basin and the west African "sus-équitoriale" basin. The fish fauna of Katanga and more especially that of the Upper Lualaba contains, surprisingly, the very typical nilotic species: Polypterus bichir, Polypterus senegalus (Polypteridae), Ichthyoborus besse (Citharinidae) and Anabas muriei (Anabantidae), although certain differences lead one to think that the fauna of Katanga belong to distinct races. Moreover, in the Lualaba there occurs one species of Nothobranchius (N. brieni), the only congolese representative of

.../...

the genus which is very closely related to, if not just a racial variation of, a nilotic species. Finally, a whole series of fish are common to Katanga and the Nile but they spread widely beyond the limits of Katanga within theCongo basin: Hydrocyon lineatus, Alestes macrolepidotus, Micralestes acutidens, Clarias lazera, Auchenoglanis occidentalis, Heterobranchus longfilis, Schilbe mystus, Malapterurus electricus, Channa obscurus, Lates niloticus, Hemichromis bimaculatus and Tilapia nilotica. This last species is particularly interesting from the fact that it is very common in Katanga but hardly spreads to the central congolese waters. It is known that the fauna of the katangan Lualaba, differs greatly from the central congolese fauna by the absence of a number of species which do not penetrate so high upstream, consequently the faunal patterns of these two parts of the Congo basin are really very different.

It seems paradoxical to conclude from this that the upper Lualaba has not always formed part of the Congo basin but that it is an ancient tributary of the Nile. Nevertheless, such a thoery has found favour with certain geologists, who see at "Les Portes de l'Enfer" the point of capture of the Luabala by the Congo River, an event following the volcanic eruptions of Kivu which certainly interrupted the initial course of the upper Nile.

The fauna of Luapula - Mweru seems difficult to integrate with that of the Congo. The Ciohlids, particularly Tilapia macrochir, Serranochromis spp., and Haplochromis moffati indicate a relationship with the fauna of the Zambesi, but we consider that to form a separate region.

* * *

The coastal basins of Angola, the Ngami basin (Okovango River, Cubango River) and the Zambesi, are the southern limits of the "région mégapotamique équitoriale".

This part of Africa is qualitatively very poor but does not form a truly distinct sub-region (Pellegrin's "région sous-équitoriale") because it is geographically heterogeneous.

The Protopteridae only occur in the lower Zambesi basin, while the Polypteridae, Pantodontidae, Phractolaemidae, Notopteridae, Centropomidae, Ophiocephalidae, Eleotridae and Tetraodontidae have all disappeared.

Some other families (Mormyridae, Characidae, Bagridae, Schilbeidae, Cyprinodontidae) which are very diversified in the Congo, are clearly reduced. Altogether there is a marked regression of the typical tropical fish fauna, but on the other hand, the families Cyprinidae and Cichlidae assume much more importance here.

According to Barnard (1948) the fish fauna of the Ngami basin (Okovango River) is essentially the same as that of the Zambesi, with the result that these two basins seem to have been interconnected at a recent period. This would justify the view of Pellegrin, who placed them together under the name "région mégapotamique sous-équitoriale" although he placed the coastal rivers of Angola under the "région équitoriale". We prefer to consider the latter rivers as belonging to a separate zone.

* * *

It now remains to consider the region of south Africa and that of eastern Africa without omitting the Great Lakes.

South Africa must be divided into a southern region and a cape region.

.../...

The absence of some families which no longer exist in the Zambesi, the further disappearance of the Malapteruridae and the Mastacembelidae, and a very pronounced reduction of tropical elements such as the Mormyridae and Characidae, is observed from the latitude of the Limpopo River, although these tropical elements are still quite evident in the Orange River.

Beyond the latitude of the Orange River the complete disappearance is noted of the Mormyridae, Characidae, Citharinidae, Schilbeidae, Clariidae, Amphiliidae, Mochocidae, Cyprinodontidae, Mastacembelidae and Cichlidae, all families which still occur in the impoverished areas of Transvaal and Natal.

The region of the coastal rivers of the Cape (south of 31°S) possesses a freshwater fauna comprising 19 genera of Cyprinidae, 2 Anabantidae, 2 Bagridae, 1 Galaxiidae (from Africa only in the region of the Cape), 1 Gobiidae, 1 Anguillidae and 1 Clupeidae.

This very restricted fauna comprises no more than a single family of endemic African fish and only a few elements belonging sometimes to the marine fauna and sometimes to the freshwater fauna of east Asia: Cyprinidae, Bagridae, and Anabantidae.

* * *

The fauna of the coastal basins of east Africa, like those of south Africa, is characterised by the absence of an important number of tropical "mégapotamique" families: Polypteridae, Osteoglossidae, Kneriidae, Cromeriidae, Phractolaemidae, Pantodontidae, Notopteridae, Gymnarchidae, Cobitidae, Ariidae, Nandidae, Centropomidae, Ophiocephalidae and Tetradontidae.

On the other hand the following families do occur: Protopteridae, Clupeidae, Mormyridae, Characidae, Citharinidae, Cyprinidae, Bagridae, Amphiliidae, Clariidae, Schilbeidae, Mochocidae, Malapteruridae, Anguillidae, Cyprinodontidae, Cichlidae, Eleotridae, Gobiidae, Anabantidae and Mastacembelidae. The truly tropical families are poorly represented.

The dominant elements are the Cyprinidae and Cichlidae.

Here, as in south Africa, the freshwater fauna has as many affinities with the east Asian fauna as with the Ethiopian fauna. This is almost entirely due to the abundance of the Cyprinidae.

* * *

The "région méglimnique" includes the Great Lakes of central Africa: Albert, Edward, Victoria, Kivu, Tanganyika, Rukwa, Bangweulu and Nyasa. Even if limited to the three largest of these lakes, this region does not constitute a true ichthyological region. These various lakes really form parts of different water basins of distinct icthyological regions, but nevertheless, they all have in common the peculiarity of being poor in tropical "mégapotomique" faunal types, but conversely they are enriched with species of the family Cichlidae. The majority of these lacustrine Cichlidae are endemic and this diversified fauna has a quantitiative and qualitative importance proportionate to the age of the lake. The table [not included here] gives an idea of the relative importance of the number of cichlid species in the various lakes, and records at the same time the numbers of species from other freshwater families which occur there.

The large number of different species which exist in particular lakes is surprising: 221 in Nyasa and 191 in Tanganyika without taking into account the species in the affluent rivers which in the case of the Tanganyika basin brings the total to 233.

.../...

As a consequence of a fairly long history as a closed system (certain of these basins having been completely isolated from other hydrographical basins for a very long time) their depth has prevented dessication which would have been fatal to their fauna during the intense dry periods which occurred in Africa between the miocene and the pliocene.

The Cichlidae are only of importance in four lakes: Victoria, Edward, Tanganyika and Nyasa but the confluence of the first two lakes has produced a fauna which is common to a fairly large extent. The Cichlidae are specifically very varied, particularly in species of the genus Haplochromis within the lakes Victoria, Edward and Nyasa (101 species in Nyasa), but in Lake Tanganyika the differentiation reaches generic rank with 39 endemic genera, from the smallest forms known in the family to the enormous Boulengerochromis of more than one metre in length. Lake Tanganyika is certainly the oldest lake of them all, and its essentially freshwater fish fauna shows the most interesting adaptations in relation to the diverse lacustrine habitats, which ecologically speaking resemble marine habitats. But this "thalassoide" [marine-type] fauna is not, in fact, a marine fauna.

Viewed from the importance of their endemic cichlid fauna three lacustrine regions can be recognised; Victoria-Edward, Tanganyika and Nyasa, while the other lakes comprise, ichthyologically at least, part of adjacent basins: the lakes Rudolf and Albert belong to the Nile basin, lakes Rukwa and Bangweulu form part of the Luapula system, and Kivu can be related to Tanganyika.

* * *

The fish fauna of Africa is thus far from being uniformly distributed. The "région mégapotamique" of tropical west and central ("sus-équitoriale" and "équitoriale") Africa is the region where the fauna is the most varied and most abundant. It was, if not the cradle, at least a sanctuary for the tertiary freshwater fauna of Africa. It then extended perhaps more widely towards the east and the north, but in these directions it has now been reduced or completely eliminated by de-afforestation and dessication.

The present different basins, or at least the principal ones being the Niger, Nile and Congo, have certainly been widely interconnected at different periods, due to the Chad basin, which formed a real hydrographic turntable in central Africa, through which riverine inter-communication between separate basins has been possible under favourable climatic conditions (higher rainfall and inundations) and perhaps also favourable tectonic events. Nevertheless, the central Congo basin seems to have remained more clearly isolated, while on the contrary, the Niger and the Nile have shown more frequent faunal interchanges.

The upper Lualaba clearly appears to have been in ancient liaison with the Nile basin.

Since the formation of the Rift Valley, the lakes have been populated from the neighbouring basins by those riverine elements which have been best able to adapt to the very unusual environmental conditions where the raised salinity and pH, the rocky nature of the substrate and the great depths, have been the dominant factors. The Cichlidae have adapted better than the other families and are there greatly diversified.

In east Africa beyond the region of the Great Lakes there is a particularly poor fauna, but the retention of quite a large number of tropical families is probably the result of a previous more flourishing stage in the history of this region coinciding with a more humid climate.

Africa, south of the Zambesi, is also poor in fish types, being finally pruned of all the tropical elements and being reduced to its most simple form in the region of Cape Province, where only the Galaxiidae represent the original tropical fauna, although their presence is readily explicable since they are of marine origin.

* * *

The faunal similarities between the Ethiopian freshwater fauna (including the Nile) and the tropical Asiatic fauna (eastern fauna) must also be considered. These similarities are explained by the ancient hydrographical confluences during the pliocene or perhaps even earlier. During the tertiary a hot tropical climate existed in the Mediterranian region and the continuity of the Afro-Asiatic flora indicates the existence of some hydrographical systems which have now disappeared, but whose development permitted some faunal exchanges. Thus, the transfer has taken place of the Notopteridae, Cyprinidae, Cotibidae, Bagridae, Schilbeidae, Clariidae, Cyprinodontidae, Nandidae, Cichlidae, Anabantidae, Ophiocephalidae, and Mastacembelidae, to speak only of the families of freshwater fish common to both continents, and whose simultaneous presence in two parts of the world cannot be the result of a marine invasion, as has probably been the case for the freshwater species of the families Clupeidae, Ariidae, Anguillidae, Centropomidae, Eleotridae, Gobiidae and Tetraodontidae.

Since certain freshwater families have eastern affinities they must have undoubtedly come from the north-east. They are much more widespread and diversified in Asia than in Africa, and moreover on the latter continent, they are lacking in the south. This is the case amongst the Cobitidae, Ophiocephalidae, and Notopteridae. It is probably also the case amongst the Cyprinodontidae, Mastacembelidae, Nandidae and Cyprinidae. But the route of migration of the sub-order Siluri is puzzling. On the other hand, the asiatic Cichlidae and Anabantidae seem to me to be clearly of African origin because of the predominance of these fishes in Africa where they are found far to the south. The possibility of faunal exc anges in both directions is thus confirmed by geographical distribution.

The faunal similarities between Asia and Africa are most apparent in the Nile which seems to have best preserved the faunal record of these great interchanges, which certainly took place but whose different phases and details are still not clear. The presence of Cobitidae in Abyssinia stresses the asiatic character of the fish fauna of north-east Africa.

The case of the Osteoglossidae is different, since they are fish of particularly ancient origin, and whose simultaneous presence in eastern Asia and in Africa (also in South America and Australia) is the result of a primitive more widespread distribution, which enabled them to populate all the lands of the southern hemisphere.

It is often debated whether the "grande forêt africane" (tropical African rain-forest) has always existed, where it occurs now, or whether it is not the result of a displacement towards the south, of a more northerly tropical forest of the pliocene-miocene. The freshwater fish fauna argues in favour of an initial tropical forest that was more widespread than the present forest, and stretching, not only north as far as the Mediterranean, but also at least as far to the south as the present forest. Indeed, the freshwater fish fauna in the present forest region is clearly the best and the most varied of the whole of Africa. This fauna shows some effects of a geographical separation which prove that these were ancient hydrographic basins. If the climatic conditions were favourable to the maintenance of these basins then the maintenance of the forest follows ipso facto. We must admit that the fate of the African forest and the fish fauna have been related since the eocene, during which period the Ostariophysi, of which Africa possess so many representatives, first appeared.

* * *

In conclusion, what is it necessary now to think of the zoogeographical sub-divisions that authors such as Boulenger, Pellegrin and Nichols & Griscom, recognised as a result of their work on the fish fauna.

.../...

The importance of these sub-divisions appears exaggerated and their defined limits are even inappropriate. There is no "région mégalimnique" and the abundance of Cichlidae, although irregular, is not sufficient reason to retain it. This predominance /of cichlids/ is not due to the common origin of the fauna nor to the confluence of the lakes, but to the existence of environmental conditions which have favoured the Cichlidae more than any other family. Under these circumstances, the significance of a single "région mégalimnique" is weak, particularly since there are some enormous faunal differences between one lake and another.

The "région mégapotamique" is, amongst the whole of the African freshwaters, the region where the extent of hydrographical systems has been the cause of a greater faunal variety. It is clearly the part of tropical Africa which was privileged from the point of view of abundant rainfall and higher temperature. It is natural that the fishes there should be more diversified than elsewhere.

Instead of dividing the "région mégapotamique" simply into three parts (like Nichols & Griscom, or Boulenger) or into six parts (like Pellegrin), I consider that it is necessary to divide it into a much greater number of sub-regions each of which has a precise significance and often has multiple affinities.

The nomenclature of these sub-regions is proposed on the attached map /not included here/. The justification for such a sub-division follows amply from the whole preceding discussion and it seems superfluous to give even a resumé of it here. There have certainly been several hydrographical confluences between the numerous now-separate basins, confluences which have led to certain clear faunal similarities. Whilst such developments must be taken into consideration their confirmation by an analysis which does not take into account the entire fauna is incorrect; the whole assemblage of families, genera and even species must be taken into consideration.

The Nile has some affinities with the Niger and Chad but there are also some other affinities with the upper Congo. It is, thus, no longer necessary to group them together, but, on the contrary, it is considered that they should comprise separate regions. The fauna of the Congo has some factors in common with the fauna of the Ogooué, but the latter has, together with the rivers of west Africa, some factors which it does not share with the Congo. It would, thus, be better to consider them as separate. Lakes Rudolf and Albert have such a characteristic nilotic fauna with so feeble an endemic element, that their grouping with the Nile region is the only logical solution, but the other lakes merit at least some consideration as comprising three distinct regions. Lakes Victoria and Edward have too many common species not to be grouped together. Tanganyika is the most surprising and most distinct ichthyological region of Africa. To Lake Tanganyika I add Lake Kivu, whose fauna, although insignificant, includes several tanganyikan elements.

The whole of the poor faunal area of east Africa is considered separate. Too little is known of the distribution of its species to attempt to sub-divide it.

The regions of Angola and the Zambesi are certainly close and similar in regard to the reduction of their fauna, but they must be considered distinct since there are some clear divergences.

Lake Nyasa merits the formation of a region to itself alone and the remainder of south Africa, the region of the Cape with its Galaxias and its particular Anabantidae must also be considered separate.

The foregoing is only an outline of the ichthyological zoogeography of Africa. Problems remain to be solved but it would be best to try to find a solution to them all when it has been decided that theories and modifications given above are well founded.

.../...

THE GEOGRAPHICAL DISTRIBUTION OF FRESHWATER FISHES FROM THE CONGO BASIN:

The distribution of animals, and of fish in particular, is not only dependent upon evolutionary factors, but also upon existing ecological factors, i.e. in relation to environmental conditions. Of all the environmental factors the salinity of the water is the factor to which fish are most sensitive. It is well known that freshwater fish do not occur in the sea, but this classification is too simple, and the establishment of five categories following the proposals by Myers (1949) (Salt tolerance of freshwater fish groups in relation to zoogeographical problems. Bijdrage tot de Dierkunde, 28) permits a much more strict ecological classification. It is summarised here together with examples from families discussed by this author.

Ecological classification of fish based upon their tolerance to salt water:

(1) "Poissons primaires": strictly intolerant to sea water. Dipneusti, Polypteriformes, Ostariophysi or Cypriniformes (Characinoides, Cyprinoides, Siluroides), Mormyridae, Centrarchidae, Percidae, etc.

(2) "Poissons secondaires": quite strictly confined to freshwater, but relatively tolerant to seawater, at least for short periods: Cyprinodontidae, Poeciliidae, Lepisosteidae, Cichlidae, Synbranchidae, Anabantidae, etc.

(3) "Poissons vicariants": clearly defined freshwater representatives of marine families, not diadromous (i.e. not anadromous nor katadromous) Clupeidae, Atherinidae, Centropomidae, Gadidae, Tetraodontidae, Eleotridae, Gobiidae, Sciaenidae, Carcharhinidae, (*Carcharhinus nicaraguensis*), Trygonidae (*Potamotrygon*).

(4) "Poissons diadromes": regular migrants between marine and freshwater environments at different stages of their life cycle: Acipenseridae, Salmonidae, Anguillidae, Clupeidae.

(5) "Poissons exclusivement marins": exclusively marine fish but which are more or less euryhaline and capable of living variously in either medium.

The mouth of the Congo:

River water does not mix intimately with salt seawater when they come into contact but spreads very widely over the surface giving the ocean a brownish or greenish colour which contrasts with the blue colour of tropical oceanic waters. Sea water, on the other hand, remains just below and penetrates into the littoral lagoons, and even into the river itself, where the presence of salt water has been noted as far upstream as the area around Boma.

In the aquatic medium described above with a very variable salinity, dependent upon the tides, the mangrove is established, forming a zone of mangrove forest along the banks of the river and the delta creeks. In this zone are found :

.../...

(1) The more or less euryhaline marine families: Pristidae, Elopidae, Sphyraenidae, Mugilidae.

(2) Those families of fish which have species adapted to freshwaters and whose presence in brackish waters is quite normal: Clupeidae, Eleotridae, Gobiidae, Tetraodontidae, Periophthalmidae.

(3) Those families of freshwater fish, which are not uniquely "secondaires", including Cichlidae, Cyprinodontidae, Anabantidae. While the genera are identical, the species are not the same as those inland.

The lower reaches of the river above Boma:

Above Boma the fish fauna assumes a much more definite freshwater character, but up to Matadi, various very euryhaline sea fishes, such as the large saw-fish (Pristis) or the large "Pastenague" (Trygon) are occasionally caught. These sea fish which penetrate as much as several hundred kilometres, up certain African rivers, such as the Ogooué, are, above Matadi, stopped by the Congo rapids.

The freshwater character of the fauna above Boma, and Mateba Island is marked by the presence of some fish types which are more representative of the freshwater fish fauna of Africa: Protopterus, including P. aethiopicus and P. dolloi, and Polypterus including P. palmas.

There are also some representatives of nearly all the other families of "primaire" freshwater fish of the Congo: Mormyridae, Characidae, Citharinidae, Cyprinidae, Pantodontidae, Ophiocephalidae, Mastacembelidae, as well as the various families of the sub-order Siluri.

To these elements are added the same families of "secondaire" freshwater fish noted already in brackish waters: Cichlidae, Anabantidae, Cyprinodontidae and the "vicariant" families of fish: Clupeidae, Eleotridae, Tetraodontidae, Centropomidae.

In the lower Congo, the absence is noted of the Kneriidae, Notopteridae, and Phractolaemidae. Except for Kneria which is a fish of mountainous regions, these absences may perhaps simply reflect an imperfection in our present knowledge.

If the freshwater fish fauna is first established upstream of Boma, not all the genera and species are represented, and only a fairly poorly diversified fauna occurs up to Stanley Pool. Above this point are found the following reaches:

(1) The reach of the Cristal mountain rapids

In this region of waterfalls and permanent violent currents the presence is noted of a fauna specially adapted to resist the rapid currents and able to adhere to rocky bottoms: Garra and Labeo (Cyprinidae), Atopochilus, Euchilichthys, Chiloglanis (mochocidae): Steatocranus, Teleogramma and Leptotilapia (Cichlidae).

All these fish show some remarkable adaptations to torrental life: the body is depressed, with low fins assisting adhesion to the surface, possibly the presence of an oral sucker, and specialised locomotion by a series of successive leaps.

The species, and sometimes the genera of the Cichlidae, are endemic to this reach. The radiation of the Cichlidae is repeated; the great adaptive ability of this family under differing circumstances is already familiar.

The presence is recorded in the chalky caves near Thysville of a well-known species, the blind cave-living barbus: Caecobarbus geertsii Boulenger. Two other completely blind freshwater fish occur in Africa: Uegitglanis zammaranoi (Clariidae) and Phreatichthys andruzii (Cyprinidae).

(2) The major valley of the Congo, or the central basin

The central basin of the Congo begins between Leopoldville and Stanley Pool. This vast region crossed by the river and transvered by innumerable tributaries is largely covered by tropical rain forest. It is the most interesting part of the Congo from the point of view of zoology; here occur a prodigious variety of life and the most varied fish fauna that there is. There is, nevertheless, a basic resemblance to the lower Congo, but it is necessary to note:

(1) the presence of a much greater number of species

(2) the presence of additional genera not recorded from the lower Congo: Genyomyrus, Myomyrus, Bryconaethiops, Clupeopetersius, Belonophago, Eugnathichthys, Xenocharax, Leptocypris, Engraulicypris, Hypsopanchax, Heterochromis, Lamprologus, Nannochromis, etc.

(3) The presence of some additional families not recorded from the lower Congo: Phractolaemidae, Notopteridae.

(4) A differentiation between forest fauna and savannah fauna: The Cyprinodontidae are characterised by a remarkable distribution which records Aphyosemion and Epiplatys and Hypsopanchax in the tropical rain forests and Aplocheilichthys in the savannah. The Phractolaemidae and certain small Barbus, Nannochromis, Stomatorhinus, etc., occur only in the tropical rain forest.

(5) A very clear geographical segregation is observed amongst the faunas of the main river and the much smaller tributaries respectively.

(6) In this fairly homogeneous distribution, the fauna of the central basin shows in several lakes the evolution of certain local endemic species:

Stanley Pool - Gymnallabes tihoni, Belonophago tinanti, Epiplatys chevalieri, Aplocheilichthys myersi, Tetraodon schoutendeni.

Lake Tumba - Eutropius tumbanus, Clupeopetersius schoutedeni, Tylochromis lateralis microdon.

Lake Fwa - Cyclopharanyx fwae, Neopharynx schewtzi, Haplochromis rheophilus.

(3) The reaches of the Lualaba and the fauna of Katanga

From Stanleyville (and Stanley Falls) the central congolese fauna undergoes some changes which increase towards the south. These changes comprise reduction of the central congolese fauna and the addition of a number of nilotic species. In Katanga, particularly in the upper reaches of the Lualaba, this nilotic fauna is clearly evident, including Protopterus annectens, P. aethiopicus, Polypterus bichir katangae, P. senegalus meridionalis, Ichthyoborus besse congolensis, Tilapia nilotica and Nothobranchius brieni.

Such similarities are inexplicable unless one accepts the existence in the past of a hydrographical connection between the Lualaba and the upper Nile - a river which was at that time a tributary of the Indian Ocean. This connection is shown by the existence of a very obvious capture, on the course of the Lualaba at the place called "Les portes de l'Enfer".

This capture of the Lualaba probably took place at the end of the pleistocene after the upthrust of the mountains of the east and more particularly the volcanic region of Kivu (which is of recent geological age). This upthrust seems to have lead to the rupture of communication between the upper Nile and its highest tributary: the Lualaba.

Since this capture the fish of the upper reaches of the Lualaba (above Kongolo) have been distributed downstream to a large extent.

This is the case for Tilapia nilotica (which however has not descended the river beyond Stanleyville), Schilbe mystus, Alestes macrophthalmus, Lates niloticus and Protopterus aethiopicus.

Conversely, some fish of the central Congo basin have succeeded in penetrating as far upstream as Bukama, but not further because of the rapids for instance, Polypterus congicus, P. ornatipinnis, P. weeksii and numerous Mormyridae, Characidae and Cyprinidae, belonging to the Congo such as: Gnathonemus stanleyanus, Alestes liebrechtsii, Distichodus antonii, Labeo lineatus.

However, as noted above, a certain number of nilotic fish, probably particularly the sedentary types, have been retained in the upper Lualaba, owing to the presence of some vast lakes on the Kamolondo plain, which form important refuges for fish.

The fauna of the Luapula - Mweru - Bangweulu system is quite different to the fauna of the central Congo basin and there are some good examples of faunal similarities with the basin of the Zambezi because of the reduction of some families of tropical freshwater fishes such as the Mormyridae, Characidae, Citharinidae and because of the much increased importance of the Cyprinidae and Cichlidae. The genus Serranochromis, typical of the Zambezi, and very widespread in the Luapula, together with other cichlids such as Tilapia macrochir, Haplochromis philander, Haplochromis mellandi constitute a fauna which through the intermediary of Bangweulu, shows some clear southern affinities. Here also the Congo basin has made a hydrographical capture of an ancient tributary of the Zambezi.

(4) The great lakes of the eastern frontier of the Congo

Lake Albert possesses a very varied fauna including some fifty species only eight of which are cichlids. It has some considerable affinities with the "région mégapotamique" in general and the nilotic region in particular but this is hardly surprising since it is a tributary lake of the Egyptian river Nile and has always been so since its formation. The pelagic lacustrine forms comprise 1 Engraulicypris, 1 Barilius and 2 Lates.

Lake Edward, like Lake Victoria with which it has shared a fauna which is still common to a large part, possesses a number of species comparable to that of Lake Albert. The majority of species belong to the family Cichlidae (twenty-six species) which is the clearly dominant family, and which includes a high number of species of the genus Haplochromis. The pelagic forms comprise some Haplochromis, and one Aplocheilichthys, but Lates are completely lacking.

Lake Kivu has an extremely poor fish fauna; only 20 species of which half are Cichlidae of the genus Haplochromis. The lake and the lacustrine fauna are the most recent in the whole of Africa.

Lake Tanganyika. This lake, which is the largest and the deepest lake along the eastern Congolese border, possesses the most highly diversified lacustrine fauna in the whole world. There is a total of 233 species, comprising the fauna of the affluents, the fauna of the littoral, the benthic fauna and the pelagic fauna, which are all very varied. This high variation is the result of an intra-lacustrine speciation, shown particularly amongst the Cichlidae, which have evolved species varying between 3 cm. to 100 cm. in length, and have adapted to all niches and all habitats. To date a total of 133 species of Cichlidae have been recognised, all of which belong to genera which occur in Tanganyika only, except for Tilapia with 2 endemic and 2 non-endemic species and Haplochromis with 2 endemic species.

The pelagic fauna comprises 2 species of Clupeidae, and also 2 Cyprinidae, (Engraulicypris and Barilius) and 4 Centropomidae (Lates and Luciolates), showing some homologous systematic elements with similar ecological niches elsewhere (e.g. Lake Albert).

At present Lake Tanganyika forms part of the Congo basin because of its confluence with the Lualaba via the Lukuga. Very few tanganyikan fish, which are adapted to a high salinity (potassium and magnesium bicarbonates) and a high pH, are capable of living in the Congo river, or have succeeded in colonising it. The genus Lamprologus must however be considered as one such example.

One very remarkable fact fromtthe point of view of zoogeography, is that the Malagarasi river possesses a fauna with remarkable congolese affinities e.g.: Polypterus ornatipinnis, Labeo weeksii and Tetraodon mbu. Assuming that the lake itself constitutes an unsurmountable barrier to these riverine fish (which have not been observed in the existing lake) it seems that the Malagarasi river must be considered as an ancient affluent of the Congo basin, prior to the formation of lake Tanganyika, and that it was separated from its primitive drainage system by the rifting responsible for the creation of lake Tanganyika.

THE DIAGNOSTIC CHARACTERS OF FISH

(The bracketed figures refer to the diagram on page 63 of Poll, 1957)

The total length (1) is the maximum perpendicular distance between the end of the snout and the extremity of the longest caudal ray. The maximum total length is a character which can be used in the diagnosis of some species. The standard length (2) of the body is the perpendicular distance between the end of the snout and the origin of the caudal (i.e. the base of the caudal rays) or the scales where they suddenly become much smaller, extending onto the caudal fin.

The body depth (3) is the maximum depth, taken perpendicular to the standard length.

The head length (4) is the maximum perpendicular length between the end of the snout and the posterior border of the opercular bone or the superior point of the gill-slit. The head depth (5) is the maximum depth measured in front of the occiput. The head width is the maximum width measured in front of the occiput.

The caudal peduncle length (6) is the minimum length of the posterior part between the level of the base of the most posterior median fin (anal or dorsal) and the middle of the origin of the caudal fin. The caudal peduncle depth (6b) is the minimum height of the posterior part without fins.

The snout length (7) is the perpendicular length between the end of the snout and the anterior border of one of the eyes.

The eye diameter (8) is the length of the greatest diameter of the eye. The inter-ordital width (9) is the greatest /minimum/width across the skull between two eyes. The inter-ocular width is the total distance between the two eyes. The pre-orbital depth is the perpendicular distance which separates the inferior border of the eye from the inferior border of the preorbital at the level of the corners of the mouth.

The fin lengths are always the maximum lengths along their bases for the median fins, and their maximum length from base to tip for the paired fins.

The premaxilla (10) is the bone on the upper jaw which borders on the mouth dorsally and anteriorly. The maxilla is the bone on the upper jaw which borders the mouth posteriorly or dorsally and posterior to the premaxilla; it is thus situated on the border of the mouth or behind the posterior part of the premaxilla! The dentary or mandibular is the bone of lower jaw.

The bones of the operculum are as follows: (i) The opercular (13) in the form of a large scale which covers the operculum to a large extent and which borders it posteriorly. (ii) The preopercular (14) in front of the opercular and whose infero-posterior border is visible and sometimes denticulate. (iii) The sub-opercular (15) and inter-opercular (16) are situated in the inferior region of the opercular. The sub-orbitals with the pre-orbital in front, surround the bottom of the eye.

The two nostrils or the single nostril (Cichlidae) are situated on the snout between the eye and the upper lip.

The gill-slits (18) are bordered below by the opercular membranes (19) and these are either fused to the isthmus (20) which separates them ventrally, or are confluent and fused together ventral to the isthmus. The branchial arches (gill-arches) are only visible if the operculum is lifted. They carry branchial filaments on the posterior face and branchio-spines (gill-rakers) on the anterior face. They are divided into two parts: ventral and dorsal, separated by an articulation. The lower pharyngeals represent morphologically, the last branchial arches and are shortened, free or fused together and carry bony denticles homologous with branchiospines; they border the entrance of the oesophagus. The teeth do not always cover only the borders of the jaws. They can also occur on the palate, and in this case one can distinguish vomerine teeth (in the centre), palatine and pterygoid teeth (on either side).

The fins are very variable in form, structure and position; they comprise median fins and paired fins. The median fins are dorsal, caudal and anal. The dorsal (21 and 22) can be simple or divided into 2 or more parts; the rqys can be either all soft or can have one or several of the anterior rays bony and spiny. It is separated from the head by the pre-dorsal region. In some cases the rayed dorsal is followed by an adipose fin which is generally much smaller. The anal (23 and 24) like the dorsal can be all soft-rayed or else can have spiny anterior rays. The caudal (25) is very variable in shape but is never spiny. The paired fins are the pectorals (26) and the ventrals (pelvics) (27), both soft or else possessing a spiny ray on their anterior border. These fins are separate and inserted far apart in certain families but in others they are closer together and their insertions are adjacent.

The scales are cycloid or ctenoid, depending whether the posterior border of the scale is smooth or spiny. Exceptionally they can be rhomboid, with a characteristic lozenge-shape (Polypteridae). The scales may also be lacking, or be replaced by bony scuted.

The lateral line (28) is usually simple and continuous, between the top of the gill-slit and the caudal. It can be incomplete or sometimes double (Cichlidae) but in this case both lines are incomplete. Certain fish are apparently not provided with a lateral line.

The air bladder, present or not, communicating or not with the gut, or the possible presence of supplementary supra-branchial respiratory organs carried on the branchial arches, are all important diagnostic characters but which are still not well known.

KEY FOR THE IDENTIFICATION OF THE FAMILIES OF AFRICAN FRESHWATER FISH

(The bracketed figures refer to the diagrams on pages 68 to 164 of Poll 1957)

1 * Anterior and posterior paired members in the form of rayed pectoral and ventral fins, (1,2), widely separate (3), or adjacent (4), both pairs sometimes absent, or sometimes only the ventrals. 2
* Paired members in the form of pectoral and pelvic filamentous thongs, widely separated (5). PROTOPTERIDAE

2 * Scales present or absent, when present cycloid, (6) or ctenoid (7) or very reduced, or replaced by erectile spines, or by bony scutes (8). Spiracles absent. Dorsal simple or double (9, 10, 11) and multi-rayed (i.e. not divided into a series of pinnules). 3
* Scales rhomboid (12), thick. Spiracles present on the upper surface of the head (13). Dorsal comprises a series of pinnules each preceeded by a spine (14). POLYPTERIDAE

3 * Body not anguilliform, or in the opposite case, not usually without ventrals or without oral barbels. 4
* Body anguilliform and usually without ventrals or without oral barbels. 26

4 * Ventrals widely separate from pectorals or sometimes absent, but body not covered with small erectile spines, and there are not usually any spines to the dorsal, anal or ventral. Barbels often present, especially oral barbels (15, 16, 17) or an adipose dorsal (18,19). Ventral serration (20, 21) present or absent. Scales cycloid, ctenoid or absent or replaced by bony scutes. 5
* Ventrals inserted beneath pectorals (4) or sometimes absent, but only in the Tetraodontidae, whose teeth form a clear beak, or in the Mastacembelidae which are anguilliform and which are the only group to possess a long series of indepemdent dorsal spines. Scales cycloid or ctenoid or replaced by small erectile spines if the ventrals are absent. No barbels, although sometimes nasal tentacles present, with (23) or without (22) a rostral process; no adipose dorsal. Ventral serration always absent. 28

..../....

5 *Never any adipose dorsal, nor any bony ray preceeding the dorsal or pectorals, nor any oral barbels, nor mental barbels. 6
*Adipose dorsal present, or a bony ray preceding the dorsal (18,24) and the pectorals (25), or oral or mental barbels, or both fused. 16

6 *Eye with a free border (delineated by a narrow circular depression the epidermis) (26) . 7
*Eye without a free border (27). Caudal peduncle often narrow with the caudal little developed (28). Snout sometimes elongated into a pipette (29), mouth often small with teeth hardly apparent. 15

7 *Ventral serration present, (formed by keeled and angular ventral scales) (20, 21). 8
*Ventral serration absent. 9

8 *Ventral serration simple, ventrals developed, or anal of normal length. CLUPEIDAE
*Ventral serration double (20 bis), ventrals rudimentary or absent, anal very long. NOTOPTERIDAE

9 *No barbels on the snout nor tubercules on the head or body. 10
*Nostrils preceded by an erect barbel. Often spiny tubercules around the eye and on the posterior part of the body (30). Mouth superior, (opening dorsally on the snout) small, protractile (capabale of being protracted by oral musculature), capable of being retracted into a depression on the snout (31, 32, 33). PHRACTOLEMIDAE

10 *Mouth not denticulate, dorsal may or may not be opposed to the anal (generally not). Caudal generally emarginate and bifurcate. 11
*Mouth denticulate. Dorsal and anal at least partly opposed. Caudal rounded or more or less bifurcate. 13

11 *Body with scales, these hiding the musculature. 12
*Body naked, showing the myomeres (musculature), mouth small and inferior without barbels (40). CROMERIDAE

12 *Scales very small, hardly visible without a lens. No barbels, mouth protractile, inferior, entirely overhung by the snout. Opercular and post opercular apparatus adhesive in the male (formed by a sucker on the operculum and a striated post-opercular thickening). Dorsal not opposed to the anal (37, 38). KNERIIDAE
*Scales large and clearly visible in all cases. One or two pairs of barbels present or absent. Mouth more or less protractile (39), variable in position. No opercular apparatus nor adhesive post-opercular in the male. Dorsal opposed or not to the anal. CYPRINIDAE partim

13 *Body naked, entirely lacking scales. Lateral line present. GALAXIIDAE
*Body obviously covered with scales, lateral line present or absent. 14

14 *Mouth denticulate, terminal and non-protractile. Head bony, naked (not covered with scales). Lateral line present (44). OSTEOGLOSSIDAE
*Mouth denticulate, superior (facing upwards) protractile. Head flat and covered with scales above. Lateral line absent [without a well defined lateral line] (34, 35, 36). CYPRINODONTIDAE

15 *Ventrals and caudal present. MORMYRIDAE
*Ventrals and caudal absent, body terminating in a filamentous point (42). GYMNARCHIDAE

16 *Body covered with imbricate scales, (arranged like tiles on a roof) but if indistinct, possessing some barbels which are not mental barbels. 17
*Body naked, without scales, sometimes covered with bony scutes (certain catfish), barbels always present, including mental barbels. 20

17 * Adipose dorsal and buccal dentition absent. No barbels, or 1 to 3 pairs of barbels inserted above the upper lip, but close to the lip fold. 18
* Adipose dorsal and buccal dentition present, but this fin and these teeth sometimes hardly apparent. Never any barbels, nor any bony spine in front of the dorsal. 19

18 * More than 2 pairs of oral barbels. Sometimes a bony ray in front of the dorsal. Scales usually clearly visible. CYPRINIDAE partin
* 3 pairs of oral barbels. Never any bony ray in front of the dorsal. Body naked or covered with minute scales (43) COBITIDAE partim

19 * Scales all cycloid, dentition usually strong. CHARACIDAE
* Scales ctenoid, except in the genus Citharinus where they are cycloid, but where the body is strongly compressed and the teeth are minute. CITHARINIDAE

20 * Anal long (50,52), gill membrane free (49,51) (The opercular bones are covered by a cutaneous membrance which borders the gill-slit; when the gill-slits are large and when they nearly join ventrally the gill membranes are free; but in the contrary case the gill membranes are fused to the isthmus of the throat). 21
* Anal short, gill membranes free or not. 22

21 * Rayed dorsal with short base, or absent (50); body more or less compressed SCHILBEIDAE
* Rayed dorsal with long base, (52) body depressed or rounded. CLARIIDAE

22 * Rayed dorsal present, no electric organ. 23
* Rayed dorsal absent, (53) an electric organ encircling the body (54). MALAPTERURIDAE

23 * Rayed dorsal preceded by bony ray. 24
* Rayed dorsal without a bony ray. AMPHILIIDAE

24 * Gill membranes free or narrowly fused to the isthmus (54,55). Mandibular barbels not branched, lips not adhesive. 25
* Gill membranes always more or less fused to the isthmus (56). Mandibular barbels branched; or widespread sucker-like adhesive lips. MOCHOCIDAE

25 * Both nostrils very close to each other on either side; no nasal barbels nor internal mandibular barbels (2 pairs of barbels only); gill membranes forming a continuous transverse fold (44,45). ARIIDAE
* Both nostrils widely separate on each side; often nasal barbels, and almost always 2 pairs of mandibular barbels; gill membranes forming an angular fold (55) BAGRIDAE

26 * Body not covered by annular bony plaques forming a rigid exoskeleton. Snout not elongate nor tubiform. 27
* Body covered by annular body plaques forming a rigid exoskeleton. Snout elongate or tubiform. SYNGNATHIDAE

27 * Gill-slits confluent ventrally. Paired fins completely absent. Median fins rudimentary. Skin naked (46,47). SYNBRANCHIDAE

* Gill-slits separate, pectorals present or not, ventrals absent, median fins more or less long. Skin naked or containing small hidden scales (48). ANGUILLIDAE and OPHICHTHYIDAE
(The Ophichthyidae are distinguished from the Anguillidae by the absence of a caudal, and the dorsal and anal terminate in front of the pointed end of the caudal peduncle.)

..../....

28 * Dorsal, anal and ventral provided with spiny rays. 29
* Fins without spines, nasal appendices present or not. 35

29 * Ventrals present, rayed dorsal including a series of spines united by membranes. Body not anguilliform and snout without a rostral appendix. 30

* Ventrals absent, spines of the dorsal independent. Body anguilliform and snout provided with a rostral appendix (57,23). MASTACEMBELIDAE

30 * Dorsal continuous, with anterior spiny rays and posterior soft rays (10). 31
* Anterior dorsal, spiny and separate from , or continuous with, the posterior dorsal (11), from which it is separated only by a notch. Posterior dorsal largely soft. 33

31 * 2 nostrils on either side. Opercular bones generally spiny. Anal possessing 3 or more spines (5? .
* 1 nostril on either side. Opercular bones not spiny. Anal possessing 3 or more spines (58). CICHLIDAE

32 * Suprabranchial cavity present (60). Lateral line clearly apparent. ANABANTIDAE
* Suprabranchial cavity absent. Lateral line very short or absent (61). NANDIDAE

33 * Opercular bones spiny. Rigid spiny dorsal rays. Ventrals never united. Gill membranes free. Large species (62). CENTROPOMIDAE
* Opercular bones not spiny, flexible spiny dorsal rays, ventrals often united and forming a sort of sucker (63,64). Gill membranes more or less widely fused to the isthmus. 34

34 * Separate ventrals. ELEOTRIDAE
* Ventrals united forming an adhesive sucker. GOBIIDAE

35 * Body scaly, teeth not fused into a beak, ventrals present. 36
* Body covered with small erectile spines. Teeth fused into a beak. Ventrals absent. Body thickset and more or less spherical (65,66). TETRAODONTIDAE

36 * Body elongate, dorsal and anal long, pectorals shorter than the head, ventrals not filamentous. With nasal appendices (67). CHANNIDAE (= OPHIOCEPHALIDAE)
* Body moderately elongate. Dorsal and anal short. Pectorals longer than head, ventrals filamentous. No nasal appendices (68). PANTODONTIDAE

KEY FOR THE IDENTIFICATION OF THE GENERA OF AFRICAN FRESHWATER FISH

(The figures in brackets refer to the diagrams on pages 68 to 164 of Poll 1957)

POLYPTERIDAE

1 * Ventrals present, body elongate but not anguilliform; pinnules fairly numerous (74,75) Polypterus

* Ventrals absent, body anguilliform; pinnules reduced in number (77) Calamoichthys

CLUPEIDAE

1 * Abdominal scales distinctly keeled. Premaxillary teeth rather strongly developed (Congo basin) (21, 78) 2
* Pre-ventral abdominal scales only feebly or not keeled (79). Premaxillary teeth small (Lake Tanganyika) or absent(South Africa) 6

..../....

2 * Lower jaw not or only slightly prognathous (80). Dentition weak or anterior mandibular teeth large but without strongly developed canines on each jaw (82b). 3

* Lower jaw clearly prognathous, some canines on one jaw or the other (78,85,86). 5

3 * Scales longer than the myotomes, 33 along the longtitudinal series, 8 in the transverse series (80); maximum length 6 cm. Poecilothrissa
* Scales not larger than the myotomes, 38-45 along the longtitudinal series, 10-12 in the transverse series. 4

4 * Dorsal with 16-18 rays, situated above or immediately behind the insertion of the ventrals; anal 16-21; branchiospines 26-33 on the lower segment of the first gill-arch. About 45 scales in longtitudinal series, 11-15 in transverse series; dentition fairly well developed, tongue provided with a patch of small teeth (81, 82, 82b); maximum length 14 cm. Pellonula
* Dorsal with 12-15 rays, variable in position. Anal 17-25 rays; branchiospines 14-27; 38-45 scales in longtitudinal series, 10 in transverse series; dentition sometimes minute; tongue without teeth (83, 84); maximum length 75 cm. Microthrissa

5 * Premaxilla with an inner series of 2 or 4 (rarely 1) strongly developed teeth resembling canines, on each side (85, 87); maximum length 16 cm. Cynothrissa
* Premaxillary teeth in one series, with 1 canine on each side; lower jaw with a pair of canines (86); maximum length 16 cm. Odaxothrissa

6 * Teeth present either on the faws, or on the palate; ventral insertion not preceding the origin of the dorsal (Lake Tanganyika). 7
* Teeth absent ventrals inserted weill in advance of the level of the origin of the dorsal; maximum length 7 cm. Gilchristella

7 * Maxilla narrow proximally and enlarged distally. Tongue and palate without teeth (89, 90); maximum length 10 cm. Stollothrissa
* Maxillary broad along entire length. A patch of teeth on each palatine bone and on the tongue (79, 88, 88b); maximum length 17 cm. Limnothrissa

NOTOPTERIDAE

1 * Dorsal present, adult attaining 60 cm. in length. Notopterus
* Dorsal absent, adult only attaining 20 cm. in length. Xenomystus

MORMYRIDAE

1 * Anal and dorsal very different in length, one messuring more than double the other. 2
* Anal and dorsal little different in proportions, anal 0.6 to 2 times (at the maximum) as long as dorsal. 3

2 * Anal very short compared to dorsal (93). Maximum length 65 cm. Mormyrus
* Anal very long, about 5 times length of dorsal (94). Maximum length 50 cm. Hyperopisus

3 * Ventrals closer to anal than to the pectorals. Body elongate (95). Maximum length 22 cm. Isichthys
* Ventrals equidistant from the anal and the pectorals, or closer to the pectorals. Body fairly elongate. 4

4 * Teeth arranged in several rows, villiform, mouth terminal, with a mental appendage (96, 97). Maximum length 50 cm. Genyomyrus
* Teeth arranged in a single row, variable in number, Mouth terminal or inferior, mental appendage present or absent. 5

5 * Teeth situated along the entire border of the jaw, 10-36 teeth on each jaw; no mental appendage. 6
* Teeth situated in the middle of the jaws, 3-10 on each jaw; mental appendage present or absent. 7

6 * Mouth terminal or sub-terminal. Nostrils separate and distant from the eye (98, 99); maximum length 150 cm. Mormyrops
* Mouth inferior, nostrils close to each other and close to the eye (100, 101); maximum length 20 cm. Petrocephalus

7 * Neither of the 2 nostrils approaching the junction of the lips (102). 8
* One of the nostrils approaching the junction of the lips (103, 104); maximum length 12 cm. Stomatorhinus

8 * One pair of strong incisors on the lower jaw, Mouth inferior and without a mental appendage. 9
*Upper and lower teeth similar. 10

9 * Teeth of the upper jaw slender and conical; anal much shorter than the dorsal; maximum length 43 cm. Myomyrus
* Teeth of the upper jaw obtuse or bicuspid; anal and dorsal the same length; maximum length 31 cm. Paramyomyrus

10 * Mouth ventral (inferior) or sub-terminal, without a mental appendage, although sometimes with a slight globular swelling (198); maximum length 32 cm. Marcusenius
* Mouth terminal or sub-terminal. Snout short or more or less elongated into a pipette. Mental appendage fairly long (109,110, 111); maximum length 65 cm. Grathonemus

CHARACIDAE

1 * Upper jaw with 1 or 2 rows of teeth and in this case sometimes an exceptional displacement of 2 teeth. 2
* Upper jaw with 3 rows of teeth (112, 113); maximum length 18 cm. Bryconaethiops

2 * Upper jaw carry a single row of teeth (115, 117). 3
* Upper jaw carrying two rows of teeth, the externals being the smaller (114). 4

3 * Both jaws furnished with one row of large teeth, upright, triangular and visible to the naked eye. Adult length exceeding 30 cm. (115, 116) and reaching 150 cm. Hydrocyon (now Hydrocynus)
* Both jaws furnished with one row of very small conical teeth sloping inwards. Adult length less than 5 cm. (117, 118). Clupeopetersius

4 * Lower jaw bearing 2 rows of teeth, the seond more or less reduced (119, 120). 5
* Lower jaw bearing 1 row of teeth (127, 129). 8

5 * Internal tooth row of lower jaw comprising only 2 simple teeth. 6
* Internal tooth row of lower jaw comprising numerous small simple teeth. Teeth of the external row simple and of unequal length (120, 121, 122); maximum length 35 cm. Hepsetus

6 * Teeth of the internal row of the upper jaw not excavate (123). 7
* Teeth of the internal row of the upper jaw excavate (114, 124); maximum length 46 cm. Alestes

7 * Lateral line complete (125); maximum length 10 cm. Micralestes
* Lateral line incomplete - 7 bis

7bis* Lateral line incomplete, usually terminating before the middle of the body (126); maximum length 10cm. Phenacogrammus
* Body less than 3 times longer than deep; black spot on caudal peduncle, anal at least III 21, lateral line variable, more or less abbreviated (rarely complete), dention as Micralestes but the inner mandibular teeth sometimes rudimentary or absent . Bathyaethiops

8 * Lateral line complete (128). 9
Lateral line incomplete, usually terminating before the middle of the body, genus otherwise very similar to genus Petersius (dubious genus); maximum length 10 cm. Hemigrammopetersius

9 * Scales on the flanks hardly discernable; upper jaw teeth number 4-6 (externals) and 8 (internals) lower jaw 8; maximum length 10 cm. (127, 128). Petersius
* Scales of the lateral line and lower rows much smaller than those of the supralateral rows; upper jaw teeth number 8 (externals), 10 (internals), lower jaw 10; maximum length 7 cm. (129). Arnoldichthys

CITHARINIDAE

1 * Mouth widely gaping, premaxilla elongate and mobile (131), teeth immobile, caniform or slightly compressed or lobed; the two halves of the lower jaw fused. 2
* Mouth narrowly gaping, premaxilla normal and immobile or very slightly mobile; teeth mobile, slender, emarginate or bifid; the two halves of the lower jaw articulated. 10

2 * Teeth in a single row along the external border of the jaws. 3
* Two rows of teeth in the jaws or a patch of internal teeth. 5

3 * Teeth not bicuspid and including some more or less numerous canines anteriorly. 4
* Teeth bicuspid, absent from the anterior part of the upper jaw (134, 135); maximum length 10 cm. Hemistichodus

4 * Snout about as long as the post-orbital region of the head. Two canines in the upper jaw, 3 canines in the lower jaw, maxillary not bordering the mouth. Fontaelle present (131, 132, 133); maximum length 18 cm. Phagoborus
* Snout at least 2 times long as high. The 8-9 anterior teeth of the beak are well developed on both sides and on both jaws. The maxillary is marginal, situated at the corner of the mouth (130); maximum length 23. cm. Gavialocharax

5 * Internal row of teeth composed of a series of teeth parallel to the external row. 6
* Internal row of teeth, comprising a patch of small teeth; 4 canines in the upper jaw, 3 in the lower jaw. Maxillary not bordering the mouth. Fontanelle present (136, 137, 138); maximum length 20 cm. Ichthyoborus

6 * No canines. 7
* Some clear canines (2 pairs in the lower jaw separated by 2 small teeth, and 2 pairs in the upper jaw). Maxillary bordering the mouth (139, 140); maximum length 25 cm. Mesoborus

7 * Rostrum nearly the same length or shorter than the post-orbital distance. Maxillary bordering the mouth. 8
* Rostrum slim and tapering, longer than the post-orbital distance. Length small. Maxillary not bordering the mouth (141, 142); maximum length 12 cm. Belonophago

8 * Scales small and soft, more than 60 along the lateral line. 9
* Scales large and very hard, less than 50 along the lateral line. Fontanelle absent. (143). Phago.

9 * Anterior external teeth slightly larger than the others, always visible on the lower jaw. Fontanelle absent (144, 145); maximum length 13 cm. Paraphago.
* External teeth all the same size . Fontanelle present (146, 147, 148, 149, 150); maximum length 30 cm. Eugnatichthys.

10 * Scales ctenoid (147); body more or less compressed. 11
* Scales cycloid (151, 152, 153). Body short and very compressed; maximum length 75 cm. Citharinus.

11 * Gill membranes fused to the isthmus (154) 16
* Gill membranes not fused to the isthmus (156). 12

12 * Gill membranes not fused together. Head large, snout obtuse (155, 156); maximum length more than 10 cm; 13
* Gill membranes fused together across the isthmus. Head more or less compressed. Snout more or less pointed (158); maximum length less than 10 cm. 14.

13 * Teeth minute, fine and pointed, arranged in one series. A large adipose dorsal present. Anal with 20-21 rays (155); maximum length 26 cm. Citharidium.
* Teeth very small and biscuspid, arranged in 2 or 3 series. A small adipose dorsal present. Anal with 14-16 rays (156, 157); maximum length 26 cm. Xenocharax.

14 * Less than 45 scales along the lateral line. 15
* More than 55 scales along the lateral line (159); maximum length 7 cm. Microstomatichthyoborus.

15 * Lateral line complete and adipose dorsal present; maximum length 6 cm. (158, 160, 161) Nannaethiops.
* Lateral line very incomplete, adipose dorsal absent or not, maximum length 6 cm. (162) Neolebias.

16 * Dorsal comprising 16-27 rays; 2 series of teeth in each jaw. 17
* Dorsal comprising less than 16 rays; one series of teeth in each jaw. 18

17 * Body short and more or less deep, strongly compressed, its depth 2. .0 -3.6 times (rarely the maximum) in the body length. Adipose dorsal and caudal scaled to a large degree; maximum length 76 cm. (164). Distichodus
* Body quite elongate, cylindrical or slightly compressed, its depth 3.75 - 4.75 times in the body length. Adipose dorsal naked and the caudal scaled only at the base; maximum length 7 cm (165) Paradistichodus.

18 * Lateral line complete. Maximum length 8 cm. (166). Nannocharax.
* Lateral line incomplete. Maximun length 5 cm. (163). Hemigrammocharax.

CYPRINIDAE

1 * 7 or less branched rays in the anal; development of the sub-orbitals and position of the lateral line variable. 2
* More than 7 branched rays in the anal; suborbitals always large and covering the cheek, lateral line not mid-lateral. 11

2 * Sub-orbitals narrow and not covering the cheek; lateral line median or nearly so along the caudal peduncle. 3
* Sub-orbitals large, covering the cheek; lateral line running along the lower part of the caudal peduncle. Rasbora.

..../....

3 * No inferior labial disk (168, 169), but sometimes a sucker formed from the thickening of the lips (179) . 4
* Labial disk present in the form of a fairly well developed sucker on the chin (167, 170). Gill-slits limited to the sides of the head; maximum length 16 cm. Garra (synonym Discognathus)

4 * Lips normal, without a horny sheath (168, 174, 175); mouth terminal, superior or inferior. 5
* Lips more or less developed but with a horny sheath on their external or internal border (169,179); mouth always inferior. 10

5 * Eyes absent or minute (171, 173), trogloditic and hypogean species, scales visible or hidden beneath the skin - 6
* Eyes present, normal, clearly visible, (174,175) scales normal and clearly visible - 8

6 * Body scaly, dorsal provided with a simple ossified ray, eye invisible in the adult (171); maximum length 10 cm. Caecobarbus
* Body naked, scales hidden or absent all dorsal rays flexible. 7

7 * Eye more or less reduced but present 0.33 to 0.12 in interorbital width, pharyngeal teeth in 2 rows, scales present but hidden beneath the skin, body more or less pigmented (172) maximum length 6 cm - Barbopsis.

Eye absent, lateral line clearly visible, pharyngeal teeth in 3 rows, completely unpigmented, maximum length 6.5 cm. (173) - Phreatichtnys)

8 * One pair of barbels inserted at the tip of the lower jaw as well as buccal barbels inserted at the angle of the mouth; maximum length 4.5 cm. Xenobarbus
o
* Barbels present or absent, but not including any mandibular barbels inserted at the tip of the lower jaw. 9

9 * Mouth superior with the maxilla nearly vertical, very protractile forwards; lower jaw prognathous; planktonophagic (175,176), maximum length 4 cm. Coptostomarbarbus
* Mouth terminal or inferior, with the maxilla almost horizontal, fairly protractile downwards; lower jaw not prognathous; ominovorous (174, 174b 177, 182); maximum length very variable between 2.5. - 90 cm. Barbus.

10 * Lips well developed, horny sheath on the internal border (178, 179); maximum length 80 cm. Labeo (see footnote)
* Lower lip absent and replaced by an horny sheath on the external border maximum length 65 cm. Varicorhimus (see footnote)

11 * Anal with 8-9 branched rays, (small size) (181), maximum length 8.5 cm. Leptocypris.
* Anal with less than 10 branched rays. 12

12 * Origin of the dorsal situated in front of that of the anal. Belly not keeled and head often furnished with nuptial tubercules. Body ornamented with transverse bands, but not always (183, 184); maximum length 50 cm. (generally less). Barilius.
* Origin of the dorsal above or behind that of the anal, never any nuptial tubercules nor any transverse bands (187, 188). 13

13 * Belly keeled between the pectorals which are short (185,187); maximum length 10 cm. Engraulicypris.
* Belly keeled between the pectprals which are long (186,188); maximum length 11 cm. - Chelaethiops.

BAGRIDAE

1 * Some teeth on the palate, in a abnd or in one or several oval groups. 2
No teeth on the palate 9

2 * Dorsal provided with 10 or more rays. 3
* Dorsal provided with 6-8 rays. 4

..../....

3 * Dorsal comprising 10 rays, maxillary barbels long and nasal barbels present, eye with free border (189); maximum length 110 cm. Bagrus
* Dorsal comprising 14-15 rays, maxillary barbels short, nasal barbels absent, eye without a free border (190); maximum length 12 cm. Notoglanidium

4 * Nasal barbels present. 5
* Nasal barbels absent. Maxillary barbels in the form of simple filaments or terminating in a foliaceous expansions (191, 192); maximum length 10 cm. Phyllonemus.

5 * Eye with a free border. 6
* Eye without a free border; lower jaw very prognathous. Adipose dorsal not greater than the eye (small size) (193, 194); maximum length 20 cm. Amarginops

6 * Caudal forked, length more than 10 cm. 7
* Caudal rounded, small size; less than 10 cm. (195). Lower jaw not prognathous. Adipose dor:·:l greater than the eye; maximum length 9 cm. Lophiobagrus

7 * Lower jaw not prognathous. Mandibular teeth not apparent. Large size. 8
* Lower jaw prognathous, exposing the teeth (197, 198); maximum length 20 cm. Gnathobagrus

8 * Adipose dorsal always entirely soft (199, 200); maximum length 150 cm. Chrysichthys
* Adipose dorsal subtended by a spiny ray (at least in the adult) (196); maximum length 85 cm. Clarotes

9 * Nasal barbels present, sometimes very short. General aspect of Gephyroglanis (201); maximum length 50 cm. Gephyroglanis
* Nasal barbels absent. 10

10 * Anterior nostril situated above the upper lip; maximum length 6 cm. (202, 203). Leptoglanis.
* Anterior nostril situated on the upper lip. 11

11 * Eye without a free border (205, 206); mouth wide, teeth arranged in narrow bands; maximum length 25 cm. Parauchenoglanis
* Eye with a free border (204, 205); mouth narrow, teeth arranged in oval or kidney-shaped patches; large size, maximum length 100 cm. Auchenoglanis

CLARIIDAE

11 * Eyes present, sometimes very small; body usually darkly pigmented 2
* Eyes absent, body completely unpigmented, living in subterranian waters (222, 223); maximum length 25 cm. Uegitglanis.

2 * Two dorsal fins, the anterior rayed, the posterior adipose (207, 209). 3
* A single rayed dorsal (211 to 222). 4

3 * Adipose dorsal large, cranium superficial and complete, with the lateral regions protected by bony scutes (207, 208); maximum length 170 cm. Heterobranchus
* Adipose small, cranium superficial and incomplete, with the lateral regions not protected by bony scutes. Dinotopterus

4 * Eye with a free border, i.e. its margin marked by a groove; median fins confluent or not, generally not. 5

* Eye without a free border, i.e. without groove around the margin, its limits imprecise; median fins always confluent. 6

5 * Cranium superficial, lateral dermal bones variously developed. Vomerine and pre maxillary teeth forming non-continuous bands (211, 212); maximum length very variable, reaching 130 cm. Clarias

* Cranium not superficial, but sub-cutaneous, very narrow and without any lateral dermal bones. Vomerine and premaxillary teeth forming continuous bands (213, 213 bis); maximum length 33 cm. Tanganikallabes.

6 * Body depth 15-20 times in length; paired fins present or absent. 7
* Body depth maximum 10 times in length; pectorals and ventrals present (except sometimes ventrals absent) (214, 215); maximum length 26 cm. Clariallabes
Clariallabes.

7 * Temples inflated. Head more or less furrowed along the mid-dorsal line. Cranial arch measuring 0.14 to 0.25 times head width. 8

* Temples not inflated. Head flat dorsally. Cranial arch 0.20 to 0.33 times the total width of the Head. Ventrals absent and pectorals vestigial or absent. (216, 217); maximum length 40 cm. Channallabes.

8 * Ventrals present. Pectorals present and provided with a spiny ray (218, 219); maximum length 50 cm. Gymnallabes.

* Ventrals absent. Pectorals present and without a spiny ray (220,221); maximum length 25 cm. Dolichallabes.

SCHILBEIDAE

1 * No rayed dorsal, no teeth on the palate. 2

* Rayed dorsal present, teeth on the palate (except in the genus Siluranodon which is completely toothless). 3

2 * Adipose absent. Small size (224); maximum length 10 cm. Parailia.

* Adipose present. Small size (225); maximum length 10 cm. Physailia

3 * Adipose absent, 4

* Adipose present 5

4 * Dorsal with a spiny ray. Teeth on the jaws and on the palate (226); maximum length 35 cm. Schilbe.

* Dorsal without a spiny ray. No teeth on the jaws or on the palate (227); maximum length 18 cm. Siluradon.

5 * 2 pairs of mandibular barbels. Length more than 10 cm. 6
* 1 pair of mandibular barbels, internal pair missing. Small size (229); maximum length 8 cm. Eutropiellus.

6 * Ventrals with 6 rays; air bladder not prolonged from ventrals as far as origin of anal. 7

* Ventrals with 9 rays; air bladder prolonged as far as the caudal end of the anal (228); maximum length 18 cm. Irvineia.

7 * Dorsal with 6 branched rays (exceptionally 5); 9 to 10 (rarely 8) branchiospines (gillrakers) (230); maximum length 50 cm. Eutropius.

* Dorsal with 3-5 branched rays; 8-9 branchiospines; maximum length 10 cm. Pareutropius.

MOCHOCIDAE.

1 * Mandibular barbels branched; lips more or less fleshy but not transforming the mouth into a flattened and circular sucker. 2

* Mandibular barbels simple, unbranched; lips flattened forming a circular oral sucker. 5

2 * Eye with a free border. 3

* Eye without a free border, small size. 4

3 * Pectoral spine simple (231); adipose dorsal not rayed; maximum length 72 cm. Synodontis.

* A spiny process above the base of the pectoral spine, as well as a humeral process (232); adipose dorsal finely rayed; maximum length 5.5. cm. Acanthocleithron.

4 * Posterior dorsal completely adipose (233); maximum length 10 cm. Microsynodontis.

* Posterior dorsal with branched rays (234); maximum length 7 cm. Mochocus.

5 * Eye with a free border, teeth at least partly truncate. 6

* Eye without a free border, small size (235, 236). Teeth all conical; maximum length 7 cm. Chiloglanis.

6 * Premaxillary teeth pointed and curved; mandibular teeth truncate or biscuspid (237, 238); maximum length 40 cm. Euchilichthys.

* Premaxillary and mandibular teeth truncate (239, 240); maximum length 10 cm. Atopochilus (see footnote)

AMPHILIDAE

1 * Body naked, entirely lacking bony scutes (241 to 244). 2

* Body with bony plaques at least along the dorsal and ventral lines (245 to 256). 4

2 * Gill membranes continuous across the isthmus, but not notched. Caudal peduncle very narrow. External ray of the pectorals very thick (241, 242); maximum length 20 cm. Doumea.

* Gill membrances continuous and deeply notched. Caudal peduncle short and deep. External ray of the pectorals more or less thickened. 3

3 * Posterior nostril distant from the eye; pectoral reaching the level of the dorsal origin ; adipose dorsal separate from the caudal (243, 244); maximum length 21 cm. Amphilius.

* Posterior nostril conti guous with the border of the eye; pectoral not reaching the level of the dorsal origin; adipose dorsal confluent with the caudal; maximum length 6 cm. Paramphilius.

4 * Lateral bony scutes on the body, some in front of the ventrals, and some others both dorsally and ventrally. 5

* No lateral body scutes in front of the ventrals; dorsal and ventral scutes only. 6

...../

5 * Adipose dorsal and pectorals provided with spines. Ventro-lateral scutes very large (245, 246, 247); maximum length 9 cm. Belonoglanis.

* A spine preceding the dorsal, adipose dorsal and pectorals. Ventro-lateral scutes no larger than the others (248, 249, 250); maximum length 5 cm. Trachyglanis.

6 * Dorsal origin in front of the base of the ventrals; no spiny ray in front of the pectorals or adipose dorsal. 7

* Dorsal origin above the base of the ventrals, or only slightly in advance; a spiny ray preceding the pectorals and the adipose dorsal (251, 252. 253); maximum length 5 cm. Andersonia.

7 * Only premaxillary teeth present (254, 255, 256); maximum length 12 cm. Paraphractura.

* Both maxillary and premaxillary teeth present (257); maximum length 10cm. Paraphractura.

CYPRINODONTIDAE.

1 * No branchiostegal rays facing posteriorly forming pointed processes. Ventrals separate from the base of the pectorals. 2

* One or two branchiostegal rays on each side, separate from the others and projecting posteriorly as pointed processes. Ventrals situated anteriorly, under or nearly under the base of the pectorals; maximum length 5 cm (268 bis) Procatopus.

2 * Scales cycloid (260); length not reaching 10 cm. 3

** Scales ctenoid (the teeth along the border of the scales are very minute); large size, reaching 13.5 cm (258, 259). Lamprichthys.

3 * Pectorals inserted very low on the lower half of the flanks (262, 264). Pre-orbital very narrow, always narrower than half the diameter of the eye (261, 263) 4

* Pectorals inserted along the middle of the flanks (266, 268). Pre- orbital broad, always at least half the diameter of the eye (267). 6

4 * Distal half of the maxillary not included in the skin, free and very mobile in front (261). Profile of the snout quite sharp, snout and head strongly flattened. Origin of the dorsal on a level with the middle of the base of the anal or more posterior. Caudal of the male generally more filamentous in the middle. Maximum length 5 to 7 cm. (262). Epiplatys

* Distal half of the maxillary included in the skin nearly to the tip (263), hardly mobile or even immobile. Snout profile rounded. 5

5 * Head wider than or as wide as, the depth at the occiput. Body elongate, not thickset. Dorsal orgin variable in position; caudal of the male often fairly filamentous at the upper and lower margins; maximum length less than 5 cm. (264). Aphyosemion.

* Head deeper than wide at the occiput. Body thickset, origin of the dorsal above that of the anal or more anterior. Caudal of the male rounded. Maximum length between 5 to 10 cm. (265). Nothobranchius.(see footnote)

6 * Abdomen strongly compressed, at least in the male. Body deep, depth usually less than 3.5 times in the body length; ventrals little distant from pectorals; maximum length less than 5 cm (266) Hypsopanchax.

* Abdomen not compressed. 7

7 * Body more or less elomgate, its depth usually 3.5 to 4 times in body length; ventrals distinctly separated from the pectorals; maximum length 5 to 7 cm. (267, 268) Aplocheilichthys (see footnote)

* Buccal teeth completely absent, anterior ventral rays spiny. Pantanodon.

MASTSCEMBELIDAE

1 * Fish with external eyes, pigmentation normal, Mastacembelus
* Blind fish, eyes reduced and internal, rudimentary pigmentation Caecomastacembelus

CICHLIDAE

With the exception of genera from lakes Tanganyika and Nyasa /which can be determined as follows:
Nyasa: Trewavas, E. (1935) The cichlid fishes of Lake Nyasa. Ann.Mag.Nat.Hist. (10), 16: 65-118.
Tanganyika: Poll, M. (1956). Poissons Cichlidae. Exploration hydrobiologique du lac Tanganika (1946-1947). Resultats Scientifiques. 3 (5B) : 597-613, which forms the basis of the subsequent part "CICHLIDAE FROM LAKE TANGANYIKA/"

1 * More than 3 spines in the anal, or only a single lateral line 2
* At most 3 spines in the anal, always 2 lateral lines. 5

2 * 1 mediam lateral line, ventrals with medium rays the longest (269, 271) 3
* 2 lateral lines; ventrals with rays variously elongated. 4

3 * Teeth all conical including some canines differentiated in front; pharyngeal very short and with very divergent branches, with non-molariform teeth (269, 270), maximum length 7.5 cm. Telogramma
* Teeth cuspid, those of the external series bicuspid, those of the internal series tricuspid, pharyngeal in the form of an equilateral triangle, with slightly diverging branches, pharyngeal teeth non-molariform (271, 272) maximum length 6.5 cm. Gobiocichla

4 * Teeth at least partly conical, pharyngeal teeth molariform 4 bis.
* Teeth cuspidate, externals bicuspid, internals tricuspidate, pharyngeal teeth not molariform; maximum length 45 cm. Tilapia. partim.

4bis * Teeth partly conical, partly cuspidate, those of the external series rather large, partly conical, partly bicuspid, followed by 1 to 2 series of small tricuspid teeth; pharyngeal teeth molariform. Ventrals with the external rays longer (273, 274, 275); maximum length 15 cm. Astatoreochromis
* Teeth all conical, 6-10 canines in front of each jaw followed by a band of smaller teeth. Pharyngeal teeth molariform. Ventrals with the medium rays longer than the others; maximum length 10 cm. Lamprologus.

5 * Teeth arranged in numerous series (8 to 10) or in a band (at least in the adult), teeth cuspid or conical, or setiform (bristle-shaped), or with an enlarged crown and curved backwards. 6
* Teeth arranged in a few series, 7 at most but generally less. Teeth cuspid or conical. 10

6 * Teeth mostly conical and quite short. 7
* Teeth long and with a very slender base, very numerous, with an enlarged crown and curved backwards, exclusively cuspid in the outer series; pharyngeal teeth not molariform but fine and densely packed 9

7 * External series of teeth on the 2 jaws bicuspid or unicuspid, internal series of teeth in wide bands both anteriorly and laterally; pharyngeal teeth cuspid (Lake Victoria). 8
* Teeth stronger, conical and quite short, in 7 to 8 series in the centre but less numerous on the sides, caniform in the external series; pharyngeal teeth molariform (279, 280, 281); maximum length 26 cm. Heterochromis

8 * Lower jaw broad with teeth also on the ascending branch on the dentary; maximum length 17 cm. Hoplotilapia (Lake Victoria)

* Lower jaw stout with the tip rounded; with anterior teeth aggregated into 2 pyriform (pear-shaped) patches; maximum length 15 cm. Platytaeniodus (Lake Victoria)

9 * External teeth bicuspid with an enlarged crown, asymmetrically cuspidate and obliquely truncate. Branchiospines (gill-rakers) 15 to 16 in number, (282, 283, 284); maximum length 22cm. Chilochromis
* External teeth tricuspid with an enlarged crown, symmetrically cuspidate, mostly with a regularly rounded type of cusp, the lateral cusps having a tendency to be reduced externally. Branchiospines 5 to 9 in number (285, 286 and 287); maximum length 15 cm. Neopharynx

10 * Upper lateral line well separated from the base of the dorsal fin. 11
* Upper lateral line contiguous or subcontiguous to base of the dorsal fin; pharyngeal teeth not molariform; very small size (288, 289); maximum length 7 cm. Nannochromis

11 * Buccal teeth all vertical and conical or more or less curved inwards. 12
* Buccal teeth at least partly cuspidate. 18

12 * External teeth not obviously stronger (except sometimes 2 teeth in the centre of the jaws), not obliquely truncate, and curved inwards. 13
* External teeth enlarged and strong, with an obliquely truncate crown and curved inwards, in 2 to 5 series; maximum length 15 cm. Macropleurodus(Lake Victoria)

13 * More than 2 series of conical teeth, the externals larger, with 2 stronger canines; pharyngeal teeth not molariform (290, 291, 292); maximum length 27cm. Hemichromis.

* No larger median teeth in the external series; 1 to 8 series of teeth. 14

14 * Teeth conical at all stages, in 1 to 7 series (most often less than 6), pharyngeal bone triangular or sub-triangular, never in the shape of a rounded dish, jaws equal, or the lower jaw longer and prognathous. 15
* Teeth conical and curved inwards in the adult only, long, fine and slightly spatulate with cusps in the young; 4 to 8 series of teeth (more numerous in the adult). Pharyngeal in the form of a rounded dish, teeth all slender; lower jaw shorter than the upper jaw; maximum length 12.5 cm. (293, 294, 295, 296). Cyclopharynx

15 * Pharyngeal teeth all fine. Depth of body 2.25 to 3.25 in the standard length. 16
* Pharyngeal teeth more or less massive and molariform, at least in the centre. Depth of body 2 to 2.66 times in the standard length. 17

16 * 25 to 30 scales in a longitudinal series /see ichthyological techniques7; 2 to 5 series of scales on the cheek. 7 to 12 soft rays in the dorsal, 6 to 9 soft rays in the anal. Posterior palate with a papillose pad on each side of the pharynx, generally well developed and close to the insertion of the gill arches. Lower jaw not or hardly prognathous; maximum length 7 to 16 cm. (297, 298, 299, 300). Pelmatochromis
* 30 to 41 scales in a longitudinal series /see ichthyological techniques 7; 5 to 10 series of scales on the cheek; 10 to 16 soft rays in the dorsal and 7 to 13 soft rays in the anal. Papillose pads near to the insertion of the gill-arches less developed. Lower jaw very prognathous. Maximum length 24 to 35 cm. (301, 302). Serranochromis.

17 * Dorsal profile much more convex that the ventral profile. Lower lateral line commemcing very far forward in respect to the posterior extremity of the upper lateral line. Caudal truncate or notched,

very scaly. Anal with 7 to 8, rarely 9 soft rays. 32 to 60 scales in a longitudinal series. Maximum length 22 to 29 cm. (303, 304, 305, 306). Tylochromis

* Dorsal profile hardly more convex than the ventral profile. Lower lateral line commencing, as in most cichlids, under the soft dorsal fin. Caudal rounded and only slightly scaly. Anal with 9 to 10 soft rays, 34 to 37 scales in a longitudinal series. maximum length 20 cm. (307, 308). Haplochromis partim

18 * 19 to 21 spines in the dorsal. Ventrals with the median rays longer than the others. 19

* Less than 19 spines in the dorsal. Ventrals with marginal rays longer than the others; cheek usually possessing some scales. 20

19 * Head possessing a swelling or adipose crest, more or less developed, on the occiput. Body moderately elongate, more than 4 times longer than deep. External teeth bicuspid, internal teeth tricuspid, the median teeth sometimes stronger and becoming incisiform in certain species (309 to 314); maximum length 8 cm. Steatocranus

* Head not possessing an adipose crest. Body elongate (4.5 to 5.5 times as long as deep). External teeth bicuspid, internal teeth tricuspid (certain teeth sometimes conical) (315, 316, 317); maximum length 15 cm. Leptotilapia

20 * Teeth of the external row not uniform nor simply cuspid nor conical. 21

* Teeth simply cuspid or conical, possessing no special features; teeth not clearly larger in front nor curving inward in the external series. 22

21 * Anterior external teeth longer than the other external lateral teeth, unicuspid and sloping forwards; maximum length 8 cm. Paralabidochromis (Lake Victoria)

* External teeth forming a series of juxtaposed elements, broad, not cuspid and strongly sloping backwards, arranged in one uninterrupted series, which is followed by 2 to 3 series of very small tricuspid teeth (318, 319); maximum length 10 cm. Schubotzia (Lake Edward)

22 * Teeth always cuspid,. Pharyngeal teeth fine. Scales cycloid. Maximum length of the adult 45 cm. Depth of body 1.75 to 2.66 times in standard length. Branchiospines 8 to 25 in number (rarely less than 10 and conversely more than 12 in many species) on the lower segment of the first gill-arch. Often a large dark "tilapia mark" at the base of the soft dorsal. (320, 321, 323). Tilapia partim

* Teeth cuspid or conical. Pharyngeal teeth fine, obtuse or molariform. Scales generally partly ctenoid. Maximum length of the adult never large, reaching 20 cm. only. Depth of body 2.5 to more than 3 times in standard length. Branchiospines 7 to 12 in number (rarely more or less), on the lower segment of the first gill-arch. No large dark "tilapia mark" on the origin of the soft dorsal, but often some coloured ocelli on the anal (324). Haplochromis partim

CICHLIDAE FROM LAKE TANGANYIKA

All the genera are endemic except Tilapia, Haplochromis and Lamprologus

1 * Anal with a maximum of 3 spines. 2

* Anal with 4 - 10 spines. 44

2 * Teeth of the external series at least partly tricuspid. 3

* Teeth of the external series not tricuspid, but on the contrary, bicuspid, conical or some other form. 10

3 * Dorsal comprising 15-20 spines; teeth tricuspid including at least partly, the external teeth (never becoming conical). 4

* Dorsal comprising 12-15 spines; teeth tricuspid. or possessing the tendency to become conical in the adult, or a mixture with conical teeth. 5

4 * 10 to 16 branchiospines on the lower segment of the first gill-arch; maximum length 12 to 21 cm. (325, 326, 327). Petrochromis
* 18 to 27 branchiospines on the lower segment of the first gill-arch; maximum length 31 to 37 cm. (328, 329, 330). Tilapia partim

5 * 34 to 43 scales in a longitudinal series. 6
* 48 to 64 scales in a longitudinal series; teeth weakly tricuspid tending to become conical, the external teeth of the lower jaw directed outwards; maximum length 21 cm. (331, 332). Cyathopharynx partim

6 * Snout feebly projecting, mouth subterminal; teeth tricuspid tending to become conical in the adult; depth of body at least 4 times in standard length. 7
* Snout strongly projecting, mouth ventral; teeth small and tricuspid in a narrow band (2 series); body depth 5 times in standard length ventrals not filamentous (335, 335); maximum length 11 cm- Asprotilapia

7 * Teeth fixed, tricuspid or conical, in narrow bands, the external teeth of the lower jaw directed outwards; teeth tending to become conical. 8
* Teeth moveable, tricuspid, in bands more or less wide, the external teeth of the lower jaw not directed outwards; some tricuspid teeth in the adult as in the young. 9

8 * Pharyngeal with a heart-shaped area of teeth, slightly concave, with the anterior process elongate and with articular apophyses situated somewhat laterally (336, 337); maximum length 15 cm. Cardiopharynx partim
* Pharyngeal with a sub-triangular area of teeth, with the anterior process moderately elongate and with articular apophyses at the posterior corners of the bone (344, 345, 346); maximum length 12 cm. Lestradea partim

9 * Teeth all tricuspid in numerous series; maximum length 14 cm. (341, 342, 343). Cunningtonia
* Teeth tricuspid in 3 to 5 series, except laterally where there is a simple row of conical teeth; maximum length 14.5 cm. (338, 339, 340). Ophthalmotilapia

10 * 27 to 42 scales in the lateral line. 11
* 44 to 96 scales in the lateral line. 34

11 * Teeth of the external series at least partly bicuspid. 12
* Teeth of the external series not bicuspid. 18

12 * Mouth terminal, snout not convex, jaws nearly equal. 13
* Mouth subterminal, snout more or less convex, lower jaw shorter; premaxillary possessing a series of bicuspid teeth anteriorly and conical teeth laterally, followed by a band of small tricuspid teeth; maximum length 19.5 cm. (347, 348, 349). Simochromis

13 * Lips normal, teeth varied. 14
* Thick lips with fairly large membranous expansions; 3 to 5 series of compressed teeth, the external teeth bicuspid and the internal teeth tricuspid in the young, all rounded or truncate without terminal notches in the adult, maximum length 36.8 cm. (350) Lobochilotes

14 * Frontal region not swollen into a lump, more developed in the adult; colouration not marked by 6 very wide vertical black bands. 15
* Frontal region swollen into a lump, more developed in the adult, external teeth bicuspid or partly bicuspid and conical, the internal

teeth the same (351, 352); maximum length 33 cm. Cyphotilapia partim.

15 * Body depth 2.5 to 3.25 times in length, anal with or without ocelli, no obvious black spot in front of the soft dorsal, branchiospines few, 7 to 14in number, adult size usually small or average; maximum length 26 cm. 16

* Body depth 1,95 to 3 times in standard length, anal without ocelli, a well marked black spot in front of the base of the soft dorsal, branchiospines 7-9 or 20-27; external teeth bicuspid (sometimes tricuspid) internal teeth all tricuspid; length reaching 33 to 50 cm. and more (353, 354, 355, 356) Tilapia partim.

16 * Caudal notched, branchiospines 10 to 14 in number on the lower segment of the first gill-arch, anal without ocelli, external teeth bicuspid or conical in part, the internal teeth mostly tricuspid; maximum length 26.0 cm. (357). Limnotilapia

* Caudal rounded or sub-truncate, branchiospines 6 to 9 in number (in one case 12 to 13) on the lower segment of the first gill-arch, anal with or without ocelli; external teeth bicuspid or conical; maximum length 10.0 to 18.5 cm. 17

17 * Body compressed, 2.5 to 3.25 times long as deep, scales present on the cheek and the breast (358); maximum length 19 cm. Haplochromis partim

* Body elongate, 3.4 to 3,85 times long as deep, scales absent from the cheek and the breast (359); maximum length 10 cm. Orthochromis

18 * Less than 20 spines in the dorsal. 19

* More than 20 spines in the dorsal. 32

19 * Lips normal 20

* Thick lips with fairly large membranous expansions; teeth all rounded or truncate at the tip, without any terminal notch in the adult; the external teeth bicuspid in the young; maximum length 36.8 cm (350) Lobochilotes partim (adult)

20 * Frontal regions not swollen into a lump, more developed in the adult. 21

* Frontal region swollen into a fairly well developed lump; external teeth conical or partly bicuspid, the internal teeth conical or partly tricuspid; maximum length 31.5 cm (351, 352). Cyphotilapia partim (adult)

21 * Frontals, nasals, pre-orbitals, lower jaw and pre-operculars not perforated with wide canals and wide apertures. 22

* Frontals, nasals, pre-orbitals, lower jaw and pre-operculars perforated with wide canals and wide apertures. 31

22 * External soft ray of the ventrals obviously longer, about 2 times longer than the internal; dentition variable; no third lateral line. 23

* External ray of the ventrals less than 2 times longer, or even equal, or shorter than the internal; teeth conical, sloping outwards or not in the external row of the lower jaw; often a third lower lateral line; maximum length 17.5 cm. Xenotilapia partim.

23 * External teeth of the lower jaw not sloping forward more or less horizontally. 24

* External teeth of the lower jaw sloping forward more or less horizontally. 27

24 * Depth of body less than 4 times in length, except in 3 species but where there are more than 19 branchiospines on the lower segment of the first gill-arch.

* Depth of body 4.5 to 4.8 times; teeth conical and small, much larger in the external series, 14 to 15 branchiospines on the lower segment of the first gill-arch (360); maximum length 15 cm. Leptochromis

25 * Eye diameter at most as long as the snout (exceptionally larger in young), ordinarily shorter in adults; less than 35 scales in the lateral line except in Limnochromis microlepidotus which has 52 to 57; ventral filament of the male not terminating in a double expansion. 26

* Eye diameter large, clearly larger than the snout length; 35-37 scales in the upper lateral line; ventral filaments of the male terminating in a whitish double expansion (361, 362, 363, 364); maximum length 15 cm. Opthalmochromis partim

26 * Caudal notched or sub-truncate; conical teeth in 2 to 4 series; lower pharyngeal teeth small or sometimes more or less enlarged at the posterior centre (365, 366, 367, 368, 369); maximum length 24 cm. Limnochromis

* Caudal rounded or sub-truncate; teeth in 2 to 5 series, the externals bicuspid, the internals tricuspid (juvenile) all becoming conical in the adult; lower pharyngeal teeth small except in the posterior centre where they are enlarged and sub-molariform (370); maximum length 19 cm. Haplochromis partim

27 * Teeth not continuous in 2 to 3 series, the internal teeth sloping backwards and not smaller than the external teeth. 28

* Teeth more or less continuous in 2 to 5 series, the internal teeth not sloping backwards and clearly smaller than the externals. 29

28 * Lower pharyngeal teeth fine and densely packed in a sub-triangular area (371, 372, 373); maximum length 12 cm. Lestradea partim (adult)

* Lower pharyngeal teeth fine and densely packed in a rounded-sub-heart-shaped area (374); maximum length 15 cm. Cardiopharynx partim (adult)

29 * Lower pharyngeal teeth strongly enlarged, sub-molariform in the posterior mid-region; 10 to 12 branchiospines (average 11) on the lower segment of the first gill-arch; body less elongate, less than 4 times longer than deep, 2 lateral lines; maximum length reaching 16 cm. (375, 376, 377) Callochromis

*Lower pharyngeal teeth all slender, even posteriorly where they are all at most slightly enlarged. 30

30 * 12 to 14 (average 12) branchiospines on the lower segment of the first gill-arch; mouth terminal, the jaws nearly equal; often a dark rounded spot on the spiny dorsal fin (378, 379, 380); maximum length 10 cm. Ectodus.

* 17 to 20 branchiospines on the lower segment of the first gill-arch; mouth sub-inferior, the lower jaw a little shorter than the upper; no rounded black spot on the spiny dorsal fin (361, 362, 363, 364); maximum length 15 cm. Opthalmochromis partim

31 * 27 to 31 scales in a longitudinal series, a single short lateral line (the upper); dorsal with 8 to 12 spines; teeth conical and small, forming a band on the jaws; maximum length 4.5 to 15 cm. (383, 384, 385, 386, 387); Trematocara

* 33 to 36 scales in a longitudinal series; two lateral lines; dorsal with 11 to 13 spines; teeth small and conical, the external series including some slightly larger teeth; maximum length 12.0 cm. (388). Aulonocranus

32 * Teeth in one series, with a crown not, or weakly enlarged at the tip, rounded or subtruncated or pointed. 33

* Teeth in 2 or 3 series, spatulate, possessing a thin root and an enlarged truncated crown at the tip (389, 390); maximum length 7.5 cm. Eretmodus

33 * Anterior teeth not longer; snout straight with a terminal mouth (391, 392); maximum length 9 cm. Spathodus

* Anterior teeth longer; snout sloping with a sub-inferior mouth (393, 394); maximum length 6.5 cm. Tanganicodus

34 * External soft ray of the ventrals less than 2 times longer, or even equal to, or shorter than, the internal rays. 35
* External soft ray of the ventrals clearly longer, about 2 times longer than the internal rays. 36

35 * 44 to 59 scales in a longitudinal series, 6.5 to 8.5 in transverse series above, 12.5 to 14.5 in transverse series below; 11 to 12 branchiospines on the lower segment of the first gill-arch; external mandibular teeth not sloping forward; maximum length 26.0 cm. (381). Grammatotria
* 34 to 43 scales in a longitudinal series, 3.5 to 5.5 in a transverse series above, 8.5 to 10.5 in a transverse series below; 9 to 18 branchiospines on the lower segment of the first gill-arch, external mandibular teeth sloping forwards without exception; maximum length 17.5 cm. Xenotilapia partim

36 * Teeth in several series, multicuspid or unicuspid. 37
* Teeth in one series, variable in form. 41

37 * Lower pharyngeal teeth varied but arranged in a sub-triangular pattern; snout equal or longer than the eye diameter; ventrals generally filamentous and not reaching the anal. 38
* Lower pharyngeal teeth slender and densely packed in a nearly circular concave pattern; snout equal to or shorter than the eye diameter which is large; ventrals becoming filamentous in the adult, exceeding the anal origin; teeth small and tricuspid (juveniles) or unicuspid (adults) in 3 to 5 series, the external teeth of the lower jaw sloping outwards (395, 396); maximum length 22 cm. Cyathopharynx partim

38 * Lower pharyngeal teeth all small; body more regularly elongate, 2.75 to 4.66 times as long as deep. 39
* Lower pharyngeal teeth including posteriorily some large flattened teeth; dorsal profile broadly convex (sometimes nearly semi-circular) ventral profile much straighter, body 2.3 to 3 (juveniles) times long as deep; teeth small and conical arranged in 4 to 5 series (397, 398); maximum length 33 cm. Tylochromis

39 * Lower jaw projecting; anal with 12 to 18 soft rays; pharyngeal very elongate. 40
* Lower jaw not projecting; anal with 8 to 11 soft rays; teeth small in 3 to 5 series, the externals bicuspid and the internals tricuspid in juveniles, all conical in adults (399, 400); maximum length 65 cm. Boulengerochromis

40 * Mouth moderate, teeth small and conical arranged in 2 to 3 series, 90 to 110 in number in the external series of the upper jaw; body 2.7 to 3.3 times as long as deep; 60-72 scales in a longitudinal series (401); maximum length 28 cm. Hemibates
* Mouth large, teeth strong and conical arranged in 2 to 4 variable series, 27 to 52 in number in the external series of the upper jaw; body 3.5 to 5.5 times as long as deep; 60 to 95 scales in a longitudinal series (402, 403, 404, 405, 406); maximum length 42 cm. Bathybates

41 * Teeth specialised, never in the form of simple cones, mouth horizontal or slightly oblique. 42

* Teeth small and conical, not or only feebly incurved; mouth nearly vertical, lower jaw very prominent, eye very large (407); maximum length 26 cm. Haplotaxodon

42 * Teeth flattened and sloping backwards. 43
* Teeth of unequal sizes, with thickened bases, transversely compressed towards the tip and possessing a small sharp point on the posterior side of their truncate extremity (408, 409); maximum length 11 cm. Perissodus

43 * Teeth small, equal, continuous, compressed, lamellate, slightly concave on the anterior face, obtusely pointed and sloping backwards; 47 to 57 branchiospines on the lower segment of the first gill-arch (411, 412, 413); maximum length 29 cm. Xenochromis
* Teeth large, unequal, separate, compressed, lamellate, a little concave on the anterior face, truncate at the extremity and strongly sloping backwards; 18 to 26 branchiospines on the lower segment of the first gill-arch (414, 415, 416); maximum length 32 cm. Plecodus

44 * Only conical teeth in the external series. 45
* External teeth bicuspid anteriorly and conical laterally , all teeth tricuspid posteriorly; anal with 4-6 spines (417,418); maximum length 13 cm. Tropheus

45 * Teeth all conical, differentiated into canines anteriorly in the external series. 46
* Teeth of the internal series at least partly tricuspid, the anterior external teeth larger, differentiated into canines or not; 18 to 22 dorsal spines (419, 420); maximum length 12 cm. Telmatochromis

46 * Sub-orbitals ligamentous; 21 to 24 dorsal spines and 6 to 7 soft rays (421); maximum length 12 cm. Julidochromis
* Sub-orbitals bony; 14 to 21 dorsal spines and 6 to 12 soft rays (422); maximum length 31 cm. Lamprologus