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REVIEW OF THE CLASSIFICATION AND OF THE OPINIONS ON THE EVOLUTION OF CYPRINOIDEI (EVENTOGNATHI) WITH AN ANOTATED LIST OF GENERA AND SUBGENERA DESCRIBED SINCE 1921

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Cyprinoidei (Eventognathi) are a suborder of the freshwater fishes of the order *Cypriniformes (Ostariophysi)* of which numerous species exist. One of the families, the *Cyprinidae,* is by far the most abundant of all, as regards species. *Cyprinoidei* are common in Eurasia (as far east as the Wallace line)[1], North America (as far south as Guatemala) and in Africa. They are not found in South America, Australia and Madagascar.

It stands to reason that the classification and the views on the evolution of such a widely ramified group of fishes could only by formed gradually, and both have since undergone fairly important changes, so that today seeing their variety and multiplicity it is rather difficult to keep a trace of them. Hence, a review of the situation is presented in the following study.

HISTORICAL REVIEW

In his biological classification, Linnaeus (1758) placed the carps in the division *Pisces Abdominales* and described two genera — *Cobitis* and *Cyprinus.* He divided 30 species of the genus *Cyprinus* into four groups according to the shape of the caudal fin and the presence of barbels:

Barbati s. ad os cirrosi
Barbus (= Barbus barbus)

[1] With the exception of *Puntius binotatus* (Valenciennes, 1842) which lives on the Lombok Island and of *Rasbora lateristriata* (van Hasselt, 1823) which lives on the Lombok and Sumbawa Islands (Popta 1911, Weber 1913, Weber and De Beaufort 1916, and Brittan 1954).

Carpio (= Cyprinus carpio)
Gobio (= Gobio gobio)
americanus (= Menticirrhus americanus)[1]

Pinna caudae indivisa
Carassius (= Carassius carassius)
Tinca (= Tinca tinca)
Cephalus (= Leuciscus cephalus)

Pinna caudae trifida
auratus (= Carassius auratus)

Pinna caudae bifida
niloticus (= Labeo niloticus?)
Phoxinus (= Phoxinus phoxinus)
Aphya (= Phoxinus phoxinus)
Leuciscus (= Leuciscus leuciscus)
Dobula (= Leuciscus leuciscus?)[2]
(= Leuciscus cephalus?)[3]
Grislagine (= Leuciscus leuciscus)
Idbarus (= Leuciscus idus?)[2]
(= Rutilus rutilus?)[3]
Rutilus (= Rutilus rutilus)
Idus (= Leuciscus idus)
Orfus (= Leuciscus idus var. orfus)
Erythrophthalmus (= Scardinius erythrophthalmus)
Jeses (= Leuciscus idus)
Nasus (= Chondrostoma nasus)
Aspius (= Aspius aspius)
Alburnus (= Alburnus alburnus)
Vimba (= Vimba vimba)
Dentex (= ?)[4]
Brama (= Abramis brama)
cultratus (= Pelecus cultratus)
Bjoerkna (= Blicca bjoerkna)
Farenus (= Abramis brama (immat.))[2]
Ballerus (= Abramis ballerus)

Genus *Cobitis* comprised four species:
Anableps (= Anableps tetrophthalmus)
Barbatula (= Noemacheilus barbatulus)
Taenia (= Cobitis taenia)
fossilis (= Misgurnus fossilis)

According to present day views,[5] the following from the above species do not belong among the *Cyprinoidei: Cyprinus americanus (= Menticirrhus americanus,* fam. *Sciaenidae,* order *Perciformes), Cyprinus dentex* ("habitat in Nilo" — Boulenger in his work The fishes of the Nile, 1907, fails to mention it among the synonyms; just as other authors do) and

[1] sec. Jordan et Evermann, 1896
[2] sec. Günther, 1868
[3] sec. Berg, 1912
[4] "ore dentibus undique molaribus" — not a Cyprinoid fish!
[5] according to Berg (1955)

Cobitis anableps (= Anableps tetrophthalmus, fam. *Anablepidae,* order *Cyprinodontiformes).*

In the 12th edition of his work Systema naturae (1766) Linnaeus assigns the species *Cyprinus americanus* into the last group. In contrast to the 10th edition, the latter deals with a cyprinid fish — *Notemigonus crysoleucas bosci*[1]. Further, he transferred the species *Cyprinus tinca* into the first group, and finally, added a new species to the last group — *Cyprinus gonorhynchus* [fam. *Gonorhynchidae,* order *Clupeiformes*]. To the genus *Cobitis* he added *C. heteroclita* [= *Fundulus heteroclitus,* fam. *Cyprinodontidae,* order *Cyprinodontiformes*].

Gmelin (1788) in the 13th edition of Systema naturae adhered to Linnaeus'division but left out the species *C. dentex* from the genus *Cyprinus* and included in it twenty additional species. To the genus *Cobitis* he added one species.

Lacépède (1803) divided genus *Cyprinus (les Cyprins)* into four groups:

1. Quatre barbillons aux mâchoires
2. Deux barbillons aux mâchoires
3. Point de barbillons; la nageoire de la queue, rectiligne ou arrondie, et sans échancrure
4. Point de barbillons; la nageoire de la queue, fourchue on échancrée en croissant

He introduced a new genus — *Misgurnus,* with a single species *M. fossilis.*

Cuvier (1817) already writes of the family *Cyprinidae* (Des Cyprins) as having six genera and divided the first, *Cyprinus,* into subgenera:

Les Carpes (*Cyprinus* L.)
- Les carpes proprement dites (*Cyprinus* Cuv.)
- Les Barbeaux (*Barbus* Cuv.)
- Les Goujons (*Gobio* Cuv.)
- Les Tenches (*Tinca* Cuv.)
- Les Cirrhines Cuv.
- Les Brèmes (*Abramis* Cuv.)
- Les Ables (*Leuciscus* Klein)
- Les Gonorhynques (*Gonorhynchus* Gronow)

Les Loches, ou Dormilles (*Cobitis* L.)
Les Anableps (*Anableps* Bl.)
Les Poecilies (*Poecilia* Schn.)
Les Lebias (Cuv.)
Les Cyprinodons (Lacép.)

In 1829, this same author added two further genera to the family *Cyprinidae* (Des Cyprinoides), e. g. *Fundulus* Lacép. and *Molinesia* Lesueur (he placed them after the genus *Lebias*) and extended the genus *Cyprinus* by two new sub-genera: *Catostomus* Lesueur and *Chela* Buchanan. In this as in the preceding work, Cuvier took as guides for his classification some external morphological traits, such as the shape and length of the anal and dorsal fins, the presence or absence of spines in the fins (or

[1] sec. Jordan and Evermann, 1896

their indentation), the presence or absence of barbels, the shape of the lips, scaling of gills, etc.

According to present day classification, Cuvier's family includes equally the Cyprinids (gen. *Cyprinus;* with the exception of sub-genus *Gonorhynchus*), the Cobitids (genus *Cobitis*), the Catostomids (genus *Catostomus*) and finally, genera classified today under the order *Cyprinodontiformes (Anableps, Poecilia, Lebias, Fundulus, Molinesia,* and *Cyprinodon).*

Valenciennes (1836) adhered to Cuvier's division.

Oken (1836), however, introduced an entirely different system. He divided the family (Sipschaft) *Cyprinidae* (Aechte Karpfen) into three genera: *Cobitis, Anableps* and *Cyprinus,* subdividing the last into two further groups with four divisions:

A: Lange Karpfen
   1. Schmale Karpfen
   2. Dickköpfige Karpfen

B: Breite Karpfen
   3. Dünne Karpfen
   4. Ovale Karpfen

As differentiating traits he took the overall shape of the body, position of the eyes, presence or absence of mandibular or pharyngeal teeth, the number of rays in the branchiostegal membrane, length and number of rays in the dorsal and anal fin.

Agassiz (1835, 1838) excluded from the family *Cyprinidae* all the species that in Cuvier's work Règne Animal (1817) came after the genus *Cobitis* and assigned them to a special family. This he designated as a link between the genera *Mugil* and *Atherina* and remarked that "... it cannot be denied that... they represent the closest relation to carps". He considered as wrong Fitzinger's separation of the genus *Cobitis* from carps as this genus has all the traits of the family, down to the "peculiar and little-known cervical vertebrae"[1]. Likewise, in his view it is incorrect to set "true carps" at the head of the family for these are "connected on the one hand, through the Cobitids, to the cods and eels, and on the other, through *Aspius* and *Pelecus* to the herrings". He set up new genera and employed new traits in their characterization. Thanks to him, special attention came to be paid to pharyngeal teeth. This trait had already been made use of by many authors prior to Agassiz (e. g. Gessner, Artedi, Bloch, Jurine and others), nevertheless, Agassiz was the first to employ it as a characteristic of the genus. In some cases, he characterized several of the genera erroneously in respect to this criterion. For instance, he stated only a single-row of pharyngeal teeth for the genus *Cyprinus* — taking into consideration only the teeth of the *C. carassius.* He mentioned altogether 19 genera, all of which belong, even in the light of today's knowledge, among the *Cyprinoidei.*

McClelland (1838) divided the *Cyprinidae* into three subfamilies:

1. *Paeonominae*
2. *Sarcoborinae*
3. *Apalopterinae*

[1] The so-called "Weberian apparatus" described by Weber, 1820.

according to their way of feeding, position of mouth, length of intestine and number of rays in the branchiostegal membrane. According to present day classification, he assigned into the family *Cyprinidae* — cyprinids, cobitids, the *Psilorhynchidae,* and one genus from the order *Cyprinodontiformes* (all of them to the last subfamily).

Bonaparte (1832—1841) estabilished some new genera of the *Cyprinidae.* However, Valenciennes (Cuvier and Valenciennes, 1842, 1844)[1] refused to recognize them along with those set up by Agassiz: this author divided the *Cyprinidae* into eighteen genera, mentioning nine further from Hamilton's work (1822) in the supplement. In the numerous genus *Leucisus* (Les Ables), he enumerated nearly 150 species divided into numerous subgroups which, however, he neither characterized, nor defined. It was precisely because of this genus that his work came in subsequently for much criticism on the part of later authors.

Heckel (1843) paid closer attention to the pharyngeal teeth. On the basis of their shape, number and arrangement (as well as the length of the intestine) he divided the *Cyprinidae* in the following manner:

Macroentri (Langdarmer)
Dentes exclavati (Holzähne)
1. *Dentes cochleariiformes* (Löffelzähne)
2. *Dentes palaeformes* (Schlaufelzähne)

Dentes masticatorii (Kauzähne)
3. *Dentes aggregati* (Pflasterzähne)
4. *Dentes molares* (Mahlzähne)
5. *Dentes calyciformes* (Becherzähne)
6. *Dentes scalpriformes* (Meisselzähne)
7. *Dentes pectinatiformes* (Kammzähne)
8. *Dentes cultriformes* (Messerzähne)

Brachyentri (Kurzdärmer)
Dentes uncinato-submolares (Hakenzähne mit Kauflächen)
9. *Dentes clavati* (Keulenzähne)
10. *Dentes contusorii* (Drückzähne)
11. *Dentes prehensiles* (Greifzähne)

Dentes uncinato-subconici (Hakenzähne ohne Kauflächen)
12. *Dentes raptatorii* (Fangzähne)
13. *Dentes voratorii* (Würgezähne)

At the same time, however, he divided the *Cyprinidae* according to their "natural sequentiality" into ten tribes (taking into account the position of the mouth, the quality of the lips, presence and numericity of barbels, shape of the dorsal and anal fins, pharyngeal teeth, praeoperculum, etc.

Tribus I. Habitus *Cyprini Carpioni* L.
Tribus II. Habitus *Cyprini amari* L.
Tribus III. Habitus *Cyprini barbi* L., vel *Cyprini Byuni* Forsk.
Tribus IV. Habitus *Cyprini teretis* Mitchill, vel *Cyprini Catostomi* Forsk.
Tribus V. Habitus *Cyprini nilotici* Geoffr.

[1] Published also under Cuvier's name. Cuvier, however, had died in 1832.

Tribus VI. Habitus *Cyprini Gobionis* L., vel *Cyprini Tincae* L.
Tribus VII. Habitus *Cyprini Nasus* L.
Tribus VIII. Habitus *Cyprini Bramae* L.
Tribus IX. Habitus *Cyprini alburni* et *cultrati*
Tribus X. Habitus *Cyprini rutili* et *Dobulae* L.

In a supplement to this work Heckel (1847) gave yet another distribution of the *Cyprinidae*, according to the quality of the lips and the pharyngeal teeth:

Temnochilae
A: *Os labiatum, vel plica menti versus oris marginem directa instructum. Pinna dorsalis ante pinnae ventrales incipiens; analis brevis, radio osseo nullo. Dentes pharyngei aggregati:* 2.4.5—5.4.2
B: *Os nudum*
a. *Radius osseus in pinna dorsali, vel ante vel super pinnas ventrales positus; pinna analis brevis.*
α. Dentes cochleariiformes: 2. 3. 4—4. 3. 2
β. Dentes cochleariiformes: 2. 3. 5—5. 3. 2
γ. Dentes palaeformes: 2. 3. 4—4. 3. 2
b. *Radius osseus nullus*
α. Dentes palaeformes: 2. 3. 4—4. 3. 2
β. Dentes aggregati: 2. 4. 4—4. 4. 2
γ. Dentes cultriformes: 7—6; 6—6; 5—5

Pachychili

He did not give any detailed division of the group of *Pachychili* but referred the reader to his subsequent work (in collaboration with Knerr, 1858). Here, however, in the *Pachychili* group he mentioned individual genera only occurring in waters of the Austro-Hungarian monarchy. He remarks that a third group could comprise "extraeuropean Catostomi".

Bonaparte (1846) divided European *Cyprinidae* into two subfamilies: *Cyprinini* and *Leuciscini.*

Bleeker (1859) divided the carps into two sub-families — *Cobitiformes* and *Cypriniformes.* The latter sub-family he again subdivided further into:

Cohors 1. *Phalacrognathini*
Strips 1. *Homalopterini*
Strips 2. *Labeonini*
Cohors 2. *Cheilognathini*
Strips 1. *Catostomini*
Strips 2. *Cyprinini*
Strips 3. *Barbini*

Girard (1859) grouped American Cyprinids into 5 tribes:

Cyprinini
Catostomi
Chondrostomi
Pogonichthi
Alburni

Gill (1861) assigned the carps into four independent families:

Homalopteridae
Cobitidae
Cyprinidae
Catostomidae

In his work, Dybowski (1862) presented a critical review oı the classification of the *Cyprinidae.* He praises, in particular, Heckel's classification and underlines the introduction of the new trait — viz. pharyngeal teeth. Similarly as Heckel had done, he too, divides *Cyprinidae* into *Pachychili* and *Temnochili,* subdividing the first further into:

Cypriniformes
Leucisciformes
L. cirrhati
L. incirrhi
Alburniformes
Abramiformes

Originally he had intended to carry out the divisions according to a single trait (relative length of fins), but as he himself states "this trait by itself is not enough to make the groups sharply to differ among themselves: consequently I have been obliged to include further traits".

Bleeker in his treatise "Systema Cyprinoideorum Revisum" (1863) divided the *Cyprinoidei* in the following manner:

Catostomini
Catostomi
Moxostomi
Ichthyobi
Carpionini
Labeonini
Garrae
Labeones
Semiploti
Opisthocheili
Chondrostomini
Oreini
Gymnostomi
Chondrostomi
Barbini
Barbi
Systomi
Osteobramae
Catlae
Danionines
Paralabeonini
Cochlognathi
Laviniae

Aulopygini
Leuciscini
Chedri
Gobiones
Phoxini
Acanthobramae
Bramae
Aspii
Acheilognathini
Smilogastrini
Smilogastri
Laubucae
Chelae

He still includes *Catostomini* among the *Cyprinidae,* but not the *Homalopterini;* in contrast to his earlier system (1859).

Day (1865) divided fishes from the Malabar coast of India into two sub-families, and these further into groups:

Labeonini
Garrae
Labeones
Barbini
Systomi
Catlae
Daniones

A review of *Cyprinoidei* on a world-wide scale was made by A. Günther in his Catalogue of Fishes (1868). On the basis of the number of rays in the anal fin, the position and length of the dorsal fin, the shape and course of the lateral line, the presence or absence of barbels, the number of rows of pharyngeal teeth and the shape of the abdomen, he divided the family *Cyprinidae* into 14 groups:

Catostomina
Cyprinina
Rohteichthyina
Leptobarbina
Rasborina
Semiplotina
Xenocypridina
Leuciscina
Rhodeina
Danionina
Hypophthalmichthyina
Abramidina
Homalopterina
Cobitidina

As an appendix to family *Cyprinidae* he added *Kneriidae.*[1]

Dybowski (1869) altered his previous division of the *Cyprinidae.*

He divided the *Temnochili* into *Chondrostomini inberbi* and *Chondrostomini barbati.* He altered the endings of the groups in *Pachychili* into *-ini* (formerly *-formes*), and termed *Leucisciformes cirrhati* as *Barbini,* and *Leucisciformes incirrhi* as *Leuciscini.*

Gill (1872) divided the carps *(Eventognathi)* into five families:

Catastomidae
Cyprinidae
Cobitidae
Homalopteridae
Kneriidae[1]

Fitzinger (1873) criticized Heckel for having introduced the classification of the *Cyprinidae* according to the pharyngeal teeth. He even criticized the fact that pharyngeal teeth were used at all to characterize individual genera. He did not believe in the permanence of this trait and asked: "Is it really urgent or perhaps inevitable for a sharp distinction of the Cyprinid genera and species to have to consider pharyngeal teeth?" In his view his could be achieved even without this particular trait, with the aid of external traits. He saw in this "a naturalist's liking for internal traits". Consequently, he himself tried to characterize the Cyprinids solely on the basis of external traits.

Cope (1874) grouped the North American genera *Plagopterus, Meda* and *Lepidomeda* into a special sub-family *Plagopterinae,* within the family *Cyprinidae.*

Day (1878—1888) divided Indian Cyprinidae into two sub-families — *Cyprinina* and *Cobitidina.*

Sagemehl (1891) in his work on comparative anatomy of the skulls of the *Cyprinoidei* suggested the following system for the family:

1. sub-family *Catostomidae*
   1. group *Catostomina*
2. sub-family *Barbidae*
   1. group *Cyprinina*
   2. group *Leptobarbina*
   3. group *Rasborina*
   4. group *Leuciscina*
   5. group *Rhodeina*
   6. group *Abramidina*
3. sub-family *Homalopteridae*
   1. group *Homalopterina*
4. sub-family *Cobitidae*
   1. group *Cobitidina*

He made use of the term *Barbidae* for the sub-family consciously, in order to avoid an interchange with the name of the family. Into the group *Abramidina* he included Günther's *Rohteichthyina, Semiplotina,*

[1] *Kneriidae* do not belong among the *Cyprinoidei.* Berg (1955) ranged this family into the order *Clupeiformes;* Greenwood, Rosen, Weitzman and Myers (1966) into the order *Gonorhynchiformes* (superorder *Protacanthopterygii*).

Xenocypridina, Danionina and *Hypophthalmichthyina* (however, he did not study any of their representatives). He designated by the term *Ostariophysen* — characoids, "electric eels", cyprinoids and catfishes, hence fishes with Weberian apparatus. (This name was evidently first latinized by Eigenman as *Ostariophysae,*[1] later Jordan and Everman, 1896, corrected its spelling to *Ostariophysi.*) Sagemehl considered the *Cyprinoidei* to be descended from Characoids and related both forms to *Amia.*

Herzenstein (1891) was probably the first to devote attention to pharyngeal bones for purposes of classification. He speaks of the length-to-width ratio and compares the distance between the first tooth and the anterior end of the bone with the height of the tooth.

Gill (1893) divided the carps *(Eventgnathi)* in the following manner:

Catostomidae Gill, 1861
- *Ichthyobinae* Jordan (188) = *Bubalichthyinae* Gill, 1861
- *Cycleptinae* Gill, 1861
- *Catostomidae Gill, 1861*

Cyprinidae (Bon., 1837) Gill, 1861
- *Cyprininae* (Bon., 1831)
- *Rohteichthyinae* (Günther, 1868)
- *Leptobarbinae* (Günther, 1868)
- *Danioninae* (Günther, 1868)
- *Semiplotinae* (Günther, 1868)
- *Xenocypridinae* (Günther, 1868)
- *Leuciscinae* (Bon., 1837)
- *Rhodeinae* (Günther, 1868)
- *Hypophthalmichthyinae* (Günther, 1868)
- *Abramidinae* (Günther, 1868)
- *Medinae* Gill, 1892 = *Plagopterinae* Jordan et Gilbert, 1882
- *Campostominae* Jordan et Gilbert, 1882

Homalopteridae Gill, 1861
Cobitidae (Swainson, 1839)
Kneriidae Günther, 1868

Jordan and Evermann (1896) classified North American *Cyprinidae* into six sub-families:

Campostominae
Chondrostominae
Mylopharodontidae
Leuciscinae
Exoglossinae
Plagopterinae

They included three sub-families in the family *Catostomidae:*

Ictiobinae
Cycleptinae
Catostomidae

[1] sec. Myers, 1958

Vaillant (1902) assigned *Cyprinoidei* occurring in Borneo into a single family *Cyprinidae* with three sub-families:

Cyprinina
Homalopterina
Cobitidina

and divided the last sub-family into two further groups: *Anopla* and *Enopla.*

Jordan and Fowler (1903) gave five sub-families for Japanese *Cyprinidae:*

Rhodeinae
Barbinae
Gobioninae
Leuciscinae
Cyprininae

Boulenger (1904) classified cyprinoids into four subfamilies:

Catostominae
Cyprininae
Cobitidinae
Homalopterinae

As a probable fift subfamily he indicated the genus *Gyrinocheilus.*

Fowler (1905) divided cyprinid fishes from Borneo into three sub-families:

Labeoninae
Mystinae
Cheilinae

the term *Mystinae* being a newly-proposed name for *Barbinae,* because *Mystus* Klein (in Walbaum) is much older than *Barbus;* according to Fowler. Further, he divided the *Homalopteridae* into two subfamilies: *Homalopterinae* and *Gastromyzoninae.*

Gill (1905) remarks that the genus *Gyrinocheilus ("Gyrinochilus")* is a type of an independent family *Gyrinochilidae.*

Boulenger (1907, 1909) however, divides the family *Cyprinidae* into two subfamilies — *Cyprininae* and *Cobitinae.*

Regan (1911) included four families in the suborder *Cypriniformes* (order *Ostariophysi*):

Catostomidae
Cyprinidae
Cobitidae
Homalopteridae

He considers Asia to be the original home of the whole group, where the greatest diversity of genera and species is to be found. Of these he considers as the most primitive the genus *Opsariichthys.* This genus as well as that of *Chela* has a developed foramen between the quadratum and the metapterygoideum, which is a specific feature of the Characids but is absent in all the remaining cyprinoids. In the genus *Opsariichthys*

even the cleithra are developed similarly as in typical characoids. Regan further discusses the relationships among individual genera, and finds the traits employed to be inadequate for determining subfamilies. According to him, pharyngeal teeth are suitable only for defining the genus or a minor group of genera. He recommends the Bornean genus *Gyrinochilus* to be classified into the family *Cyprinidae* (next to *Crossochilus* and *Discognathus*), for an attempt "to make it a type of a separate family or a subfamily would merely obscure its relationships". As regards the order *Ostariophysi,* he considers it to be close to some *Clupeiformes* of the type of *Elopidae* and not to *Amioidei.*

In contrast to Regan, Berg (1912) considers America to be the original home of the order *Ostariophysi.* He bases his deduction on the fact that a single row of pharyngeal teeth is a more primitive trait. Among American *Cyprinidae* predominate genera with a single row of pharyngeal teeth and those with a triple row are completely lacking. In Asia, on the contraty, the latter are by far the more numerous. And finally, "the abundance of *Catostomidae,* close ancestors to the *Cyprinidae* likewise point, in a certain measure, to America as the original home of *Ostariophysi*". He judged Heckel's system, based on pharyngeal teeth, to be entirely artificial. He divided the *Cyprinidae* into ten groups (in particular the genera occurring in the waters of the Russian empire), but remarked that it is extremely difficult to set up a "genetic system" for all the Cyprinid genera:

Leuciscini
Chondrostomini
Gobionini
Abramidini
Barbini
Schizothoracini
Rhodeini
Cyprinini
Elopichthyini
Hypophthalmichthyini

In his evaluation he took as basis mainly the following traits: number of rows of pharyngeal teeth, presence or absence of barbels, number of rays in the dorsal and anal fin, presence or absence of spines in these fins or their indentation, presence of a keel in front of the anal fin, position of the vertical fins, presence of scaled sheat arround the anal orifice, colour of the peritoneum, length of intestine, and so on.

Weber and De Beaufort (1916) classified *Cyprinoidei* of the Indo-Australian archipelago in the following manner:

fam. *Homalopteridae*
fam. *Cobitidae*
fam. *Cyprinidae*
  sub-fam. *Abramidinae*
  sub-fam. *Rasborinae*
  sub-fam. *Cyprininae*

Regan (1922) cosidered India and South-east Asia as the centre of evolution of the *Cyprinoidei*. In his view, the carps spread northward so that the ancestors of the family *Catostomidae* easily reached North America before the Eocene by way of the isthmus at the place of the present Behring strait. He further held as quite probable that *Cyprinidae* did not reach Europe before the Oligocene and that North America, isolated during the Eocene, again regained connection with Asia in the Oligocene, handing in at the same time one genus of the *Catostomidae* and gaining the *Leuciscinae*. According to Regan the family *Cyprinidae* may be divided into three main groups:
Bariliinae (most abundant in the Indian region),
Leuciscinae (characteristic for and confined nearly exclusively to the palearctic and nearctic region), and
Cyprininae (showing the greatest development in the Indian region).

Hora (1923) raised the genus *Gyrinocheilus* to the rank of a separate family *Gyrinocheilidae* and defined it exactly.

Jordan (1923) classified carps as an order *Eventognathi* (series *Ostariophysi*, or *Plectospondyli*) and divided it into six families:

Catostomidae
Cyprinindae
Medidae
Cobitidae (incl. *Psilorhynchus*)
Homalopteridae (incl. *Gyrinocheilus* and *Glaniops*)
Adiposiidae

The genus *Gastromyzon*, classed today among cyprinoids, was assigned by him into the order *Nematognathi* (fam. *Plotosidae*).

Fowler (1924b) sorted North American *Cyprinidae* into six subfamilies:

Campostominae
Chondrostominae
Mylopharodontinae
Abramidinae
Plagiopterinae
Exoglossinae

The Indian *Cyprinidae* into ten subfamilies (Fowler, 1924a):

Rhodeinae
Danioninae
Rasborinae
Abramidinae
Leuciscinae
Barbinae
Oreininae
Labeoninae
Garrinae
Cyprininae

Hora (1925) estabilished an independent family for the Assam

mountain genus *Psilorhynchus,* on the basis of external traits and pharyngeal bones.

Nichols (1925a) asserted that the centre from which the Cyprinids spread was the Yang-tse river drainage. They reached North America through the isthmus in the Behring strait.

Hubbs (1926) divided American *Cyprinidae* in the region of Great Lakes into three subfamilies:

Leuciscinae
Pimephalinae
Campostominae

Pimephalinae are a new subfamily equivalent to *Medidae* of Jordan, Evermann and Clark (1930), and Jordan (1923).

For the family *Catostomidae* he suggested (Hubbs, 1930) the following system:

Ictiobinae
Cycleptinae
Catostominae
- *Moxostomatini*
- *Erimyzonini*
- *Catostomini*
- *Thoburniini*

Nichols (1930, 1934) cosiders the *Catostomidae* as being more primitive than the *Cyprinidae.* He was of the opinion that the former originated in China where they left one representative *(Myxocyprinus)* and where they have been more or less replaced by the present day gudgeons. According to him, the centre of Cyprinoid differentiation was China. He indicated the *Cobitidae* as probable offshoot of the *Cyprinidae* (reasoning out that the genus *Gobiobotia* had the traits of both the *Cobitids* and the gudgeons). He considered Boulenger's view (1904) that the Characoids are the most primitive group among *Ostariophysi,* as reliable and asserted that these together with catfishes, reached their present habitat from the north where they have been replaced mor or less by cyprinoids.

Tchang (1930a, 1931) divided the *Cyprinidae* of the Yang-tse river drainage as follows:

sub-fam. *Catostominés*
- group 1. *Catostomina*

sub-fam. *Cyprininés*
- group 2. *Cyprinina*
- group 3. *Gobionina*
- group 4. *Leptobarbina*
- group 5. *Xenocypridina*
- group 6. *Leuciscina*
- group 7. *Rhodeina*
- group 8. *Danionina*
- group 9. *Hypophthalmichthyina*
- group 10. *Abramidina*

sub-fam. *Homaloptérines*
group 11. *Homalopterina*
sub-fam. *Cobitidinés*
group 12. *Cobitidina*

In his work he also introduced a classification of the pharyngeal teeth of *Cyprinidae:*

I. Dents molariformes
1. Dents molaires
2. Dents arrondies
II. Dents comprimeés
3. Dents tronqueés
4. Dents comprimeés
5. Dents spatuleés
III. Dents poitues
6. Dents crochues
7. Dents cigues
8. Dents coniques

Hora (1932) divided the family *Homalopteridae* into two sub-families: *Homalopterinae* and *Gastromyzoninae.*
This family, however, is in his view, polyphyletic — *Homalopterinae* have evolved from the *Cyprinidae,* and *Gastromyzoninae* from the *Cobitidae.*

Gregory (1933) ponders over the ancestors of the *Ostariophysi.* He claims that it is not impossible that the family *Lycopteridae* from the Jurassic of China and Siberia may stand in or near the line of ancestry to the carps. Taking support from Frost's data (1925) according to which the otoliths of *Barilius* present certain Characid features, he too, considers them to be the most primitive of living Cyprinoids. He thinks that the most primitive members of the cyprinoid group were not the free-swimming types, with large mouths, but the more sedentary or slow-moving, bottom-living forms, derived eventually perhaps from some small-mouthed characin like *Distichodus,* which developed thick lips and became edentulous.

Mori (1933) determined within the family *Cyprinidae* a new sub-family for the genera *Gobiobotia, Saurogobio* and *Microphysogobio* — *Gobiobotinae.* In 1934 he divided the *Cyprinidae* into:

Cyprininae
Cyprinini
Barbini
Gobionini
Leuciscini
Danionini
Abramidini
Rhodeini
Gobiobotinae
Cobitidae

Vladykov (1934) took note of the geographical variability in the number of rows of pharyngeal teeth in the Cyprinids. He found that the

number of Cyprinid genera with three rows of pharyngeal teeth tends to increase from the north southward, or rather in a north-west to south-east direction. No genera with three rows of pharyngeal teeth in North America, where most genera possess a single row only (46%). Among the European genera those with a double row of pharyngeal teeth predominate (50%) while those with a triple row represent only 9%. In Far Eastern Asia (China) the numbers of genera with single and double rows of pharyngeal teeth are about equal, but those with a triple rows are the most numerous (49%). In India (Burma and Ceylon) the number of those with a triple row of pharyngeal teeth amount to as much as 70% (with only 8% of single rows). In the African genera the numbers with double and triple rows are about the same (37,5%). However, when he took into consideration the species and not the genera of African Cyprinids, then the number of species with a triple row attained 90%. He also mentioned the views of various authors as to whether single or triple rows of pharyngeal teeth should be considered as the more primitive, but he himself took no stand on this point.

C h u (1935) studied the scales, pharyngeal bones and teeth of Chinese Cyprinid fishes, their evolution and significance for taxonomy. He indicated as the most primitive scales those having radii and circuli present in all fields. As a new subject for systematic studies he introduced pharyngeals bones which seem to be part of pharyngeal teeth but are, however, of a different morphology and origin. The primitive type of pharyngeals he believed to be one which is moderately elongated and moderately broad, with the anterior and posterior limbs about equal in length and the anterior edentulous process about as long as the posterior endentulous process. The specialization of the pharyngeals has apparently taken place along two main lines:

(1) specialization by broadening, (2) specialization by elongation. He divided the pharyngeal teeth into three basic groups

1. compressed teeth
2. depressed teeth
3. conical teeth

These basic groups were further subdivided — the first into six, the second into three, and the third into three groups. He indicated the primitive type of tooth to be moderately compressed, with the tips more or less recurved and the grinding surfaces narrow and rudimentary. From this type he deduced six main lines of specialization.

As regards the number of rows of pharyngeal teeth the most primitive, according to him, are those with triple rows. He considers the reduction in the number of rows of pharyngeal teeth as a general tendency in the *Cyprinidae* which he puts into relation with feeding habits (primitive Cyprinids were carnivorous with a triple row of pharyngeal teeth). He believed that 5 is the primitive number of teeth in the main row, 4 in the second, and 2 in the third. Specialization has taken place by means of reduction, with the exception of the *Chondrostomatinae* which have as many as 7 teeth in the first row.

Chu, similarly as Vladykov had done, set up a table of geographical

variability in the number of rows of pharyngeal teeth. He came to the conclusion that the centre of distribution and the original home of cyprinids is China. India, the East Indies and Africa probably received their cyprinid stock directly or indirectly from southern China. The predominance in those regions of genera with the teeth in three rows may, according to Chu, be explained by either of two theories:

(1) they may have been populated at an early time by primitive cyprinids, which have remainded there, whereas the more specialized genera which one or two rows of teeth have been held back by barriers of sea, mountain, desert or climate; or (2) conditions in the warmer regions may favor the herbivorous types, chiefly *Cyprininae,* which retain three rows of teeth because all of the teeth are utilized in the formation of the common grinding surfaces. Or both these circumstances may have been involved. The areas of the U.S.S.R. were populated by Cyprinids from the northeastern China and gave rise here to many specialized forms, some with a reduced number of rows of pharyngeal teeth. The American cyprinids were probably derived from northeastern Asia by way of the Behring Strait connection, though some may have come directly from Europe to eastern North America. In all probability, a further reduction in tooth rows has taken place in America. Why the Palearctic genera should be specialized by the reduction of the rows, concludes Chu, is very difficult to understand.

He divided the family *Cyprinidae* into eigth sub-families:

Leuciscinae
Chondrostomatinae
Abramidinae
Acheilognathinae
Hypophthalmichthyinae
Gobioninae
Cyprininae
Schizothoracinae

F a n g (1935b) studied the family *Gastromyzonidae.* He judged it to be a polyphyletic grouping of genera which may be divided into two groups — association of *Crossostoma* and association of *Gastromyzon.* He also outlined their mutual relationships.

N i c h o l s (1938) suggested proposals for a temporary classification of the Cyprinoids, in which he took as his starting point the assumption that the most primitive family are the Catostomidae:

Catostomidae
Cyprinidae
Leuciscinae
Rasborinae
Abramidinae
Shizothoracinae
Rhodeinae
Cyprininae

Chondrostomatinae
Gobioninae
Cobitidae
Cobitinae
Nemacheilinae
Homalopterinae
Gastromyzoninae

As regards the family *Catostomidae* Nichols questions the view whether similarity between the Chinese and the American genera denotes relationship, or parallelism. He considers the *Cyprinidae* to be the most difficult family and of these, the *Leuciscinae* as perhaps the oldest subfamily. *Leuciscinae* seem to have given rise to *Abramidinae* and *Schizothoracinae,* the *Rhodeinae* are perhaps descendants from *Abramidinae.* He considers the genus *Cyprinus* to be a relict form, traces the *Gobioninae* to the *Cyprininae* and denotes them as the most widenspread Cyprinid subfamily. In his view, the *Cobitidae* area recent and probably polphyletic speciation of cyprinids and therefore, it is not possible to classify them without disrupting the familial relationships. Because of the erectile spine which representatives of the subfamily *Cobitinae* bear under the eye, he declares these to be the most primitive, and assigned the genus *Gobiobotia* to the subfamily *Homalopterinae.*

Just as Vladykov and Chu, Lukaš (1939) likewise gave a table of the variability in the number of rows of the pharyngeal teeth in the *Cyprinidae,* in various geographical regions. He pointed out the fact that there is not a single genus of *Cyprinidae* in the area of the Notrh Ice sea with a triple row of pharyngeal teeth, while on the Malabar coast of India all the genera have three rows. Reasoning from the assumption that the most probable ancestors of the *Cyprinidae* were some of the primitive Characoids and that the latter are exclusively tropical fishes, he concluded that even the most primitive Cyprinids must originate from the southern latitudes. Since genera with triple rows of pharyngeal teeth predominate precisely in these regions, Lukaš took this as the most primitive trait. He declared that the original home of the *Cyprinidae* was the Old World. According to him, the Cyprinids supplanted on vast expanse of territory a more primitive type of fauna of early tertiary characoids and occupied new aquatoria which were formed in the Pleistocene after the glacial period.

Vasnecov (1939) investigated the development of the pharyngeal teeth in the *Cyprinidae* and *Cobitidae* and arrived at some noteworthy conclusions: During the first year, there appear two generations of pharyngeal teeth. The first generation recapitulates teeth common to the cyprinoid ancestors, the second those of the cyprinoids themselves. The initial stage is identical for all the genera and enables the primary shape of the pharyngeal tooth to be determined: this had a cylindrical neck and a narrow, bent corona, somewhat inclined towards the neck. The grinding groove ran along the inner edge of the corona (its edges were ridged). The top of the tooth probably carried a hooklet.
Teeth of this shape occur, with slight alterations, in numerous genera

(type of *Leuciscus*). Through divergent evolution this shape gave rise to the remaining patterns still encountered, viz. teeth of the *Abramis* type, on the one hand (uniform development of the inner edges of the teeth), and on the other, to those of the *Barbus* type (unequal development of the frontal edge of the chewing groove). This latter type whose most primitive stages appear in the *Gobio* gave rise, on the one hand, to teeth of the *Varicorhinus* type, and on the other, to the *Cyprinus* and *Carassius* type. Since, in certain genera, which when adult possess a single row of pharyngeal teeth *(Abramis, Rutilus)* there had appeared in the course of their ontogenesis a double row of these teeth, Vasnecov concludes that the multirowed pharyngeal teeth are primary for carps.

L i u (1940) drew attention to the intermediary character of the traits in the genus *Gobiobotia* between the cobitids and the gudgeons.

N i c h o l s (1943) divided Chinese *Cyprinoidei* as follows:

Catostomidae
Cyprinidae
Cyprininae
Xenociprinidae
Leuciscinae
Abramidinae
Rhodeinae
Gobioninae
Cobitidae

T r e t j a k o v (1946) taking into consideration the morphology of the lateral line canal on the head, the number and shape of the circumorbital bones, the peculiarities in the formation of the temporal fossa, dermosphenoticum and the number of rows of pharyngeal teeth, divided the Cyprinids into four groups, though he did not give them any name. As the most primitive, he considered cyprinids with a triple row of pharyngeal teeth, concretely carp, whose build of the skull is close to that of the family *Acentrophoridae (Amiiformes)* and does not substantially differ from that of the characoids. He likewise considered the supraorbital lateral line canal in the cyprinids and the young *Amia* as concordant with that in the carp and adult *Amia.* The presence of massive and similar orbital bones as well as of massive and wide dermosphenoticum are primitive traits. He estimated the family *Cyprinidae* as being more primitive than that of *Catostomidae.* In this connection he drew attention to the tench in which the lateral line canals show a different pattern in that they do not run on the head as in the other cyprinids, i. e. through the cranial bones, but through osseous tubes adhering only lightly here and there to the skull and showed it to be a close relation to the family *Catostomidae,* whose lateral line canals on the head show the same features.

H u b b s and B l a c k (1947) indicated the subfamily *Pimephalinae* as a probable branch of the subfamily *Notopterinae (Cyprinidae).* According to these authors, the small length of the intestine and carnivorous habits in the cyprinids constitute a primitive trait, while on the contrary, the dark colouring of the peritoneum, modification of the mouth and

pharyngeal teeth connected with herbivorous habits of feeding are traits of specialization.

K r y ž a n o v s k i j (1947) classified the *Cyprinidae* not only on the basis of morphological, but also genetical, ecological and particulary embryological traits. On this basis he set up the following system for the family *Cyprinidae:*

Barbini (subfamily)
Barbina (group)
Barbinae (subgroup)
Schizothoracinae
? (*"Barbus" phutunio*)
Cyprinina
Rhodeina
Rhodeinae
Acanthorhodeinae
Gobionini
Gobionina
Gobioninae
Pseudogobioninae (?)
Sarcochilichthyna
Armatogobionina
Armatogobioninae
Gobiobotiinae
Leuciscini
Leuciscina
Leuciscinae
Pelecinae
?
? (*Xenocypris*)
Cultrinae
Tincina
Danionini

In his genetical analysis he took into account the intergeneric and interspefic hybrids which, stemming from the same subfamily, developed for the most part normally and attained adulthood. If, however, they came from different subfamilies, then their development was abnormal and they perished in the embryonal stage of their life (or the eggs developed parthenogenetically). This regularity was found disrupted only in the genus *Tinca* which crossbred with representatives of the group *Cyprinina,* but not with some of *Leuciscina,* which corresponds to its peculiar position in the system of the *Cyprinidae.* This author remarked that the subfamilies as he had determined them, differ both geographically and ecologically. *Barbini* live predominatly in central, southeastern and south Asia, on the Caucassus, in Asia Minor and Africa. They are fairly rare in Europe are nearly absent in Siberia and completely so in the New World. *Gobionini* are common mainly in Eastern and South Eastern Asia, they are rare in Europe and are completely absent in Africa and North America. The *Leuciscini* are abundant in both the

Old and the New World, but are scarce in Central and South Asia and in Africa. *Danionini* are common only in South Asia.
Barbini are mountain lihophilous an also ostracophilous fishes: there are neither psammophilous nor pelagophilous types among them.
Gobionini differ from the others only in that there are psammophilous types among them: there are no phytophylous nor lithophilous. *Leuciscini* are typical lithophilous, but also pelagophilous and phytophilous types: they contain no ostracophilous nor psammphilous species. *Danionini* are phytophilous fishes only.
As regard relatedness — he considered the *Barbini* as the most primitive (because of their triple rows of pharyngeal teeth, their multi-segmental body and the complete hyoid arch of the aorta). The subfamily *Gobionini* gave certainly rise to *Cobitidae,* more exactly, psammophile *Nemachilini.*

Suvorov (1948), on the other hand, considers single rows of pharyngeal teeth as a more primitive trait and in this connection designates North America as the original home of the *Cyprinidae.* As the most primitive from among these he considers *Leuciscini,* and from among the cyprinoids — the *Catostomidae.*

Hora (1950) raised the subfamilies *Homalopterinae* and *Gastromyzoninae* (family *Homalopteridae*) to the rank of separate families within the suborder *Cyprinoidei.* Their former assignment in the same family was, in his view, unreliable, for *Homalopterinae* are, according to him, derived from the family *Cyprinidae* and *Gastromyzoninae* from that of *Cobitidae.* He recommends separate families for the genera *Gyrinocheilus* and *Psilorhynchus* to be preserved until they are better investigated osteologically.

Jayaram (1950) defends the independence of the family *Gyrinocheilidae* in view of the peculiar arrangement of the gills and the fine toothlees pharyngeal bones of the genus *Gyrinocheilus.*

Law (1950) studied the cyprinoid scales and found the *Gastromyzoninae* to have the scales of the type of *Cobitidae,* while those of the *Homalopterinae* are of the cyprinid type. The most primitive scales are those of the genus *Sewellia.* Affinity towards the genus *Beaufortia* could not be determined.

Hora (1952a, b) came up with the theory of a parallel evolution of the family *Gastromyzonidae* on the mainland of Asia ant the island of Borneo.

Mori (1952) raised the subfamily *Gobiobotinae* (Mori, 1933) to an independent family — *Gobiobotidae.*

Ramaswami (1952a, b, c, d) was concerned with the osteology of cyprinoids. On the basis of his investigations he made this statement concerning classification of individual families or subfamilies:
Raising the genus *Gyrinocheilus* to a full family is correct. *Gyrinocheilus* descends from a cyprinid ancestor — the question is, from which? By the arrangement of its Weberian apparatus it resembles more to a representative of the family *Catostomidae.* None of the Indian genera can be a probable ancestor of *Gyrinocheilus.* Likewise, raising the genus *Psilorhynchus* to an independent family is also correct. This genus, however,

possesses more cyprinid traits than the preceding *Gyrinocheilus* — it evidently, dissociated itself from the common cyprinid stock later. By the build of Weberian apparatus, the *Psilorhynchus* shows affinity towards the subfamily *Nemachilinae* and the family *Homalopteridae.* The *Homalopteridae* developed from a cyprinid ancestor and their further development ran parallel with that of the family *Cobitidae.* Because of a series of features, the raising of the subfamily *Gastromyzoninae* to an independent family comprising two independent lines of evolution is sufficiently justified — one on the mainland and the other in Borneo. The latter perhaps descend from a glaniopsid ancestor, the genus itself manifests a certain relationship to the family *Cobitidae.* The continental genera (subfamily *Crossostominae*) differ greatly among themselves and are a polyphyletic group in which at least thre branches may be differentiated: the first is represented by the genus *Crossostoma,* the second by that of *Vanmanenia* and the third by *Beaufortia* and *Pseudogastromyzon.* He remarked that there had never existed at any period a geographic continuity between the island of Borneo and Southern China — hence, the evolution of this group proceded, in his view, independently and parallel.

Silas (1952) divided the family *Gastromyzonidae* into two subfamilies — *Crossostominae* and *Gastromyzoninae.* He gives support to Hora's assertion (1952) that the *Gastromyzonidae* developed independently on Borneo and the mainland of Asia from primitive Cobitids and therefore, the Bornean elements are not represented by the species that had penetrated to the south, as claimed by earlier authors. He further divided the *Gastromyzoninae* according to their geographical distribution, into two divisions, the *Pseudogastromyzonini* (continent) and the *Gastromyzonini* (Borneo). He was of the opinion that a similar division will have to be made in the case of the subfamily *Crossostominae* and suggested the following names for the new groups: *Crossostomini* (continent) and *Glaniopsini* (Borneo). Representatives of the family *Homalopteridae* spread, according to him, from the north southwards. The member of endemic species in Borneo and the absence of endemits in Java testify to the fact that *Homalopteridae* settled in this island more recently. An imporant role in the evolutionary divergence of these fishes was played by their geographical and ecological isolation.

Kobayasi (1953) studied scales and among others investigated those of the cyprinids. Contrary to Chu's opinion (1935), he considers those scales to be the most primitive that have only the circuli ("ridges") and have not radii ("grooves"). In this he based his arguments on Heckel's recapitulating law: Yong scales have only circuli, with radii forming on them gradually only. There are no scales that have only grooves, however, there are many primitive fishes that have only ridges.

Nikol'skij (1954) considers the centre of the origin of cyprinids to be the mainland occupied at present by southern Asia and India that had once ben connected with Africa, but separated from northern Asia by the Tibeto-Himalayan geosynclinale filled up by the sea. However, according to him, the Cyprinids are clearly divided into two branches.

The first includes genera *Leuciscus, Rutilus, Phoxinus, Abramis, Aspius, Chondrostoma,* and others (the nearest to the original type is the genus *Leuciscus*). The second branch comprises genera: *Barbus,* gudgeons, *Schizothorax, Cyprinus, Erythroculter,* and *Parabramis* (the nearest to the original type are probably fishes close to the *Barbus*). The nearest to the primary type of both groups stands either the *Opsariichthys,* or the *Barilius.* He asserts that the first to penetrate into northern latitudes were the genera of the first group. They occupied also the waters of North America. The migration of the second group began only following the filling up of the Himalayan geosynclinale. He states that the most primitive type of pharyngeal teeth is that of the triple rows. He divided the teeth proper into four basic groups:

1. Grasping teeth with or without hook
   (*Leuciscus idus, Aspius aspius,* etc.)
2. Grasping teeth, but with a grinding surface
   (*Abramis brama*)
3. Concave teeth
   (*Barbus*)
4. Masticatori teeth
   (*Cyprinus, Mylopharyngodon*)

According to the number of rows of pharyngeal teeth, the presence or absence of barbels, spines in the dorsal and anal fin, length of intestine, colour of peritoneum, position of mouth and further traits, he divided the *Cyprinidae* into 9 subfamilies:

Leuciscinae
Chondrostominae
Barbinae
Gobioninae
Schizothoracinae
Cultrinae
Rhodeinae
Cypininae
Hypophthalmichthyinae

Berg (1955) in his classification of fishes divided the *Cyprinoidei* in the following manner:

Catostomidae
  Cycloleptinae
  Ictiobinae
  Catostominae
Cyprinidae[1]
  Cypininae
  Psilorhynchinae
  Gobiobotiinae
  Hypophthalmichthyinae

[1] including Medidae Jordan and Psilorhynchidae Hora.

Gyrinocheilidae
Homalopteridae
Homalopterinae
Gastromyzoninae
Cobitidae
Nemachilinae
Botiinae
Cobitinae

Hubbs (1955), on the basis of his studies of intergeneric hybrids, classified North American *Cyprinidae* and *Catostomidae* as follows:

Catostomidae
Catostominae
Thoburniini
Catostomini
Erimyzontini
Moxostomatini
Cycleptinae
Ictiobinae
Cyprinidae
Leuciscinae
Plagopterini[1]
Leuciscini
Abramidinae (?)

Ramaswami (1955a, b) in following up his osteological studies, divided the subfamily *Gobioninae (Cyprinidae)* into three groups: The first, with three genera *(Saurogobio, Abbottina* and *Pseudogobio)* shows an affinity towards the family *Catostomidae.* The second is formed by a single genus *(Gobiobotia)* evidently related to the subfamily *Nemachilinae* (family *Cobitidae*). Finally, the third group comprises the remaining genera. When studying the osteology of the family *Cyprinidae,* he was unable to find such traits as would permit their division into subfamilies, owing to the extreme divergence in the genera.

Kafuku (1957), as a result of comparative studies of Japanes gudgeons and of North American suckers came to the conclusion that by their way of life and morphological traits, the gudgeons correspond to suckers and gave this as an instance of parallelism in evolution.

Fowler (1958) emended the nomenclature of certain subfamilies of the *Cyprinidae: Rohteinae* (= *Smilogastrini* Bleeker, 1865; type — genus *Rohtee* Sykes), *Bariliinae* (= *Chedri* Bleeker, 1863; type — genus *Chedrus* Hamilton-Buchanan), *Gibelioninae* (= *Catlae* Bleeker, 1863; type — genus *Gibelion* Heckel), and *Oreininae* (= *Oreini* Bleeker, 1863; type — genus *Oreinus* M'Clelland). He likevise set up a new subfamily in the *Catostomidae* — the *Myxocyprininae.*

Hubbs and Lagler (1958) assigned all the North American cyprinids in the region of the Great Lakes into a single subfamily — the *Leuciscinae.*

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[1] equal to family *Medidae* or subfamily *Plagopterinae*; here for the first time as tribe.

Nalbant (1963) asserts that the *Cobitidae* appeared after the *Cyprinidae,* and that their origin is to be looked for in that cyprinid group whose evolution began following the separation of North America from Euro-Asia. From among present day cyprinids, the *Gobioninae* stand closest to the *Cobitidae* by their anatomical traits. However, they developed independently and their similarity is to be ascribed to convergence. He assigns the origin of the *Cobitidae* to South East Asia, whence they spread northward to China and Japan and then penetrated through Siberia to Europe. Westward, they reached India. From Europe they passed through Spain into North-West Africa, and from Asia Minor to North-eastern Africa and Abyssinia. As the most primitive subfamily he considers the *Botiinae* (*Leptobotia* being the most primitive genus), from which sprang the *Nemachilinae* on the one hand, and *Cobitidinae,* on the other; the latter are the most developed.

Das and Subla (1963) consider the centre of origin of the Cyprinids to have been in the Lemuria land-mass which formerly connected Southern Asia, India and Africa. They claim that the cyprinids may be divided into two branches: the first comprises the roach, dace or dart, minnows and bream, and evidently reached the northern latitudes before the second branch, which includes barbes, gudgeons, marinka *(Schizothorax)* and wild carps *(Cyprinus carpio).* The representatives of the second group, as they state, began to migrate following the filling up of the Tibeto-Himalayan geosynclinale.

Alexander (1964), following a study of the Weberian apparatus, admits as a possibility that the Cobitidae are a monophyletic family. The most primitive among them are the *Botiinae,* very close relatives to the *Nemachilinae* (or to their ancestors).

Wu (1964) divided Chinese *Cyprinidae* into ten subfamilies:

Leuciscinae
Abramidinae
Xenocyprininae
Schizothoracinae
Acheilognathinae
Hypophthalmichthyinae
Gobiobotiinae
Cyprininae
Barbinae
Gobioninae

Bănărescu and Nalbant (1965) look upon the *Gobioninae* as being a clear and monophyletic subfamily, comprising 18 genera.

Grenwood, Rosen, Weitzman and Myers (1966) have proposed the following classification of the cyprinoid fishes:

Cyprinidae (incl. *Gobiobotidae* and *Medidae*)
Gyrinocheilidae
Psilorhynchidae
Catostomidae

Homalopteridae (incl. *Gastromyzonidae, Gastromyzontidae* and *Lepidoglanidae*)
Cobitidae (incl. *Adiposidae*)

They consider the family *Cyprinidae* as the most primitive from among the *Cyprinoidei.* They leave the *Gastromyzonidae* and the *Homalopteridae* in one family with the remark that their mutual relationships have not been indicated. *Cobitidae, Gastromyzonidae* and *Homalopteridae* appear related to one another and may be derived from some cyprinoid ancestor near the *Cyprinidae.* As regards the family *Cyprinidae* proper, they consider certain traits to be of importance, from a phyletic aspect, at the subfamily level. For instance, the presence or absence of metapterygoid-quadrate fenestra, common in the characoids, the existence of which in the Cyprinids may be taken as a primitive feature. Besides the genus *Opsariichthys* (as reported by Regan in 1911) they found this fenestrum also in the closely related genus *Zacco.* Further they think that the fusion of the centra of the second and third vertebrae is an important and specialized character. From this point of view they doubt about the conservative character of the genus *Barilius. Barilius* has no separate centra of the second and third vertebrae, nor the fenestrum between the quadratum and metapterygoideum. As another character of specialization they also consider the course of the laterosensory canal in the sphenoticum. They discussed the affinity of Ostariophysi (especially the Characoidei) with the Gonorhynchiformes (Gonorhynchoidei, Chanoidei, Phractolaemoidei and Cromerioidei; sensu Berg, 1955), and the Gonorhynchiformes with the salmoniformes (Clupeiformes in part, Galaxiiformes, Scopeliformes in part; sensu Berg, 1955).

In his study of the pharyngeal teeth of catostomids W e i s e l (1967) found that 10% of the examined larval suckers had a double row of pharyngeal teeth. He interpreted the occasional occurrence of this double row as a probable incomplete recapitulation of a multi-rowed ancestral form. During their development, the teeth of the suckers pass through stages first resembling those of the cyprinid ancestors, and next resembling those of the primary cyprinid type, before becoming typical catostomid teeth.

CONCLUSION

The review of the works cited above allows us to draw the following conclusions:

The *Cyprinoidei* descend from a characoid ancestor. The probable centre of their differenciation was South Asia. Opinions as to wether this was South China, India or perhaps Gondwana, differ.

The ontogenetic development of pharyngeal teeth in the *Cyprinoidei,* as also the geographical variability in the number of rows pharyngeal teeth support the view according to which multiple rows of teeth should be considered as a primitive character. From this point of view as well as because of numerous other character, the *Cyprinidae* are the most primitive family of the *Cyprinoidei.* Because of the great divergence of

the genera and an inadequacy of suitable criteria, it is not possible at present to divide them into subfamilies. Perhaps the only well defined cyprinid group are the *Gobioninae* which also seem to be the most differentiated among them. On the other hand, we may designate the genera *Opsariichthys* and *Zacco* as the most primitive. Both the genera as the only ones among the cyprinids have quadrato-metapterygoid fenestra, similarly as the majority of the characoids, (which, ultimately, testifies also to the primitivity of the *Cyprinidae*).

The estabilishment of independent families *Gyrinocheilidae* and *Psilorhynchidae* seems to be justified. Both the families manifest an affinity to the *Cyprinidae* from which they evidently derived.

Catostomidae are a well defined family. Their position, and particularly their origin will require further investigation.

Homalopteridae have perhaps developed from a cyprinid ancestor, and the *Gastromyzonidae* probably from a cobitid. The evolution of the family *Gastromyzonidae* proceeded differentiatedly — separate on the Asian continent and on Borneo. However, many factors here remain obscure. We cannot rule out even their eventual assignment into one family.

Cobitidae are a well defined, perhaps monophyletic family, descending from a cyprinid ancestor. The most primitive subfamily are the *Botiinae.* The nearest to them are *Noemacheilinae. Cobitinae* are the most differentiated subfamily.

Only a very hazy idea can be obtainedon the number of genera in individual families, particularly in that of the *Cyprinidae.* A list of the genera and subgenera up to the year 1921 was made by D. S. Jordan (1923), however, without regard to their validity. Since it is in reality extremely difficult to provide a review of the valid cyprinoid genera and subgenera, we judge it suitable at least to complete Jordan's list and bring it up to date.[1] Consequently, in the following section we present the list of genera and subgenera of *Cyprinoidei* described since 1921.

On the basis of this list, we indicated the following new objective synonymes:

In the family *Cyprinidae* —
ADAMACYPRIS Fowler, 1934a, syn. nov.
of *Puntioplites* H. M. Smith, 1929
MESOCYPRINUS Cheng, 1950, syn. nov.
of *Mesocyprinus* Fang, 1935
PARASCHIZOTHORAZ Tsao (in Wu), 1964, syn. nov.
of *Tetrostichodon* Tchang, Yueh et Hwang, 1964
In the family *Cobitidae* —
DIPLOPHYSOIDES Fowler, 1958, syn. nov.
of *Didymnophysa* Whitley, 1950
MADRASIA Nalbant, 1963, syn. nov.
of *Enobarbichthys* Whitley, 1931.

[1] When this article was already in print, the paper of Golvan (Catalogue systématique des noms de genrēs de poissons actuels de la X° édition du "Systema naturae" de Charles Linné jusqu'a la fin de l'année 1959. Ann. Parasitol. Hum. et Comp., 37,6 (suppl.):1—227, 1962) dropped in my hands. In this work the author gives the list of genera and subgenera of cyprinoids up to the year 1959.

Caecobarbus Boulenger, 1921
(type *Caecobarbus geertsi* Boulenger)
Anabarilius Cockerell, 1923[1]
(type *Barilius andersoni* Regan)
Rasborella Fowler et Bean, 1923
(type *Rasborella dubia* Fowler et Bean)
Xenobarbus Norman, 1923
(type *Xenobarbus loveridgei* Norman)
Hemigrammopuntius Pellegrin, 1923
(type *Barbus apogonostomatus* Pellegrin)
Cephalakompsus Herre, 1924
(type *Cephalakompsus pachycheilus* Herre)
Mandibularca Herre, 1924
(type *Mandibularca resinus* Herre)
Ospatulus Herre, 1924
(type *Ospatulus truncatulus* Herre)
Pfrille Jordan, 1924a
(type *Phoxinus neogaeus* Cope)
Erimonax Jordan, 1924b
(type *Ceratichthys monacus* Cope)
Phreatichthys Vinciguerra, 1924
(type *Phreatichthys andruzzii* Vinciguerra)
Acahara Jordan et Hubbs, 1925
(type *Richardsonius semotilus* Jordan et Starks)
Moroco Jordan et Hubbs, 1925
(type *Pseudaspius bergi* Jordan et Metz)
Belligobio Jordan et Hubbs, 1925
(type *Belligobio eristigma* Jordan et Hubbs)
Caraspius Nichols, 1925c
(type *Caraspius agilis* Nichols)
†*Daunichthys* Annandale et Hora, 1925
(type *Daunichthys gregorianus* Annandale et Hora)
Barbopsis Caporiacco, 1926
(type *Barbopsis devecchi* Caporiacco)
Sanagia Holly, 1926
(type *Sanagia velifera* Holly)
Spinibarbichthys Oshima, 1926
(type *Spinibarbichthys denticulatus* Oshima)
Carassoides Oshima, 1926[2]
(type *Carassoides rhombeus* Oshima)
Kendallia Evermann et Shaw, 1927[3]
(type *Kendallia goldsboroughi* Evermann et Shaw)

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[1] synonyme of *Hemiculterella* Warpachowski, 1887 (sec. Bănărescu, 1967).
[2] according to Berg (1949, p. 830) the Carassoides is hybrid between *Carassius auratus* and *Cyprinus carpio*. *Carassoides rhombeus* Oshima, 1926 = *Carpio kantonensis* Heincke, 1892 (sec. Chu, 1935).
[3] synonyme of *Hemiculter* Bleeker, 1859 (sec. Bănărescu, 1967).

Clarkina Jordan et Evermann, 1927
(type *Cyprinus caurinus* Richardson)
Hainania Koller, 1927[1]
(type *Hainania serrata* Koller)
Pseudohemiculter Nichols et Pope, 1927[1]
(type *Hemiculter hainanensis* Nichols et Pope)
Hemigrammocapoeta Pellegrin, 1927
(type *Hemigrammocapoeta culiciphaga* Pellegrin)
Rhinogobioides Randahl, 1928[2]
(type *Gobio longipinnis* Nichols)
Nicholsiculter Rendahl, 1928[3]
(type *Hemiculter andrewsi* Nichols)
Sapa Kazanskij, 1928
(type *Sapa sapa*[4])
Oregonichthys Hubbs in Schultz, 1929
(type *Hybopsis crameri* Snyder)
Eilichthys Pellegrin, 1929
(type *Eilichthys microphthalmus* Pellegrin)
Puntioplites H. M. Smith, 1929[6]
(type *Puntius proctozysron* Bleeker)
Ptychidio Myers, 1930
(type *Ptychidio jordani* Myers)
Parosteobrama Tchang, 1930b[5]
(type *Parosteobrama pellegrini* Tchang)
Glabrobarbus Fowler, 1931
(type *Barbus nigripinnis* Fowler)
Spratellicypris Herre et Myers, 1931
(type *Barbodes palata* Herre)
Parexoglossum Hubbs, 1931
(type *Parexoglossum laurae* Hubbs)
Yaoshanicus Lin, 1931
(type *Yaoshanicus arcus* Lin)
Varicogobio Lin, 1931
(type *Varicogobio kaa* Lin)
Discogobio Lin, 1931
(type *Discogobio tetrabarbatus* Lin)
Poropuntius H. M. Smith, 1931a
(type *Poropuntius normani* H. M. Smith)

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[1] synonyme of *Hemiculter* Bleeker, 1859 (sec. Bănărescu, 1967).
[2] synonyme of Rhinogobio Bleeker, 1870 (sec. Bănărescu, 1966). Gobio longipinnis Nichols = Rhinogobio ventralis Sauvage et Dabry.
[3] synonyme of *Hemiculterella* Warpachowski, 1887 (sec. Bănărescu, 1967).
[4] Kazanskij (1928, p. 16) writes: "Uakazannyje otličija nastoľko značiteľny, čto oni, kak nam kažetsja, dajut osnovanije dlja ustanovlenija novogo roda *Sapa,* s vidami *Sapa sapa* — beloglazka i *Sapa ballerus* — sopa. Nazvanije rodu dano po najboleje charakternomu vidu."
[5] synonyme of *Megalobrama* Dybowski, 1872 (sec. Bănărescu, 1967).
[6] see also Adamacypris Fowler, 1934.

Scaphognathus H. M. Smith, 1931a[1]
(type *Scaphognathus stejnegeri* H. M. Smith)
Sikukia H. M. Smith, 1931b
(type *Sikukia stejnegeri* H. M. Smith)
Barbellion Whitley, 1931a[2]
(type *Barynotus lagensis* Günther)
Nazatexico Whitley, 1931a[3]
(type *Notropis orca* Woolman)
Aspiobarbus Berg, 1932b
(type *Barbus comiza* Steindachner)
Chalcalburnus Berg, 1932b
(type *Cyprinus chalcoides* Güldenstädt)
Squalalburnus Berg, 1932a
(type *Alburnoides oblongus* Bulgakov)
Fustis Lin, 1932a
(type *Fustis vivus* Lin)
Tanichthys Lin, 1932b
(type *Tanichthys albonubes* Lin)
Prolabeo Norman, 1932
(type *Prolabeo batesi* Norman)
Pseudogyrinocheilus Fang, 1933
(type *Discognathus prochilus* Sauvage et Dabry)
Altigena Lin, 1933a
(type *Varicorhinus discognathoides* Nichols et Pope)
Amplolabrius Lin, 1933a
(type *Amplolabrius mirus* Lin)
Procypris Lin, 1933b
(type *Procypris merus* Lin)
Microphysogobio Mori, 1933
(type *Microphysogobio koreensis* Mori)
Sinilabeo Rendahl, 1933a
(type *Varicorhinus tungting* Nichols)
Oreichthys H. M. Smith, 1933
(type *Oreichthys parvus* H. M. Smith)
Adamacypris Fowler, 1934a[4]
(type *Puntius proctozysron* Bleeker)
Grandisquamachela Fowler, 1934a
(type *Parachela williaminae* Fowler)
Holotylognathus Fowler, 1934a
(type *Holotylognathus reticulatus* Fowler)
Scaphiodontopsis Fowler, 1934a
(type *Scaphiodontopsis acanthopterus* Fowler)
Rambaibarnia Fowler, 1934b
(type *Danio regina* Fowler)

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[1] preoccupied in *Reptilia;* see *Scaphognathops* H. M. Smith, 1945.
[2] a substitute for *Barynotus* Günther, 1868 (= preoccupied in *Coleoptera*).
[3] a substitute for *Orcula* Jordan et Evermann, 1900 (= preoccupied in *Mollusca*) and *Orcella* Jordan et Evermann, 1896 (= preoccupied in *Cetacea*).
[4] syn. nov. of Puntioplites H. M. Smith, 1929.

Nicholsopuntius Pellegrin, 1934
(type *Barbus candens* Nichols et Griscom)
†*Eocyprinus* Sanders, 1934
(type *Eocyprinus sumatranus* Sanders)
Xenocheilichthys H. M. Smith, 1934
(type *Xenocheilichthys gudgeri* H. M. Smith)
†*Aspiurnus* Štyľko, 1934
(type *Aspiurnus czerskii* Štyľko)
Atrilinea Chu, 1935
(type *Barilius chenchiwei* Chu)
Danioides Chu, 1935
(type *Danio kakhiensis* Anderson)
Herzensteinia Chu, 1935
(type *Schizopygopsis microcephalus* Herzenstein)
Nicholsicypris Chu, 1935
(type *Aphyocypris normalis* Nichols et Pope)
Percocypris Chu, 1935
(type *Leptobarbus pingi* Tchang)
Rohanus Chu, 1935[1]
(type *Ischikauia transmontana* Nichols)
Semiculter Chu, 1935[1]
(type *Nicholsiculter rendahli* Wu)
Sinigobio Chu, 1935
(type *Gobio sihuensis* Chu)
Pteronotropis Fowler, 1935
(type *Alburnus formosus* Putnam)
Rectoris Lin, 1935
(type *Rectoris posehensis* Lin)
Coreoleuciscus Mori, 1935
(type *Coreoleuciscus splendidus* Mori)
Pseudopungtungia Mori, 1935
(type *Pseudopungtungia nigra* Mori)
Hemibarboides Wang, 1935
(type *Hemibarboides tientaiensis* Wang)
Sinocyclocheilus Fang, 1936b
(type *Sinocyclocheilus tingi* Fang)
Mesocyprinus Fang, 1936c[2]
(type *Cyprinus micristius* Regan)
Paraprocypris Fang, 1936c
(type *Paraprocypris papillosolabiatus* Fang)
Anchovicypris Fowler, 1936
(type *Engraulicypris congicus* Nichols et Griscom)
Clypeobarbus Fowler, 1936
(type *Barbus kemoensis* Fowler)
Lanceabarbus Fowler, 1936
(type *Barbus tanensis* Günther)

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[1] synonyme of *Hemiculterella* Warpachowski, 1887 (sec. Bănărescu, 1967).
[2] see also *Mesocyprinus* Cheng, 1950.

Rastrineobola Fowler, 1936
(type *Neobola argentea* Pellegrin)
Sagittabarilius Fowler, 1936
(type *Barilius salmolucius* Nichols et Griscom)
Vanderbiltella Fowler, 1936
(type *Barbus lepidura* Fowler)
Beirabarbus Herre, 1936
(type *Beirabarbus palustris* Herre)
Coptostomabarbus David et Poll, 1937
(type *Coptostomabarbus whittei* David et Poll)
Orthroleucos Deržavin, 1937
(type *Rutilus atropatenus* Deržavin)
Discolabeo Fowler, 1937
(type *Discolabeo fisheri* Fowler)
Filirasbora Fowler, 1937
(type *Filirasbora rubripinna* Fowler)
Incisilabeo Fowler, 1937
(type *Labeo behri* Fowler)
Longiculter Fowler, 1937
(type *Longiculter siahi* Fowler)
Mekongina Fowler, 1937
(type *Mekongina erythrospila* Fowler)
Neorohita Fowler, 1937
(type *Rohita hasseltii* Valenciennes)
Thynnichthyina Fowler, 1937
(type *Thynnichthys thai* Fowler)
Armatogobio Taranec, 1937
(type *Saurogobio dabryi* Bleeker)
Rostrogobio Taranec, 1937
(type *Rostrogobio amurensis* Taranec)
Huigobio Fang, 1938
(type *Huigobio chenshienensis* Fang)
Cultrichthys H. M. Smith, 1938a[1]
(type *Culter brevicauda* Günther)
Cultrops H. M. Smith, 1938a[2]
(type *Culter siamensis* Hora)
Chagunius H. M. Smith, 1938b
(type *Cyprinus chagunio* Hamilton)
Parasinilabeo Wu, 1939
(type *Epalzeorhynchus mutabilis* Lin)
Sinibrama Wu, 1939[3]
(type *Chanodichthys wui* Rendahl)
Parabarilius Pellegrin et Fang, 1940
(type *Parabarilius laoensis* Pellegrin et Fang)

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[1] synonyme of *Culter* Basilewski, 1855 (sec. Bănărescu, 1967).
[2] synonyme of *Paralaubuca* Bleeker, 1860 (sec. Bănărescu, 1967).
[3] synonyme of *Megalobrama* Dybowski, 1872 (sec. Bănărescu, 1967).

Lepidopygopsis Raj, 1941
(type *Lepidopygopsis typus* Raj)
Prolabeops Schultz, 1941
(type *Prolabeops cameroonensis* Schultz)
Rhodopleuriscus Fowler, 1942
(type *Leuciscus vandoisulus* Valenciennes)
Kantaka Hora, 1942
(type *Scaphiodon brevidorsalis* Day)
Nukta Hora, 1942
(type *Cyprinus nukta* Sykes)
Osteochilichthys Hora, 1942
(type *Scaphiodon thomassi* Day)
Mannichthys Schultz, 1942
(type *Mannichthys lucileae* Schultz)
Aphyocyproides Tang, 1942
(type *Aphyocyproides typus* Tang)
Masticobarbus Tang, 1942
(type *Masticobarbus pentafasciatus* Tang)
Horadandiya Deraniyagala, 1943
(type *Horadandiya atukorali* Deraniyagala)
Bertinius Fang, 1943[1]
(type *Barbus lorteti* Sauvage)
Iranocypris Brunn et Kaiser, 1944
(type *Iranocypris typhlops* Brunn et Kaiser)
Snyderichthys Miller, 1945a
(type *Squalius copei* Jordan et Gilbert)
Klamathella Miller, 1945b
(type *Tigoma bicolor* Girard)
Allodanio H. M. Smith, 1945
(type *Danio ponticulus* H. M. Smith)
Daniops H. M. Smith, 1945
(type *Daniops myersi* H. M. Smith)
Henicorhynchus H. M. Smith, 1945
(type *Henicorhynchus lobatus* H. M. Smith)
Papillocheilus H. M. Smith, 1945
(type *Papillocheilus ayuthiae* H. M. Smith)
Scaphognathops H. M. Smith, 1945[2]
(type *Scaphognathus stejnegeri* H. M. Smith)
Eremichthys Hubbs et Miller, 1948
(type *Eremichthys acros* Hubbs et Miller)
Moapa Hubbs et Miller, 1948
(type *Moapa coriacea* Hubbs et Miller)
Mesocyprinus, Cheng, 1950[3]
(type *Cyprinus micristius* Regan)

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[1] preoccupied in *Mollusca;* see *Bertinichthys* Whitley, 1953
[2] a substitute for *Scaphognathus* H. M. Smith, 1931 (= preoccupied in *Reptilia*)
[3] syn. nov. of *Mesocyprinus* Fang, 1936

Hemigrammocapoeta Estève, 1952[1]
(type *Barbus mirei* Estève)
Bertinichthys Whitley, 1953[2]
(type *Barbus lorteti* Sauvage)
Estevea Whitley, 1953[3]
(type *Barbus mirei* Estève)
Rasboroides Brittan, 1954
(type *Rasbora vaterifloris* Deraniyagala)
Horalabiosa Silas, 1954
(type *Horalabiosa joshuai* Silas)
Typhlogarra Trewavas, 1955
(type *Typhlogarra widdowsoni* Trewavas)
Microbarbus Géry, 1957
(no type; provisional generic name)
Allochela Silas, 1958
(type *Chela fasciata* Silas)
Neochela Silas, 1958
(type *Laubuca dadiburjori* Menon)
Eirmotus Schultz, 1959
(type *Eirmotus octozona* Schultz)
†*Sigmopharodon* Uyeno, 1961
(type *Sigmopharodon idahoensis* Uyeno)
Rheogobio Bănărescu, 1961
(type *Cyprinus uranoscopus* Agassiz)
Romanogobio Bănărescu, 1961
(type *Gobio kessleri* Dybowski)
Schizothoraxichthys Misra, 1962
(type *Schizothorax esocinus* Heckel)
Ancherythroculter Yih et Wu, Ch. K. (in Wu, H. W.), 1964
(type *Chanodichthys kurematsui* Kimura)
Oxygymnocypris Tsao (in Wu), 1964
(type *Schizothorax stewartii* Lloyd)
Tetrostichodon Tchang, Yueh et Hwang, 1964[4]
(type *Schizothorax o'connori* Lloyd)
Paraschizothorax Tsao (in Wu), 1964[5]
(type *Schizothorax o'connori* Lloyd)
†*Evomus* Uyeno et Miller, 1965
(type *Evomus navaho* Uyeno et Miller)
Pseudoxygaster Bănărescu, 1967
(type *Cyprinus gora* Hamilton-Buchanan)

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[1] preoccupied in *Pisces;* see *Estevea* Whitley, 1953
[2] a substitute for *Bertinius* Fang, 1943 (= preoccupied in *Molusca*)
[3] a substitute for *Hemigrammocapoeta Estève, 1952* (= preoccupied in *Pisces*)
[4] see *Paraschizothorax* Tsao, 1964
[5] syn. nov. of *Tetrostichodon* Tchang, Yueh et Hwang, 1964

GYRINOCHEILIDAE

Gyrinocheilops Fowler, 1937[1]
(type *Gyrinocheilops pennocki* Fowler)

PSILORHYNCHIDAE

Parapsilorhynchus Hora, 1921
(type *Parapsilorhynchus discophorus* Hora)

CATOSTOMIDAE

†*Catostomides* Schlaikjer, 1937
(type *Catostomides alaskensis* Schlaikjer)
Megapharynx Legendre, 1942
(type *Moxostoma valenciennesi* Jordan)

HOMALOPTERIDAE

Chopraia Prashad et Mukerji, 1929
(type *Chopraia rupicola* Prashad et Mukerji)
Sinogastromyzon Fang, 1930
(type *Sinogastromyzon wui* Fang)
Sinohomaloptera Fang, 1930
(type *Homaloptera kwangsiensis* Fang)
Homalopterula Fowler, 1939
(type *Homalopterula ripleyi* Fowler)
Travancoria Hora, 1941
(type *Travancoria jonesi* Hora)
Metahomaloptera Chang, 1944
(type *Metahomaloptera omeiensis* Chang)
Neohomaloptera Herre, 1944
(type *Homaloptera johorensis* Herre)
Balitoropsis H. M. Smith, 1945
(type *Balitoropsis bartschi* H. M. Smith)

GASTROMYZONIDAE

Pseudogastromyzon Nichols, 1925d
(type *Hemimyzon zebroidus* Nichols)
Annamia Hora, 1932
(type *Parhomaloptera normani* Hora)

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[1] synonyme of *Gyrinocheilus* Vaillant, 1902 (sec. Smith, 1945)

Beaufortia Hora, 1932
(type *Gastromyzon leveretti* Nichols et Pope)
Protomyzon Hora, 1932
(type *Homaloptera whiteheadi* Vaillant)
Sewellia Hora, 1932
(type *Balitora lineolata* Valenciennes)
Vanmanenia Hora, 1932[1]
(type *Homalosoma stenosoma* Boulenger)
Liniparhomaloptera Fang, 1935b
(type *Parhomaloptera disparis* Lin)
Praeformosiana Fang, 1935b
(type *Praeformosiana pingchowensis* Fang)
Paraprotomyzon Pellegrin et Fang, 1935
(type *Parapromyzon multifasciatus* Pellegrin et Fang)
Progastromyzon Hora et Jayaram, 1951
(type *Progastromyzon griswoldi* Hora et Jayaram)
Pseudohomaloptera Silas, 1952
(type *Homaloptera tateregani* Popta)

COBITIDAE

Cobitinula Hankó, 1924
(type *Cobitinula anatoliae* Hankó)
Yunnanilus Nichols, 1925b
(type *Nemachilus pleurotaenia* Regan)
Homatula Nichols, 1925b
(type *Nemachilus potanini* Günther)
Cobitophis Myers, 1927
(type *Acanthophthalmus anguillaris* Vaillant)
Enobarbus Whitley, 1928[2]
(type *Platacanthus maculatus* Day)
Sabanejewia Vladykov, 1929
(type *Cobitis balcanica* Karaman)
Enobarbichthys Whitley, 1931b[3]
(type *Platacanthus maculatus* Day)
Triplophysa Rendahl, 1933b
(type *Nemacheilus hutjertjuensis* Rendahl)
Tauphysa Rendahl, 1933b
(type *Nemacheilus kungessanus* Kessler)
Hedinichthys Rendahl, 1933b
(type *Nemacheilus yarakandensis* Day)

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[1] a substitute for *Homalosoma Boulenger, 1901* (= preoccupied in *Reptilia*)
[2] preoccupied in *Aves;* see *Enobarbichthys* Whitley, 1931 and also *Madrasia* Nalbant, 1963
[3] a substite for *Enobarbus Whitley, 1928* (= preoccupied in *Aves*) and *Jerdonia* Day, 1870 (= preoccupied in *Mollusca*); see also *Madrasia* Nalbant, 1963

Deuterophysa Rendahl, 1933b[1]
(type *Diplophysa strauchi* Kessler)
Acanthopsoides Fowler, 1934a
(type *Acanthopsoides gracilis* Fowler)
Mesomisgurnus Fang, 1935a
(type *Nemachilus bipartitus* Sauvage et Dabry)
Paralepidocephalus Tchang, 1935
(type *Paralepidocephalus yui* Tchang)
Sinibotia Fang, 1963a
(type *Botia superciliaris* Günther)
Pogonoemacheilus Fowler, 1937
(type *Nemacheilus masyae* H. M. Smith)
Eonemachilus Berg, 1938
(type *Nemachilus nigromaculatus* Regan)
Micronemacheilus Rendahl, 1944
(type *Nemacheilus cruciatus* Rendahl)
Neacanthopsis H. M. Smith, 1945
(type *Neacanthopsis gracilentus* H. M. Smith)
Didymnophysa Whitley, 1950[2]
(type *Diplophysa strauchi* Kessler)
Diplophysoides Fowler, 1958[3]
(type *Diplophysa strauchi* Kessler)
Acanestrina Băcescu, 1962
(type *Cobitis elongata* Heckel et Knerr)
Nivaëlla Nalbant, 1963
(type *Cobitis delicata* Niwa)
Madrasia Nalbant, 1963[4]
(type *Platacanthus maculatus* Day)
Turcinoemacheilus Bănărescu et Nalbant, 1964
(type *Turcinoemacheilus kosswigi* Bănărecu et Nalbant)
Oxynoemacheilus Bănărescu et Nalbant, 1966
(type *Cobitis persa* Heckel)

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[1] preoccupied in *Lepidoptera;* see *Didymnophysa* Whitley, 1950 and also *Diplophysoides* Fowler, 1958

[2] a substitute for *Deuterophysa* Rendahl, 1933 (= preoccupied in *Lepidoptera*) and *Diplophysa Kessler, 1874* (= preoccupied in *Coelenterata*); see also *Diplophysoides* Fowler, 1958

[3] syn. nov. of *Didymnophysa* Whitley, 1950

[4] syn. nov. of *Enobarbichthys* Whitley, 1931.

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