

## B.

### A SYNOPSIS OF THE FAMILY CATOSTOMIDÆ.

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## CLASS PISCES.

### SUBCLASS TELEOSTEI.

#### ORDER TELEOCEPHALI.

#### SUBORDER EVENTOGNATHI.

#### FAMILY CATOSTOMIDÆ.

*Catostomoidæ* GILL, Proc. Acad. Nat. Sc. Phila. v. 13, p. 8, 1861.

*Catostomidæ* COPE, Proc. Am. Assoc. Adv. Sci. v. 20, p. 332, 1872.

*Catostomidæ* JORDAN, Man. Vert. E. U. S. p. 292, 1876.

*Cyprinidæ* gen. RAFINESQUE, RISSO, CUVIER, BONAPARTE, GIRARD, BLEEKER.

*Cyprinidæ* subfam. HECKEL, AGASSIZ, BLEEKER, GÜNTHER.

The family of *Catostomidæ*, or the "Suckers", may be briefly defined as follows:—*Eventognathous* fishes, having the pharyngeal teeth pectiniform, in a single row, closely approximated, very numerous, and compressed at right angles to the direction of the bone, and the intermaxillaries forming but a small part of the upper arch of the mouth, the maxillaries entering into it largely on each side.\*

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\* The following more elaborate diagnosis is given by Professor Gill (Johnson's Universal Cyclopædia, vol. iv, p. 1574):—"The body varies between an elongated subcylindrical and an oblong more or less compressed contour; the scales are of medium or rather large size, cycloid; the lateral line is generally present and decurved, but some-

Early writers on fishes, as well as most foreign ichthyologists, have considered the Suckers as forming a mere tribe or subfamily of the *Cyprinidæ*, which group has been variously denominated *Catostomi*, *Catostomina*, and *Catostominae*, but the characters above noted, of teeth and mouth, seem to the writer to fully justify their separation as a distinct family. The dorsal fin in *Catostomidæ* is more developed than is usual in American *Cyprinidæ*, although various Old World genera show similar characters. The development of the lips and the great protractility of the mouth are features usually diagnostic, but in the genus *Quassi'abia* the mouth is scarcely protractile, and among our *Cyprinidæ* certain species of *Phenacobius* and *Ceratichthys* have thicker lips than have some of the *Catostomidæ*.

The *Catostomidæ* fall at once into three well-marked subfamilies, first indicated by Professor Gill, and termed by him *Catostominae*, *Cycleptinae*, and *Bubalichthyinae*. These may be characterized as follows:—

*Catostominae*.—Body oblong or elongate, subterete or more or less compressed: dorsal fin nearly median, short and subquadrate, with from nine to eighteen developed rays: ventral fins under the dorsal, of nine or ten rays: anal fin high and short, normally of seven rays, nearer the base of the caudal than that of the ventral fins: lips well developed, usually papillose or plicate: gill-rakers little developed. Genera *Quassilabia*, *Placopharynx*, *Myxostoma*, *Erimyzon*, *Minytrema*, *Chasmistes*, *Catostomus*, *Pantosteus*.

*Cycleptinae*.—Body elongate, slender: dorsal fin falciform, of about 30 rays, beginning over the interval between the pectoral and ventral fins, and extending as far back as the beginning of the anal fin: ventral fins 10 rayed; anal fin small, of about 7 rays: head extremely small: scales moderate, with the exposed surfaces broad: fontanelle entirely obliterated;

times absent; the head is diversiform; the opercular bones normally developed; the nostrils double; the mouth more or less inferior, and provided with fleshy and generally papillose or crenated lips; the upper jaw is formed on the middle by the small and lamelliform internaxillaries, and on the sides by the supramaxillaries; teeth are wanting in the jaw; the pharyngeal bones are developed in a falciform manner, and provided with a row of numerous comb-like teeth; the branchial apertures are restricted to the sides; branchiostegal rays three on each side; dorsal variable in development; anal posterior, and generally short and high; caudal large, and more or less emarginated; pectoral fins low down, but lateral and with their rays branched; ventral fins abdominal; the intestinal canal is very long; the stomach simple and destitute of pyloric cæca; the air-bladder is large, unprotected by an osseous capsule, and divided by transverse constrictions into two or three regions."

ated by the union of the parietal bones: mouth inferior, with thick papillose lips: gill-rakers moderate, soft. Genus *Cycleptus*.

*Bubalichthyinæ*.—Body stout, oblong-oval, and compressed. Dorsal fin elongate, beginning more or less in front of the ventral fins, and extending at least as far as the commencement of the anal, its rays 20 to 50 in number, the anterior ones more or less elongate: ventral rays usually 10: anal rays 8 to 12: head stout and heavy: mouth moderate or small, with thin lips: fontanelle open: gill-rakers of anterior arch long, slender, and stiff above, growing smaller downwards. Genera *Carpiodes*, *Bubalichthys*, *Ichthyobus*, *Myxocyprinus*.

As the chief purpose of this paper is to ascertain and make known the proper nomenclature of the valid genera and species of *Catostomidæ*, I shall omit further discussion of family and subfamily characters, and proceed at once to a catalogue of described species, arranged in chronological order, with the date and my identification of each species opposite its name. As is the case in nearly every group of American fishes, the number of nominal species is about three times the number really existing. It will be noticed that the number of species which I have admitted is in most of the Catostomoid genera fewer than has been recognized by previous writers. This seems to me to result not from any peculiar theories as to what constitutes a species, but from the fact that I have had a greater range of specimens of most forms than any previous writer has had. I am confident that in the presence of a still greater amount of material, the characters of several other species will be found to melt away. To indicate which these species are, in default of such material, would, however, be an unprofitable task. In this group, as in so many others, the truth well stated by Dr. Coues\* becomes apparent:—“We can only predicate and define species at all from the mere circumstance of *missing links*. ‘Species’ are the twigs of a tree separated from the parent stems. We name and arrange them arbitrarily, in default of a means of reconstructing the whole tree according to Nature’s ramifications.”

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\* Birds of the Northwest, p. 227.

*List of Nominal Species of Catostomidae, with Identifications.*

Nominal species.	Date.	Identification.
Cyprinus catostomus Forster.....	1773	Catostomus longirostris.
" <i>Le cyprin commersonien</i> "* Lacépède....	1803	Catostomus teres.
Cyprinus sucetta Lacépède.....	1803	Erimyzon sucetta.
Cyprinus rostratus Tilesius.....	1813	(Catostomus) rostratus.
Cyprinus teres Mitchill.....	1814	Catostomus teres.
Cyprinus oblongus Mitchill.....	1814	Erimyzon sucetta.
Catostomus cyprinus Le Sueur.....	1817	Carpiodes cyprinus.
Catostomus gibbosus Le Sueur.....	1817	Erimyzon sucetta.
Catostomus tuberculatus Le Sueur....	1817	Erimyzon sucetta.
Catostomus macrolepidotus Le Sueur..	1817	Myxostoma macrolepidotum.
Catostomus aureolus Le Sueur.....	1817	Myxostoma anreolum.
Catostomus communis Le Sueur.....	1817	Catostomus teres.
Catostomus longirostrum Le Sueur....	1817	Catostomus longirostris.
Catostomus nigricans Le Sueur.....	1817	Catostomus nigricans.
Catostomus maculosus Le Sueur.....	1817	Catostomus nigricans.
Catostomus elongatus Le Sueur.....	1817	Cycleptus elongatus.
Catostomus vittatus Le Sueur.....	1817	Erimyzon sucetta.
Catostomus duquesnii Le Sueur.....	1817	Myxostoma macrolepidotum duquesni.
Catostomus bostoniensis Le Sueur....	1817	Catostomus teres.
Catostomus hudsonius Le Sueur.....	1817	Catostomus longirostris.
Catostomus bubalus Rafinesque.....	1818	Ichthyobus bubalus.
Catostomus erythrurus Rafinesque....	1818	Myxostoma macrolepidotum duquesni.
Exoglossum macropterum Rafinesque..	1818	Catostomus nigricans.
Amblodon niger Rafinesque.....	1819	Bubalichthys sp. ?
Cycleptus nigrescens Rafinesque.....	1819	Cycleptus elongatus.
Rutilus melanurus Rafinesque.....	1820	Myxostoma macrolepidotum duquesni.
Catostomus anisurus Rafinesque.....	1820	Myxostoma anisura.
Catostomus anisopterus Rafinesque....	1820	Carpiodes sp.
Catostomus carpio Rafinesque.....	1820	Carpiodes carpio.
Catostomus velifer Rafinesque.....	1820	Carpiodes velifer.
Catostomus xanthopus Rafinesque.....	1820	Catostomus nigricans.
Catostomus melanops Rafinesque.....	1820	Minytrema melanops.
Catostomus fasciolaris Rafinesque....	1820	Erimyzon sucetta.
Catostomus flexuosus Rafinesque.....	1820	Catostomus teres.
Catostomus megastomus Rafinesque..	1820	<i>A myth.</i>
Catostomus forsterianus Richardson...	1823	Catostomus longirostris.
Catostomus lesueurii Richardson.....	1823	Myxostoma anreolum.

\*This species is quoted by Dr. Günther as "*Cyprinus commersonii* Lacépède". I have been unable to examine Lacépède's original work, but in the reprints of it, supposed to be literal, I find only the French form, "*Le Cyprin Commersonien*". Unless Lacépède really bestowed a Latinized specific name on the species, "*commersoni*" or "*commersonianus*" should not claim priority over *teres* of Mitchill.

*List of Nominal Species of Catostomidae, with Identifications—Continued.*

Nominal species.	Date.	Identification.
<i>Cyprinus</i> ( <i>Catostomus</i> ) <i>sneurii</i> Rich. . . . .	1836	<i>Myxostoma aureolum</i> ?
<i>Cyprinus</i> ( <i>Catostomus</i> ) <i>reticulatus</i> Rich. . . . .	1836	<i>Catostomus teres</i> .
<i>Catostomus gracilis</i> Kirtland . . . . .	1838	<i>Catostomus teres</i> .
<i>Labeo elegans</i> DeKay . . . . .	1842	<i>Erimyzon sucetta</i> .
<i>Labeo esopus</i> DeKay . . . . .	1842	<i>Erimyzon sucetta</i> .
<i>Catostomus oneida</i> DeKay . . . . .	1842	<i>Myxostoma macrolepidotum</i> .
<i>Catostomus pallidus</i> DeKay . . . . .	1842	<i>Catostomus teres</i> .
<i>Labeo elongatus</i> DeKay . . . . .	1842	<i>Erimyzon sucetta</i> .
<i>Catostomus fasciatus</i> Le Sueur, MSS. . . . .	1844	<i>Minytrema melanops</i> .
<i>Catostomus planiceps</i> Valenciennes . . . . .	1844	<i>Catostomus nigricans</i> .
<i>Catostomus carpio</i> Valenciennes . . . . .	1844	<i>Myxostoma carpio</i> .
<i>Catostomus tilesii</i> Valenciennes . . . . .	1844	( <i>Catostomus</i> ) <i>rostratus</i> .
<i>Sclerognathus cyprinella</i> Valenciennes . . . . .	1844	<i>Ichthyobus bubalus</i> .
<i>Catostomus forsterianus</i> Agassiz . . . . .	1850	<i>Catostomus teres</i> .
<i>Catostomus aurora</i> Agassiz . . . . .	1850	<i>Catostomus longirostris</i> .
<i>Catostomus latipinnis</i> Baird & Girard . . . . .	1853	<i>Catostomus latipinnis</i> .
<i>Carpiodes urus</i> Agassiz . . . . .	1854	<i>Bubalichthys urus</i> .
<i>Carpiodes taurus</i> Agassiz . . . . .	1854	<i>Bubalichthys</i> sp.
<i>Carpiodes bison</i> Agassiz . . . . .	1854	<i>Carpiodes bison</i> .
<i>Carpiodes vitulus</i> Agassiz . . . . .	1854	<i>Bubalichthys</i> sp.
<i>Carpiodes vacca</i> Agassiz . . . . .	1854	<i>Carpiodes cyprinus</i> .
<i>Catostomus congestus</i> Baird & Girard . . . . .	1854	<i>Myxostoma congestum</i> .
<i>Catostomus clarki</i> Baird & Girard . . . . .	1854	<i>Catostomus clarki</i> .
<i>Catostomus insignis</i> Baird & Girard . . . . .	1854	<i>Catostomus insignis</i> .
<i>Catostomus plebeius</i> Baird & Girard . . . . .	1854	<i>Pantosteus plebeius</i> .
<i>Carpiodes tumidus</i> Baird & Girard . . . . .	1854	<i>Carpiodes cyprinus</i> .
<i>Catostomus occidentalis</i> Ayres . . . . .	1854	<i>Catostomus occidentalis</i> .
<i>Ichthyobus rauchii</i> Agassiz . . . . .	1855	<i>Ichthyobus bubalus</i> .
<i>Ichthyobus stolleyi</i> Agassiz . . . . .	1855	<i>Ichthyobus bubalus</i> .
<i>Moxostoma tenue</i> Agassiz . . . . .	1855	<i>Erimyzon oblongus</i> .
<i>Carpiodes thompsoni</i> Agassiz . . . . .	1855	<i>Carpiodes thompsoni</i> .
<i>Bubalichthys niger</i> Agassiz . . . . .	1855	<i>Bubalichthys urus</i> .
<i>Bubalichthys bubalus</i> Agassiz . . . . .	1855	<i>Bubalichthys bubalus</i> .
<i>Bubalichthys bonasus</i> Agassiz . . . . .	1855	<i>Bubalichthys urus</i> .
<i>Catostomus occidentalis</i> Agassiz . . . . .	1855	<i>Catostomus occidentalis</i> .
<i>Catostomus labiatus</i> Ayres . . . . .	1855	<i>Catostomus labiatus</i> .
<i>Carpiodes damalis</i> Girard . . . . .	1856	<i>Carpiodes cyprinus</i> .
<i>Moxostoma claviformis</i> Girard . . . . .	1856	<i>Erimyzon sucetta</i> .
<i>Moxostoma kennerlyi</i> Girard . . . . .	1856	<i>Erimyzon sucetta</i> .
<i>Moxostoma victoriae</i> Girard . . . . .	1856	<i>Minytrema melanops</i> .
<i>Moxostoma campbelli</i> Girard . . . . .	1856	<i>Erimyzon sucetta</i> .
<i>Ptychostomus albidus</i> Girard . . . . .	1856	<i>Myxostoma albidum</i> .
<i>Ptychostomus haydeni</i> Girard . . . . .	1856	<i>Minytrema melanops</i> .

*List of Nominal Species of Catostomida, with Identifications—Continued.*

Nominal species.	Date.	Identification.
<i>Catostomus (Acomus) guzmanensis</i> Gir.	1856	<i>Catostomus latipinnis</i> .
<i>Catostomus (Acomus) generosus</i> Girard.	1856	<i>Pantosteus generosus</i> .
<i>Catostomus (Acomus) griseus</i> Girard...	1856	<i>Catostomus longirostris</i> .
<i>Catostomus (Acomus) lactarius</i> Girard.	1856	<i>Catostomus longirostris</i> .
<i>Catostomus macrocheilus</i> Girard.....	1856	<i>Catostomus macrochilus</i> .
<i>Catostomus sucklii</i> Girard.....	1856	<i>Catostomus teres</i> .
<i>Catostomus bernardini</i> Girard.....	1856	<i>Catostomus occidentalis</i> .
<i>Catostomus texanus</i> Abbott .....	1860	<i>Catostomus teres</i> .
<i>Catostomus chloropteron</i> Abbott.....	1860	<i>Catostomus teres</i> .
<i>Carpiodes asiaticus</i> Bleeker.....	1864	<i>Myxocyprinus asiaticus</i> .
<i>Teretulus cervinus</i> Cope.....	1868	<i>Myxostoma cervinum</i> .
<i>Sclerognathus meridionalis</i> Günther ...	1868	<i>Bubalichthys meridionalis</i> .
<i>Placopharynx carinatus</i> Cope.....	1870	<i>Placopharynx carinatus</i> .
<i>Ptychostomus papillosum</i> Cope.....	1870	<i>Myxostoma papillosum</i> .
<i>Ptychostomus velatus</i> Cope.....	1870	<i>Myxostoma velatum</i> .
<i>Ptychostomus collapsus</i> Cope.....	1870	<i>Myxostoma velatum</i> .
<i>Ptychostomus pidiensis</i> Cope.....	1870	<i>Myxostoma pidiense</i> .
<i>Ptychostomus coregonus</i> Cope.....	1870	<i>Myxostoma coregonus</i> .
<i>Ptychostomus albus</i> Cope.....	1870	<i>Myxostoma album</i> .
<i>Ptychostomus thalassinus</i> Cope.....	1870	<i>Myxostoma thalassinum</i> .
<i>Ptychostomus robustus</i> Cope.....	1870	<i>Myxostoma macrolepidotum</i> .
<i>Ptychostomus lachrymalis</i> Cope.....	1870	<i>Myx. macrolepidotum lachrymale</i> .
<i>Ptychostomus crassilabris</i> Cope.....	1870	<i>Myxostoma crassilabre</i> .
<i>Ptychostomus breviceps</i> Cope.....	1870	<i>Myxostoma anisura</i> .
<i>Ptychostomus conus</i> Cope.....	1870	<i>Myxostoma conus</i> .
<i>Carpiodes difformis</i> Cope.....	1870	<i>Carpiodes difformis</i> .
<i>Carpiodes cutisanserinus</i> Cope.....	1870	<i>Carpiodes cutisanserinus</i> .
<i>Carpiodes selene</i> Cope.....	1870	<i>Carpiodes cutisanserinus</i> .
<i>Carpiodes grayi</i> Cope.....	1870	<i>Carpiodes cyprius</i> .
<i>Carpiodes nummifer</i> Cope.....	1870	<i>Carpiodes carpio</i> .
<i>Catostomus discobolus</i> Cope.....	1872	<i>Catostomus discobolus</i> .
<i>Minomus delphinus</i> Cope.....	1872	<i>Pantosteus (plebeius?)</i> .
<i>Minomus bardus</i> Cope.....	1872	<i>Pantosteus (plebeius?)</i> .
<i>Ptychostomus bucco</i> Cope.....	1872	<i>Myxostoma congestum</i> .
<i>Minomus platyrhynchus</i> Cope.....	1874	<i>Pantosteus platyrhynchus</i> .
<i>Minomus jarrovii</i> Cope.....	1874	<i>Pantosteus generosus</i> .
<i>Catostomus alticolus</i> Cope.....	1874	<i>Catostomus teres</i> .
<i>Ichthyobus cyanellus</i> Nelson.....	1876	<i>Bubalichthys bubalus</i> .
<i>Pantosteus virescens</i> Cope.....	1876	<i>Pantosteus virescens</i> .
<i>Catostomus fecundum</i> Cope & Yarrow.	1876	<i>Chasmistes fecundus</i> .
<i>Moxostoma trisignatum</i> Cope.....	1876	<i>Catostomus teres</i> .
<i>Ichthyobus ischyus</i> Nelson.....	1877	<i>Ichthyobus bubalus</i> .
<i>Bubalichthys altus</i> Nelson.....	1877	<i>Bubalichthys bubalus</i> .

*List of Nominal Species of Catostomidæ, with Identifications—Continued.*

Nominal species.	Date.	Identification
<i>Myxostoma enryops</i> Jordan .....	1877	<i>Myxostoma enryops</i> .
<i>Bubalichthys bubalius</i> Jordan .....	1877	<i>Bubalichthys bubalus</i> .
<i>Myxostoma pœcilura</i> Jordan .....	1877	<i>Myxostoma pœcilura</i> .
<i>Lagochila lacera</i> Jordan & Brayton....	1877	<i>Quassilabia lacera</i> .
<i>Erimyzon goodei</i> Jordan .....	1878	<i>Erimyzon goodei</i> .
<i>Catostomus aræopus</i> Jordan .....	1878	<i>Catostomus aræopus</i> .
<i>Catostomus retropinnis</i> Jordan .....	1878	<i>Catostomus retropinnis</i> .

## ANALYSIS OF GENERA OF CATOSTOMIDÆ.

\* Dorsal fin short, subquadrate, with ten to eighteen developed rays: body oblong or elongate: gill-rakers feeble. (*Catostominæ*.)

a. Mouth singular, the upper lip not protractile, greatly enlarged, the lower lip developed as two separate lobes: operculum very short: air-bladder in three parts: scales large: fontanelle well developed: lateral line present: pharyngeal bones and teeth ordinary.....QUASSILABIA, 1.

aa. Mouth normal, the lower lip entire or merely lobed, either tubercular or plicate.

b. Air-bladder in three parts: lateral line continuous: fontanelle present: scales large, subequal.

c. Pharyngeal bones very strong, with the lower teeth much enlarged, subcylindrical and truncate, the teeth of the upper part of the bone small and compressed: mouth large, somewhat oblique, with very thick lips .....PLACOPHARYNX, 2.

cc. Pharyngeal bones moderate, the teeth compressed, gradually larger downwards: mouth moderate or small, the lips usually plicate.

MYXOSTOMA, 3.

bb. Air-bladder in two parts.

d. Lateral line interrupted or wanting: scales large (40 to 50 in the course of the lateral line): lips plicate.

e. Lateral line incomplete, obsolete in the young, becoming developed in the adult, but always more or less interrupted: mouth small, inferior.

MINYTREMA, 4.

ee. Lateral line entirely wanting: mouth somewhat oblique..ERIMYZON, 5.

dd. Lateral line complete and continuous: scales small, 55 to 115 in the course of the lateral line.

f. Fontanelle present.

g. Mouth very large, terminal, oblique: lips thin, nearly smooth.

CHASMISTES, 6.

gg. Mouth inferior, moderate or small, with thick, papillose lips.

CATOSTOMUS, 7.

ff. Fontanelle obliterated by the union of the parietal bones: mouth small, inferior, with thick, papillose lips, the lower jaw provided with a cartilaginous sheath.....PANTOSTEUS, 8.

- \*\* Dorsal fin elongate, more or less elevated in front, of about 25 or more developed rays: air bladder in two parts.
- † Fontanelle obliterated by the union of the parietal bones: head short and small: body elongate. (*Cycleptinae*.)
- h. Mouth small, inferior, with very thick, papillose lips: scales small, 55 to 60 in the course of the lateral line .....CYCLEPTUS, 9.
- †† Fontanelle well developed: head large: body oblong or ovate: scales large, 35 to 45 in the course of the lateral line. (*Bubalichthyinae*.)
- i. Dorsal rays in moderate number (24 to 33).
- j. Mouth comparatively small, inferior, protractile downwards.
- k. Pharyngeal bones narrow, with the teeth comparatively thin and weak. CARPIODES, 10.
- kk. Pharyngeal bones strong, the teeth comparatively coarse and large, increasing in size downwards.....BUBALICHTHYS, 11.
- jj. Mouth quite large, terminal, protractile forwards: pharyngeal bones and teeth moderate: lips thin, nearly smooth .....ICHTHYOBUS, 12.
- ii. Dorsal fin very long, of about 50 developed rays .....MYXOCYPRINUS, 13

### Genus QUASSILABIA *Jordan & Brayton*.

*Lagochila* JORDAN & BRAYTON, Proc. Ac. Nat. Sc. Phila. 280, 1877. (Preoccupied in conchology as *Lagochilus*.)

*Quassilabia* (JORDAN & BRAYTON) JORDAN, Man. Vert. E. U. S. ed. 2d, 401, 1878.

Type, *Lagochila lacera* Jordan & Brayton.

Etymology, *quassus*, broken or torn; *labia*, lip.

Suckers like *Myxostoma* in every respect excepting the structure of the mouth and opercula. Head shortish, conical, with lengthened snout; its length  $4\frac{1}{2}$  to 5 times in that of the body, the opercular region being reduced, so that the eye is well backwards: suborbital bones narrow: fontanelle large, widely open. Mouth large, singular in structure, inferior, the upper lip not protractile, greatly prolonged, closely plicate. Lower lip much reduced, divided into two distinct elongate lobes, which are weakly papillose. The split between these lobes extends backwards to the edge of the dentary bones, which are provided with a rather hard, horny plate, as in *Pantosteus*. The lower lip is entirely separated from the upper at the angles by a deep fissure. The skin of the cheeks forms a sort of cloak over this fissure, the crease separating this skin from the mouth extending up on the sides of the muzzle. The crease between the lips extends down on the under side of the head. System of muciferous tubes well developed.

Pharyngeal bones not dissimilar from the usual type in *Myxostoma*, rather weak, with numerous small teeth.

Body elongate, not much compressed, not elevated. Fins moderate, of precisely the type usual in *Myxostoma*.

Scales large, precisely as in *Myxostoma*, the lateral line well developed and nearly straight, with about 45 scales in its course.

Air-bladder in three parts.

Sexual peculiarities unknown; probably little marked.

But a single species of this genus is known. It is a sort of offshoot from the genus *Myxostoma*, but its non-protractile mouth and singular lower lip would seem to indicate some real affinity with the genus *Exoglossum*.

The name *Lagochilus* had been previously applied to a genus of Gasteropods by Blanford, and to a genus of Insects by Loew. As *Lagochila* is substantially the same word, with the same etymology, and as, if written in strict correctness, it would be *Lagochilus* also, its authors have seen fit to substitute the name *Quassilabia*, and thus to forestall all discussion as to whether the name *Lagochila* should be retained. As this substitution was made soon after the original description of the genus, and before the name *Lagochila* had come into any general use, it is to be hoped that it will be accepted by succeeding ichthyologists.

*Generic Characterizations.*

LAGOCHILA Jordan & Brayton, 1877.—“Similar to *Myxostoma* (*Ptychostomus* Agassiz) except in the structure of the mouth parts. Dorsal fin short; lateral line well developed; scales large, subequal; air-bladder in three parts; fontanelle between parietal bones well developed; pharyngeal bones weak, with numerous small teeth; upper lip not all protractile, greatly enlarged, but attenuated, and singular in form. It consists of two elongated and narrow lobes, separated by a narrow, deep fissure, which extends inward to the edge of the mandible proper, which seems to be armed with a rather hard or almost horny plate, about as in the genus *Pantosteus*. The two lobes of the lip are weakly papillose. The lower lip is entirely separated from the upper at the angles by a deep fissure. Over this fissure the skin of the cheek lies as a sort of cloak; the crease separating this skin from the mouth, extending up on the sides of the muzzle. The fissure between the lips extends down on the skin of the under side of the head. The opercle is extremely short and the eye is entirely in the posterior part of the head.”—(JORDAN & BRAYTON, *Proc. Ac. Nat. Sc. Phila.* p. 280, 1877.)

QUASSILABIA Jordan & Brayton, 1878.—“When the name *Lagochila* was first proposed for this genus, its authors were not aware that the masculine form, *Lagochilus*, had been already given to two different genera, to one of Gasteropods by Blanford and to one of Insects by Loew. The words *Lagochila* and *Lagochilus* are identical in etymology and in all except terminations, and many writers would consider them insufficiently distinct, and would hold that the name *Lagochila* should be changed. At present, I am inclined to the contrary opinion; nevertheless, as the matter stands, and as the name *Lagochila* has not yet come into general use, less confusion perhaps will result from renaming the genus, than from any other course. The name *Quassilabia* (Jordan & Brayton) is accordingly suggested as a substitute for *Lagochila*, considered to be preoccupied in conchology. The etymology is *quassus*, broken or torn; *labia*, lip.

The case is precisely like that of the genus of Doves, *Leptoptila* Swainson, lately named *Æchmoptila* by Dr. Cones, on account of the previous *Leptoptilus* of Lesson."—(JORDAN, *Bull. U. S. Geol. Surv. Terr.* vol iv, No. 2, p. 418, 1878.)

## ANALYSIS OF SPECIES OF QUASSILABIA.

\*Head short, conical, with lengthened snout, the region between the eyes flattened and with prominent mucous ridges: cheeks and lower part of head rather swollen: opercle much reduced, its greatest length scarcely greater than the diameter of the eye: head about  $4\frac{2}{3}$  in length: eye  $4\frac{1}{3}$  in length of head, about 2 in length of the snout, its situation thus quite posterior; length of the top of the head  $1\frac{2}{3}$  in the distance from the snout to the base of the dorsal. Body rather slender, the form being between that of *Myxostoma cervinum* and *M. macrolepidotum*, the depth  $4\frac{2}{3}$  in the length. Dorsal fin rather low; its rays I, 12; A. I, 7; V. 9. Scales 5–45–5. Color olive or bluish-brown above; sides and belly silvery; lower fins faintly orange...LACERA, 1.

1. QUASSILABIA LACERA *Jordan & Brayton.*

*Hare-lip Sucker. Split-mouth Sucker. May Sucker of the Scioto. Cut-lips.*

1877—*Lagochila lacera* JORDAN & BRAYTON, *Proc. Ac. Nat. Sc. Phila.* 280, 1877.

*Lagochila lacera* JORDAN, *Man. Vert.* ed. 2d, 511, 1878.

*Quassilabia lacera* JORDAN, *Man. Vert.* ed. 2d, 406, 1878.

*Quassilabia lacera* JORDAN, *Bull. U. S. Geol. Surv. Terr.* 418, 1878.

HABITAT.—Tennessee River. Scioto River.

Only three specimens of this singular Sucker are yet known. Two of these were taken by Professor Brayton and myself in the Chickamunga River at Ringgold, Catoosa County, Georgia, and the other in Elk River near Estill Springs, Tennessee. In both these streams, the species was well known to the fishermen, who said that it is one of the most abundant species in those waters, and one of the most highly valued for food. In the Chickamunga, it is known as the Hare-lip or Split-mouth Sucker. None of the specimens taken were mature, the largest being but ten inches long, so that its maximum size cannot be given.

Since the above was written, a fine large specimen has been sent to me by J. H. Klippart, Esq., of the Ohio Fish Commission. It was taken in Scioto River near Columbus, in April, 1878. Mr. Klippart informs me that the species is well known to the Scioto fishermen, who call it May Sucker, as it runs up the river in May. That so strongly marked a species has so long escaped the attention of ichthyologists in the State of Ohio is singular.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
—	Chickamunga River .....	D. S. Jordan.

## Genus PLACOPHARYNX Cope.

*Placopharynx* COPE, Proc. Am. Philos. Soc. Phila. 467, 1870.

Type, *Placopharynx carinatus* Cope.

Etymology,  $\pi\lambda\acute{\alpha}\xi$ , a broad surface;  $\phi\acute{\alpha}\rho\upsilon\gamma\acute{\xi}$ , pharynx.

Suckers like *Myxostoma* in all respects, except that the pharyngeal bones are much more developed, and the teeth reduced in number, those on the lower half of the bone very large, 6 to 10 in number, nearly cylindrical in form, being but little compressed, and with a broad, rounded or flattened grinding surface. The forms and positions of these enlarged teeth vary greatly. In a specimen before me, the first tooth is the highest and most compressed, its summit being rounded and then abruptly truncate. The second tooth is notably shorter and thicker, much larger, and rounded on top, the body of the tooth serving as a peduncle for the swollen grinding surface. The third tooth is still shorter and similar in form. The fourth tooth is similar to the first, being much higher than the second and third, and flat on top. The others seem to be irregularly alternated or arranged in pairs, a long one and a short one, the long teeth in all cases being the most truncated, as if their surfaces had been most worn off.

As I have at present no perfect specimens of this genus, nothing but very young specimens, and pharyngeal jaws of adults, I cannot do better than to copy Professor Cope's original description, which seems to be an accurate one. I substitute the generic names used in this paper (*Myxostoma*, etc.) for those used by Professor Cope (*Ptychostomus*, etc.), whenever a difference occurs:—

“Allied to *Myxostoma*. The pharyngeal teeth much reduced in number, only seven on the proximal half of the bone, cylindrical in form, with a broad, truncate triturating surface. These play against a broad, crescentic, chitin-like shield on the posterior roof of the pharyngeal cavity. Three divisions of the *vesica natatoria*.

“With a great superficial resemblance to *Myxostoma*, the masticatory apparatus is different from that of any *Catostomoid* form known to me, and combines peculiarities observed in some forms of true *Cyprinidæ*. The chitin-like shield is found in some of the latter; it is represented in *Catostomus*, *Myxostoma*, and *Carpiodes* by a narrow and very thin pellicle of the same material, frequently interrupted in the middle line.”

But one species of the genus is known. It is apparently widely distributed through the Mississippi Valley and the Great Lakes, but its

peculiarities are rarely noticed unless the pharyngeal teeth are exposed. The writer has obtained four sets of the pharyngeal jaws and one entire skeleton, but has seen only two small specimens, collected by Professor Brayton in the Illinois River, and has obtained none in life.

Since the foregoing was written, I have collected numerous large specimens in the French Broad River, North Carolina, where it is the most abundant member of the family, known to all fishermen as the "Red Horse". With a great superficial resemblance to the Northern Red Horse (*Myxostoma macrolepidotum*), *Placopharynx carinatus* differs from all the species of *Myxostoma* in its larger and more oblique mouth and extremely thick lips.

## 2. PLACOPHARYNX CARINATUS Cope.

*Big-jawed Sucker.*

1870—*Placopharynx carinatus* COPE, Proc. Am. Philos. Soc. Phila. 467, 1870.

*Placopharynx carinatus* JORDAN, Fishes of Ind. 221, 1875. (Name only.)

*Placopharynx carinatus* JORDAN, Man. Vert. 296, 1876.

*Placopharynx carinatus* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49, 1876.

*Placopharynx carinatus* JORDAN & COPELAND, Check List, 158, 1876. (Name only.)

*Placopharynx carinatus* JORDAN, Proc. Ac. Nat. Sc. Phila. 72, 1877.

*Placopharynx carinatus* JORDAN & GILBERT, in Klippart's Rept. 53, 1877. (Name only.)

*Placopharynx carinatus* KLIPPART, First Report Ohio Fish Commission, 86, 1877.

*Placopharynx carinatus* JORDAN, Bull. U. S. Nat. Mus. ix, 50, 1877. (Name only.)

*Placopharynx carinatus* JORDAN, Man. Vert. ed. 2d, 311, 1878.

*Placopharynx carinatus* JORDAN, Bull. U. S. Geol. Surv. vol. iv, No. 2, p. 417, 1878.

HABITAT.—Mississippi Valley and Upper Great Lakes. Wabash River (*Cope, Jordan*). Scioto River. Ohio River. Detroit River. Illinois River. French Broad River.

The following is Professor Cope's description of this species:—

"The physiognomy and proportions of this sucker are those of the *Pt. erythrurus* or the 'red horse' of the Western Rivers.

"The lips are large and plicate, the anterior pendent like that of the *P. collapsus*, the posterior full like that of *Pt. cervinus*. Muzzle vertically truncate. Length of head in that of body four times; depth of body in same 3.66 times; scales 6—41—5. Radii D. XIV, V. 9, A. 7. Free margin of dorsal straight, not elevated anteriorly. Occipital region more elevated medially than in *Pt. erythrurus*, superior ridges well marked, with a special addition characteristic of this species, and of none other with which I am acquainted. This is a median longitudinal frontal ridge, extending from the fontanelle to between the nasal ridges. Only

the posterior extremity of this ridge appears in some *Ptychostomi*. Orbit longitudinally oval, 4.5 times in length of head, twice in interorbital width. Type, fourteen inches in length.

“Color in alcohol like that of other species, uniform straw or whitish silvery.

“The pharyngeal bones of this species are much stouter than those of other species of its own and greater size, *e. g.*, *Pt. aureolus* of eighteen inches, where they are comparatively slight. The exteroposterior ala is twice as wide as the body inside the teeth is deep, and but for its short base and narrowed tip would do for that of a *Semotilus*. But while there are seven broad teeth without heel or cusp on the basal half, there are at least forty on the distal half, they becoming more compressed and finally like those of other allied genera. There are fourteen with truncate extremities. The pharyngeal plate has narrow horns directed upwards and forwards, and is thickened medially. It is placed immediately in advance of the opening of the œsophagus. I have but one specimen of this curious species, which I obtained at Lafayette, on the Wabash River, in Indiana.”

The writer has in his collection two young specimens obtained in Illinois River by Prof. Brayton, a skeleton of a very large individual found in Scioto River by Dr. J. W. Wheaton, and a pair of pharyngeal bones taken by Dr. G. M. Levette from a fish taken in the Wabash at Terre Haute. I have also seen a pair of pharyngeals and an air-bladder of one taken in Detroit River by Professor Baird, and now in the United States National Museum, and a jaw from “Post-pleiocene” deposits near the Falls of the Ohio, found by Dr. John Sloan. The jaws and air-bladder above noticed are the only specimens of this species preserved in the National Museum.

Since the foregoing was written, the writer has obtained numerous living specimens of *Placopharynx carinatus* from the French Broad at Wolf Creek and other localities in North Carolina. From one of these, the following description was taken:—

Body oblong, moderately compressed, heavy at the shoulders: head very large,  $3\frac{2}{3}$  in length of the body: eye small, behind the middle of the head: mouth extremely large, the lower jaw oblique when the mouth is closed, the mouth, therefore, protractile forwards as well as downwards: lips very thick, coarsely plicate, the lower lip full and heavy, truncate behind: head above evenly rounded, in my specimens not showing the carination described by Professor Cope: scales 6–45–6: dorsal rays 13; ventral 9: color brassy-green above; lower fins red.

Genus MYXOSTOMA (*Rafinesque*) *Jordan*.

*Catostomus* sp. LE SUEUR, and of all writers till 1855.

*Moxostoma* RAFINESQUE, Ichthyologia Ohiensis, 1820, 54. (Proposed as a subgenus for those species of *Catostomus* with eight ventral rays and the caudal lobes unequal: type *C. anisurus* Raf.)

*Teretulus* RAFINESQUE, Ichthyologia Ohiensis, 1820, 57. (As a subgenus, to include those species of *Catostomus* with nine ventral rays: no type designated—most of the species recorded belong to the present genus. *C. aureolus* Le Sueur is the species first mentioned, and to this species and its relatives the name *Teretulus* was afterwards restricted by Professor Cope.)

*Ptychostomus* AGASSIZ, American Journal of Science and Arts, 1855, p. 203. (No type designated: the species mentioned are *P. aureolus*, *P. macrolepidotus*, *P. duquesnii*, and *P. melanops*. *P. aureolus* has been considered the type of the genus.)

*Teretulus* COPE, Journ. Ac. Nat. Sc. Phila. 1868, 236.

*Moxostoma* JORDAN, Manual of Vertebrates, 1876, 295.

*Myxostoma* JORDAN, Ann. Lyc. Nat. Hist. 1877, 348. (Corrected orthography.)

Etymology,  $\mu\acute{\upsilon}\xi\omega$ , to suck;  $\sigma\acute{\tau}\omicron\mu\alpha$ , mouth.

Type, *Catostomus anisurus* Rafinesque.

Body more or less elongate, sometimes nearly terete, usually more or less compressed.

Head variously long or short, its length ranging from  $3\frac{1}{2}$  to  $5\frac{1}{2}$  in that of the body: eye usually rather large, varying from 3 to 6 times in the length of the side of the head, its position high up and median or rather posterior: suborbital bones very narrow, always much longer than broad, their width less than one-fourth that of the fleshy part of the cheek: fontanelle on top of head always well open, the parietal bones not coalescing.

Mouth varying much in size, always inferior in position, the mandible being horizontal or nearly so: lips usually well developed, the form of the lower varying in different sections of the genus, usually with a slight median fissure, but never deeply incised; the lips with transverse plicæ—the folds rarely so broken up as to form papillæ: jaws without conspicuous cartilaginous sheath: muciferous system considerably developed, a chain of tubes along the supraorbital region, a branch of which extends around behind the eye and forwards along the suborbital bones and the lower edge of the preorbital: opercular bones moderately developed, nearly smooth: isthmus broad: gill-rakers weak, moderately long, in length about half the diameter of the eye.

Pharyngeal bones rather weak, much as in *Erimyzon* and *Catostomus*,

the teeth rather coarser, strongly compressed, the lower five or six much stronger than the others, which are rapidly diminished in size upwards, each with a prominent internal cusp.

Scales large, more or less quadrate in form, nearly equal in size over the body, and not specially crowded anywhere, usually about 44 in the lateral line (41 to 56), and about twelve series between dorsal and ventrals. Lateral line well developed, straight or anteriorly decurved.

Fins well developed, the dorsal inserted about midway of the body, its first rays usually rather nearer snout than the caudal, the number of developed rays usually about 13, but varying in different species from 11 to 17: anal fin short and high, usually emarginate in the male fish, probably always with seven developed rays: ventrals inserted nearly under the middle of the dorsal; their number of rays normally 9, occasionally varying to 10; the occurrence of ten ventral rays is probably an accidental individual character, and not a permanent specific one: caudal fin deeply forked, the lobes about equal, except in two species.

*Air-bladder with three chambers*: skeleton essentially as in *Catostomus*, the vertebræ in *M. carpio* 27-14 (Günther).

Sexual peculiarities little marked, the males in the spawning season with the lower fins reddened, and the anal rays swollen and somewhat tuberculate.

This genus is widely diffused, some of its species occurring in all the waters of the United States east of the Rocky Mountains, excepting those of the New England States. Some of the more aberrant species seem to be quite local; other species are of the widest distribution. The principal species in the genus, although not the technical type, *M. macrolepidotum*, is very widely diffused, and is subject to much variation.

This genus is one readily recognizable by external appearance, its species being known to the fishermen as "*Red Horse*" and "*Mullet*"; those of other genera being called rather "*Suckers*". Its proper nomenclature has, however, been a subject of considerable uncertainty.

The subgenus *Moxostoma* was originally proposed by Rafinesque to include *C. anisurus* Raf., with the following diagnosis:—"Body oblong, compressed; head compressed, eight abdominal rays; dorsal fin commonly longitudinal; tail commonly unequally forked."

The characters here noticed are either common to several genera, or else merely specific, and the use of the generic name must depend on our identification of the original typical species. By some

process of reasoning not now explainable, Professor Agassiz identified this with the common Chub Sucker of the West, a species which I consider identical with *Cyprinus oblongus* Mitchill. He thus transferred the name *Moxostoma* from the "Red Horse" to the "Chub Sucker" group. Rafinesque's description, however, renders it evident that his fish was one of the Red Horse kind; and as *Moxostoma* is the first generic name applied to species of that group, it must be retained in spite of the incompleteness of the original diagnosis.

*Teretulus* Rafinesque was proposed three pages later for "an extensive subgenus, to which belong all the following species of Le Sueur: *C. aureolus*, *C. macrolepidotus*, *C. longirostrum*, *C. nigricans*, *C. vittatus*, *C. maculosus*, *C. sucetta*, besides the *C. teres* and *C. oblongus* of Mitchill." To these he adds his own species, *C. melanops*, *C. melanotus* (= *Campostoma*), *C. fasciolaris*, *C. erythrurus*, and *C. flexuosus*. This "omnium gatherum" receives the following diagnosis:—"Body elongate cylindrical or somewhat quadrangular, 9 abdominal rays, dorsal fin commonly small, tail equally forked."

A name proposed for a group of this kind, in the opinion of the present writer, should not be set aside, but should be retained for some one or more of the species originally referred to it, and when any writer adopts such a genus, he shall have the right to select any of the species as its type, and the name should be considered thereafter as applying to such typical species only, not to be revived in case such typical species be afterwards found to have had a prior generic name. In case no such type has been selected by any author, then the "principle of exclusion" should be applied, and the name be retained for such species as may be left to the last, on subtracting from the mongrel group the different component genera in chronological order.

In this view, *Teretulus*, having been by Professor Cope, in 1868, restricted to *C. aureolus* Le S. and its affines, these being congeneric with species previously called *Moxostoma*, becomes a synonym of *Moxostoma*, and cannot be used for a distinct genus. The principle of exclusion, if unmodified, would require us to use the name *Teretulus* for those species left on subtracting *Catostomus* proper, *Moxostoma*, *Campostoma*, *Erimyzon*, and *Hypentelium*, *i. e.*, in place of *Minytrema*.

*Ptychostomus* Agassiz was proposed for this same group, without reference to the two names conferred by Rafinesque. This genus was well characterized by Professor Agassiz on the peculiarities of the scales

and lips, although the species of *Minytrema* was inadvertently included in it. The most important generic feature, the tricellular air bladder, was first noticed by Professor Cope.

I have seen fit to change the orthography of the name from *Moxostoma* to *Myxostoma*, in accordance with its apparent etymology. This change is rather desirable from the fact that it tends to avoid confusion, the name *Moxostoma* having been commonly used in connection with a different genus.

The genus *Myxostoma* contains two well-marked sections, typified respectively by *M. velatum* and *M. macrolepidotum*, and characterized by the form of the mouth and lower lip: that of *M. velata* being as in the genus *Erimyzon*; that of *M. macrolepidotum* being of the character most common in this genus.

#### Generic Characterizations.

MOXOSTOMA Rafinesque, 1820.—“Body oblong, compressed; head compressed, eight abdominal rays, dorsal fin commonly longitudinal; tail commonly unequally forked.”—(*Ichthyologia Ohiensis*, p. 54.)

TRETULUS Rafinesque, 1820.—“Body elongate cylindrical or somewhat quadrangular, 9 abdominal rays, dorsal fins commonly small; tail equally forked. An extensive subgenus, to which belong all the following species of Le Sueur: *C. aureolus*, *C. macrolepidotus*, *C. longirostrum*, *C. nigricans*, *C. vittatus*, *C. maculosus*, *C. sucetta*, besides the *C. teres* and *C. oblongus* of Dr. Mitchill.”—(*Ich. Oh.* p. 57.)

PTYCHOSTOMUS Agassiz, 1855.—“In respect to form of body and the structure and position of the fins, this genus does not differ from *Catostomus* proper, but may be distinguished by the following structural peculiarities. The lips are marked by transverse ridges or folds, and hardly bilobed below; they are not papillated as in *Catostomus* proper. The generic name of this type is derived from this character of the lips. The head is shorter and stouter. The dorsal is longer than it is high, but in the males, it is longer in proportion than in the females. The anal of the male is also broader than that of the female, and its lower margin lobed, while in the female it is trapezoidal and narrow.

“The scales are as large on the anterior as on the posterior region of the body; their vertical diameter about as great as the longitudinal, so that the scales are nearly quadrangular, with rounded edges; the ornamental concentric ridges not longer nor broader upon the posterior than upon the lateral and anterior fields; the radiating furrows few, only one or two in the posterior field and one on each side limiting that field from the lateral fields; those of the anterior field are more numerous, and yet not crowded. Tube of the lateral line arising in the centre of radiation or farther back upon the posterior field.

“The pharyngeals are strong, their entire edge spreading like a wing, and that spreading margin is separated from the symphysis by a deep emargination. The teeth increasing rather rapidly in size from above downwards, are more apart from one

another than in the preceding genera, and arched inward as in *Moxostoma*, the inner edge of the lower ones square, its inner margin rising into a broad cusp in the middle and upper teeth."—(*American Journ. Sci. Arts*, xix, p. 203.)

TERETULUS Cope, 1868.—"The essential character of this genus is the division of the natatory bladder into three chambers, while *Catostomus* and all *Cyprinidæ*, exhibit but two. This feature is accompanied by plicate lips, as Agassiz has indicated, and nine rays to the ventral fin, already pointed out by Rafinesque. The species are the largest scaled of the typical suckers. Le Sueur and Valenciennes have pointed out the generic features in the *P. macrolepidotus*; Prof. Baird informs me that it occurs in *Pt. florealis* Bd., and I find it in *Pt. cervinus* and *Pt. duquesnii*. It no doubt exists also in the *Pt. awcootus*. Other species described by Baird and Girard from the Southwest probably possess it.

"It is difficult to assign a name to this genus. Rafinesque proposes it upon untenable characters, and includes with it species of *Moxostoma* and *Catostomus*. Agassiz purged it of these elements, but did not express its essential character, apparently relying on the plicate lips. I have taken the older name, leaving for others the final decision."—(*Journal Acad. Nat. Sci. Phila.* 1868, p. 236.)

PTYCHOSTOMUS Cope, 1870.—"The development of the lips furnish important diagnostic indications in this genus. In those most nearly allied to *Moxostoma*, the inferior lip resembles that of that genus in being narrower and deeply incised, emarginate posteriorly forming a figure V with the apex forwards, at the same time the superior lip is very thin and often narrow. Such species are shorter, and tend to a great development of dorsal fin. Others of this type are more elongate. Some species of both are distinguished by their very prominent conic muzzle and minute, inferior mouth, reminding one of the *Carpoides*. In one species the lips are papillose instead of plicate. In some species, the mouth is very projectile, in others scarcely so at all.

"Rafinesque proposed a genus *Teretulus* on the characteristic peculiarity of nine ventral radii, belonging to most species of this genus. He however included species of two other genera. On this account, Agassiz, in rearranging the suckers, imposed on it the name standing at the head of this article, regarding the plicate lips as a primary character. I think Rafinesque's name is to be rejected, owing to its ill application; the more as I find two species in which there are ten ventral radii. I adopt that of Agassiz, though I showed, when describing the *Pt. cervinus*, that the tricellular natatory bladder was a more distinctive feature. This becomes the more obvious now that I have found a species where the lips are tubercular instead of plicate."—(*Proc. Am. Philos. Soc. Phila.* p. 469.)

MOXOSTOMA Jordan, 1876.—"Dorsal moderate, of 11 to 20 rays: air bladder in three parts: lips usually plicate: lateral line very distinct: pharyngeal teeth numerous and all small, of the usual type, the bones slender" (in comparison with those of *Placopharynx*).—(*Man. Vert. E. U. S.* p. 292.)

MOXOSTOMA Cope & Jordan, 1877.—"Body oblong or elongate, with a short subquadrate dorsal fin of 10 to 17 developed rays: air bladder in three parts: lateral line present: fontanelle present: scales large, subequal: pharyngeal bones not especially enlarged, the teeth of the usual type."—(*JORDAN, Proc. Acad. Nat. Sci. Phila.* 1877, p. 21.)

## ANALYSIS OF SPECIES OF MYXOSTOMA.

\* Lips distinctly plicate.

† Lower lip full, its posterior edge truncate, not infolded and "Λ-shaped".

a. Species with the body distinctly compressed, the depth  $3\frac{1}{2}$  to nearly 5 in length.

b. Dorsal fin largely developed, its rays 15 to 18 in number: head rather large,  $3\frac{3}{8}$  to  $4\frac{1}{4}$  in length, broad above: mouth large, with full lips: eye rather large: body deep, strongly compressed, the back somewhat elevated, the depth about  $3\frac{1}{4}$  in length: dorsal fin high and large, larger than in any other species of the genus, the first ray about as long as the base of the fin: scales 5-43-4, quite large: coloration very pale and silvery, the lower fins white ..... CARPIO, 3.

bb. Dorsal fin moderate, its rays 12 to 14 in number.

c. Scales large, 41 to 50 in the course of the lateral line.

d. Caudal fin normal, the two lobes about equal and similarly colored.

e. Head singular in form, much shortened, the muzzle very abruptly decurved, descending almost perpendicularly in front of the eye: the head wedge-shaped from behind forwards, and less so from below upwards, its sides subvertical and the lower cross-diameter of the head greater than the upper.

f. Eye very large, more than one-third the length of the side of the head (in an individual of six inches in length): lips thin, very faintly plicate: width of head through the opercles greater than the thickness of the body: head  $4\frac{1}{3}$  in length; depth about the same: dorsal rays 13: scales 6-43-5: body shortish, closely compressed, the back somewhat elevated, and the caudal peduncle unusually long in proportion: color smoky-blue; lower fins white: size probably small ..... EURYOPS, 4.

ee. Head normal in form, not as above.

g. Mouth moderate or large, not very small, nor very much overpassed by the muzzle: lips thick, strongly plicate: body stoutish, varying to moderately elongate: dorsal fin medium, its developed rays 12 to 14, usually 13 in number: scales large, about 6-45-5: lower fins in the adult red or orange.

h. Head comparatively elongate, 4 to 5 in length: mouth large: size very large, reaching a length of two feet or more ..... MACROLEPIDOTUM, 5.

x. Head quite elongate, 4 to  $4\frac{2}{3}$  in length: back little elevated: body rather elongate, not greatly compressed: scales pretty large, 6-42 to 49-5: back bluish or olive; sides brilliantly silvery, with bright reflections; dorsal fin dusky above; lower fins bright red ..... *duquesnii*.

xx. Head a little shorter,  $4\frac{1}{3}$  to  $4\frac{2}{3}$  in length: form of the preceding: scales distinctly smaller, 7 or 8-48 to 50-6: back with much smoky shading ..... *lachrymale*.

\*Lips distinctly plicate—Continued.

xxx. Head still shorter and deeper,  $4\frac{1}{2}$  to 5 in length, its upper profile concurrent with the curve of the back, which is considerably elevated, the form being thus somewhat elliptical: sides compressed: dorsal rays usually 13: coloration little silvery, the sides reflecting brownish and golden; back smoky, some of the scales dusky at base: scales 6-42 to 50-5....*macrolepidotum*.

hh. Head comparatively short, low and small, 5 to  $5\frac{1}{2}$  in length; back elevated and compressed; depth  $8\frac{2}{3}$  in length: mouth rather small, more or less overpassed by the snout: coloration bright yellowish-brown, etc., not silvery; lower fins bright red: dorsal rays 13: scales 6-42 to 48-5: size large.

AUREOLUM, 6.

gg. Mouth very small, much overpassed by the conic muzzle: head small, about 5 in length.

i. Body flattish, the back elevated and compressed; depth  $3\frac{2}{3}$ : muzzle contracted: scales large, 5-44-5: dorsal rays usually 12: dorsal fin elevated in front, its first soft ray longer than the base of the fin: color silvery, with smoky shading above, some of the scales blackish at their bases; lower fins white; top of head, humeral bar, and dorsal fin dusky.

CRASSILABRE, 7.

ii. Body flattish, the dorsal outline elevated, the form being like that of *M. coregonus*: head small and conic: mouth exceedingly small, the snout far overpassing it, the muzzle being much longer than in *M. crassilabre*: dorsal rays 14: eye large: coloration smoky above, some scales dusky at their bases; sides pale; lower fins white.....CONUS, 8.

dd. Caudal fin with the upper lobe falcate, much longer than the lower, at least in the adult, the lobes similarly colored: dorsal fin short and high, falcate: body compressed; back somewhat elevated; depth  $3\frac{1}{2}$  in length: head conic, flattish,  $5\frac{1}{4}$  in length: mouth very small, much as in *aureolum*. D. 12-13, half higher than long: scales 6-46-5.

ANISURA, 9.

ddd. Caudal fin with the lower lobe much longer than the upper and differently colored, the upper lobe in the adult being red, the inferior jet-black, its two lowermost developed rays and their membranes abruptly white (? in both sexes). Body elongate, moderately compressed, somewhat elevated forwards; depth  $4\frac{1}{2}$  in length: head about the same: mouth medium, the lips full: dorsal rays 13: scales large, 5-44-4: coloration usual, except of the caudal fin; other fins all red, with blackish shadings: size small.....PÆCILURA, 10.

\*Lips distinctly plicate—Continued.

cc. Scales very small for the genus, about 9-56-8 in number: body moderately elongate, the depth about 4 in the length.

ee. Head shortish, conic, the snout not much projecting, about 4 in length: eye large: dorsal fin small, with about eleven rays, the last rapidly shortened (characters of mouth unknown, but probably similar to *macrolepidotum* and *pœcilura*; it is said to be "much larger than in *P. congestus*") ..... ALBIDUM, 11.

aa. Species with the body elongate, little compressed, broad, the depth about 5 in length, not very much greater than the thickness.

j. Head very short, roundish above, rather pointed forwards, about 5 in length: cheeks subvertical: mouth rather large, with thick lips, which are strongly plicate, the folds somewhat broken up: eye small: fins very small, the dorsal rays 10 to 12: scales rather large, 6-44 to 49-5: color greenish-brown, a pale blotch on each scale, these forming continuous streaks along the rows of scales: back with more or less distinct brownish cross-blotches; fins brownish, not much red; the dorsal blackish at tip: size smallest: length less than a foot ..... CERVINUM, 12.

†† Lower lip thin, not infolded and "Λ-shaped", forming a narrow, crescent-shaped border around the mandible.

k. Head small, 5 times in length: muzzle prominent, but less so than in *M. coregonus*: mouth moderate: back a little elevated: depth about  $3\frac{1}{2}$  in length: dorsal rays 12 to 14, its free border often incised: scales 6-45-5: coloration very pale; lower fins white: size large; reaches a weight of four pounds or more ..... ALBUM, 13.

kk. Head stout, as in *M. relatum*, rather long, 4 in length, flattish above, muzzle truncate, not very prominent: mouth moderate: back elevated: dorsal fin long, of 14 or 15 rays: sea-green above; white below; lower fins white ..... THALASSINUM, 14.

††† Lower lip infolded, Λ-shaped when viewed from below, with a distinct median crease, in which the two halves of the lip meet, forming an acute angle: mouth small.

l. Dorsal large, with 16 (15 to 17) developed rays.

m. Body stout, deep, compressed, the back elevated, the depth 3 to 4 in length: head short, heavy, flattish and broad above, thick through the cheeks,  $3\frac{1}{2}$  to  $4\frac{1}{2}$  in length: eye rather large, midway in head, 4 to 5 in its length: muzzle rather prominent, bluntish, overhanging the very small mouth: fins very large: dorsal long and high, its height five-sixths the length of the head: pectorals nearly reaching ventrals: color silvery, smoky above; lower fins red: size large ..... VELATUM, 15.

\*Lips distinctly plicate—Continued.

ll. Dorsal moderate, with 12 to 14 developed rays.

n. Head comparatively large, about 4 in length: dorsal rays usually 12.

o. Head short and very wide through the opercles, flat above: body stout, the back somewhat elevated, depth 4 in length: muzzle subtruncate, slightly projecting: scales 6-40-5: olivaceous, silvery below; dorsal fin dusky.

CONGESTUM, 16.

oo. Head rather long,  $4\frac{1}{2}$  in length, flattish above: body elongate, more nearly cylindrical, little compressed: muzzle truncate: olivaceous, sometimes with rows of faint spots along the series of scales; dorsal and caudal fins black-edged: size quite small: resembles *M. cervinum*, but the mouth entirely different . . . . . PIDIENSE, 17.

nn. Head very small, about 5 in length: muzzle conic, much projecting beyond the very small mouth; body broadly fusiform, much compressed, the back elevated and arched: dorsal rays 14: color silvery, with plumbeous shades above; lower fins white: size small . . . . . COREGONUS, 18.

\*\* Lips full, strongly papillose, much as in the subgenus *Hypentelium*.

p. Body comparatively stout, the dorsal region somewhat elevated and rounded, the depth being about 4 in length, the head about the same: eye rather large, high up and well back, the preorbital space being longer than in the other species: top of head flat: dorsal rays 12 to 14: scales rather large, 6-42-5: lips well developed, deeply incised: color silvery; back with smoky shading; lower fins white: size large, reaches a length of about two feet

PAPILLOSUM, 19.

### 3. MYXOSTOMA CARPIO (*Valenciennes*) *Jordan*.

*Carp Mullet. White Lake Mullet.*

1844—*Catostomus carpio* VALENCIENNES, Cuv. et Val. Hist. Nat. des Poiss. xvii, 457, pl. 517.

*Catostomus carpio* STORER, Syuopsis, 426, 1846.

*Catostomus carpio* GÜNTHER, Cat. Fishes Brit. Mus. vii, 20, 1868.

*Ptychostomus carpio* COPE, Proc. Am. Philos. Soc. Phila. 476, 1870.

*Ptychostomus carpio* JORDAN, Fishes of Ind. 221, 1875. (Name only.)

*Moxostoma carpio* JORDAN, Man. Vert. 296, 1876.

*Teretulus carpio* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49, 1876.

*Teretulus carpio* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)

*Moxostoma carpio* JORDAN & GILBERT, in Klippart's Rept. Fish Comm. Ohio, 53, 1877. (Name only.)

*Myxostoma carpio* JORDAN, Man. Vert. E. U. S. ed. 2d, 312, 1878.

HABITAT.—Great Lake Region and northward. Also in the Ohio River.

This species is apparently not very common, and its distribution is probably chiefly northward. I have obtained but one living specimen, a fine large one, from Lac des Buttes des Morts, in Northeastern Wisconsin. This specimen in life was extremely pale and silvery, its fins having none of the orange coloration common to most of the species. *M. carpio* is related to *M. macrolepidotum*, but the much greater development of the dorsal will always distinguish it.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
10793	Cincinnati, Ohio.....	J. W. Milner.
11214	Alpena, Mich. (Lake Huron) .....	J. W. Milner.
12270	Cincinnati, Ohio.....	J. W. Milner.
12271	Cincinnati, Ohio.....	J. W. Milner.
12293	Cincinnati, Ohio.....	J. W. Milner.
—	Marietta, Ohio.....	Prof. Andrews.

#### 4. MYXOSTOMA EURYOPS *Jordan.*

*Snub-nosed Sucker.*

1876—*Teretulus euryops* JORDAN & COPELAND, Check List, 157. (Name only.)

*Myxostoma euryops* JORDAN, Ann. Lye. Nat. Hist. N. Y. xi. 348, 1877.

*Myxostoma euryops* JORDAN, Man. Vert. ed. 2d, 312, 1878.

HABITAT.—Alabama River.

This species is still known only from the type-specimen obtained in Lovejoy's Creek, a small tributary of Oostanaula River, a few miles north of Rome, Ga. The species is most nearly related to *M. macrolepidotum*, and it is barely possible that the type-specimen is a monstrosity of that species. The peculiarities of the mouth, and the fact that the bones of the head seem to be normally developed, lead me to consider it a distinct species.

5. MYXOSTOMA MACROLEPIDOTUM (*Le Sueur*) Jordan.

*Common Red Horse. Mullet. White Sucker. Large-scalcd Sucker.*

a. Subspecies *macrolepidotum*.

- 1817—*Catostomus macrolepidotus* LE SUEUR, Journ. Ac. Nat. Sc. Phila. i, 94.  
*Catostomus macrolepidotus* DEKAY, New York Fauna, part iv, Fishes, 202, 1842.  
*Catostomus macrolepidotus* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 447, 1844.  
*Catostomus macrolepidotus* STORER, Synopsis, 420, 1846.  
*Ptychostomus macrolepidotus* AGASSIZ, Am. Journ. Sci. Arts, 2d series, xix, 204, 1855.  
*Ptychostomus macrolepidotus* COPE, Proc. Am. Philos. Soc. Phila. 475, 1870.  
*Ptychostomus macrolepidotus* JORDAN, Fishes of Ind. 221, 1875. (Name only.)  
*Moxostoma macrolepidotum* JORDAN, Man. Vert. 296, 1876.  
*Teretulus macrolepidotum* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49, 1876.  
*Catostomus macrolepidotus* UHLER & LUGGER, Fishes of Maryland, 140, 1876.  
*Teretulus macrolepidotus* JORDAN & COPELAND, Check List; x, 157, 1876. (Name only.)  
*Moxostoma macrolepidota* JORDAN & GILBERT, in Klippart's Rept. 53, 1876. (Name only.)  
*Myxostoma macrolepidota* JORDAN, Man. Vert. E. U. S. ed. 2d, 313, 1878.
- 1842—*Catostomus oncida* DEKAY, New York Fauna, part iv, Fishes, 198.  
*Catostomus oncida* STORER, Synopsis, 425, 1846.  
*Ptychostomus oncida* COPE, Proc. Am. Philos. Soc. Phila. 476, 1870.
- 1870—*Ptychostomus robustus* COPE, Proc. Am. Philos. Soc. Phila. 473.  
*Teretulus robustus* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)
- 1876—*Ptychostomus congestus* COPE & YARROW, Lieutenant Wheeler's Expl. W. 100th Mer. v, 680, 1876. (Not of Girard.)

HABITAT.—North Carolina to Vermont, and northwestward through the Great Lake Region and the Upper Mississippi—the only form of the species occurring east of the Alleghany Mountains. (Also in Arizona?)

b. Subspecies *lachrymale* (Cope) Jordan.

- 1870—*Ptychostomus lachrymalis* COPE, Proc. Am. Philos. Soc. Phila. 474.  
*Teretulus lachrymalis* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)  
*Myxostoma duquesnii* var. *lachrymalis* JORDAN, Ann. Lye. Nat. Hist. N. Y. xi, 349, 1877.  
*Myxostoma macrolepidota* var. *lachrymalis* JORDAN, Man. Vert. ed. 2d, 313, 1878.
- HABITAT.—North Carolina to Alabama.

c. Subspecies *duquesnii* (Le Sueur) Jordan.

- 1817—*Catostomus duquesnii* LE SUEUR, Journ. Ac. Nat. Sc. Phila. 105.  
*Catostomus duquesnii* RAFINESQUE, Ich. Oh. 60, 1820.  
*Catostomus duquesnii* KIRTLAND, Rept. Zool. Ohio, 163, 1838.  
*Catostomus duquesnii* DEKAY, New York Fauna, part iv, Fishes, 203, 1842.

*Catostomus duquesnii* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 458, 1844.

*Catostomus duquesnii* KIRTLAND, Boston Journ. Nat. Hist. v, 268, 1845.

*Catostomus duquesnii* STORER, Synopsis, 423, 1846.

*Ptychostomus duquesnii* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 204, 1855.

*Catostomus duquesnii* GÜNTHER, Cat. Fishes Brit. Mus. vii, 18, 1868.

*Teretulus duquesnei* COPE, Journ. Ac. Nat. Sc. Phila. 236, 1868.

*Ptychostomus duquesni* COPE, Proc. Am. Philos. Soc. Phila. 476, 1870.

*Ptychostomus duquesnei* JORDAN, Bull. Buffalo Soc. Nat. Hist. 95, 1876.

*Moxostoma duquesnii* JORDAN, Man. Vert. 295, 1876.

*Catostomus duquesnii* UHLER & LUGGER, Fishes of Maryland, 139, 1876.

*Teretulus duquesnii* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49, 1876.

*Teretulus duquesnii* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)

*Moxostoma duquesnei* JORDAN & GILBERT, in Klippart's Rept. 53, 1876. (Name only.)

*Myxostoma duquesnii* JORDAN, Ann. Lyc. Nat. Hist. N. Y. xi, 349, 1877.

*Myxostoma duquesnii* JORDAN, Bull. U. S. Nat. Mus. ix, 37, 1877.

*Myxostoma macrolepidota* var. *duquesnii* JORDAN, Man. Vert. ed. 2d, p. 313, 1878.

1818—*Catostomus erythrurus*, RAFINESQUE, Am. Month. Mag. and Crit. Rev. 354.

*Catostomus erythrurus* RAFINESQUE, Ich. Oh. 59, 1820.

*Catostomus erythrurus* KIRTLAND, Rept. Zool. Ohio, 168, 1838.

*Ptychostomus erythrurus* COPE, Proc. Am. Philos. Soc. Phila. 474, 1870.

*Ptychostomus erythrurus* JORDAN, Fishes of Ind. 221, 1875. (Name only.)

*Teretulus erythrurus* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)

1820—*Rutilus melanurus* RAFINESQUE, Ich. Oh. 51.

HABITAT.—Ohio Valley. Upper Mississippi River and southward; most abundant from Wisconsin to Georgia.

Examination of a very large series of "Mullet" and "Red Horse" from various parts of the country has led me to the conclusion, at first rather unexpected, that all the various forms included in the above synonymy belong to one widely diffused and somewhat variable species.

The "Mullet" of the lakes and of Eastern Pennsylvania appears generally to differ in the more elevated and compressed body, shorter, deeper head, and brownish or brassy rather than silvery coloration. This represents the general tendency of "var. *macrolepidotum*"; but specimens of "*duquesnei*" can be found which will match the average *macrolepidotum* in each of these respects. The form which I have identified with Professor Cope's *lachrymale* is to some extent intermediate, but has the additional peculiarity of smaller scales. In this respect, however, occasional individuals, both of *duquesnei* and of *macrolepidotum*, can be found which approach it.

The form inhabiting the waters of the eastern and northern parts of the United States is the variety *macrolepidotum*. It is sold commonly as a food-

fish in the winter and spring in the markets of Washington and Philadelphia, as well as in the markets of those cities in the West which are supplied by the fisheries of the Great Lakes. It is probably much more abundant in Lake Erie than *M. aureolum* is, and it has been frequently confounded with the latter species. I once obtained two specimens, each of nearly twelve pounds weight, in the Fox River in Wisconsin.

In the Ohio River and its tributaries, and in the rivers of the Southwest generally, the var. *duquesnii* is the prevailing form. This variety is more delicately colored than the other, the silvery lustre of the scales is more strongly marked, and the red of the fins is rather more vivid. This form, too, is valued somewhat as a food-fish, although the flesh, like that of all the Suckers, is comparatively coarse, tasteless, and full of bones. The variety *duquesnei* is everywhere known by the curious vernacular name of "Red Horse", a name possibly to be accounted for by the color of the fins and the form of the head. This variety also grows to a large size.

The variety *lachrymale* I only know from specimens obtained in Etowah River, Georgia, in company with the variety *duquesnei*. Nothing distinctive was noticed in regard to its habits.

The Red Horse prefer rather deep, clear water, seldom ascending very small streams, and then chiefly in the spawning season—in May—at which time they may be found in great abundance in any rapid of a river or a creek, or below a mill-pond. They are generally caught by nets, traps, or snares, but will frequently bite at a hook baited with a worm.

In the confinement of an aquarium, the Red Horse are not very hardy. Foul water kills them at once.

*Synonyms.*—The earliest name given to a Red Horse is that of *Catostomus macrolepidotus* Le Sueur. The specific name *macrolepidotus* must therefore be retained for this species. The specific name *oneida*, given by DeKay to an individual from Oneida Lake, New York, doubtless belongs here, as the var. *macrolepidotum* is the only member of this genus known to inhabit that part of New York, and there are no serious discrepancies in the rather poor description.

*Ptychostomus robustus* Cope may possibly be different; but as its describer has failed to note any distinctive characters which I consider likely to be permanent, I am compelled to refer it here. It is from Yadkin River in North Carolina. A *Ptychostomus congestus* is described by Cope and Yarrow from Arizona. It is probably not Girard's species of

that name, and I am unable to distinguish it from typical *macrolepidotum*, although the mouth is rather small, more like that of *aureolum*.

I have identified certain specimens with Professor Cope's *P. lachrymale* with a little doubt, as the points of differentiation which I notice are not those emphasized by Professor Cope. The original types, which I believe are now lost, were from the Neuse River in North Carolina. In describing this species, Professor Cope remarks, "This species is quite near the last (*P. erythrurus*) and may at some future time be shown to be a local variety of it, but in this case *P. macrolepidotus* must follow also."

The synonyms of var. *duquesnei* may now be noticed. Of these, the only one of importance is that of *Catostomus erythrurus* Rafinesque, recently recognized by Professor Cope as a species distinct from *P. duquesnii*.

The presence of ten ventral rays in *duquesnii*, as contrasted with nine ventral rays in *erythrurus*, is the chief point on which Professor Cope relies to distinguish the two species. He also finds the mouth rather more inferior in *duquesnii*, and the scales rather smaller, 7-48-7, instead of 5-42-4.

In regard to the number of ventral rays, my experience is that in every species of the genus the normal number is *nine*, but that ten-rayed individuals occur in the proportion of about one in twenty in any of the species. I have seen specimens of *duquesnii* with nine rays on one side and ten on the other. I have therefore discarded all consideration of the number of ventral rays as a specific character. In regard to the number of scales in the lateral line, the usual number in most of the species is 43 to 44; but of every species in which I have been enabled to examine a large series of individuals, I have found a range extending from 42 to 49. I have seen ten-rayed specimens of *duquesnei* with large scales, and nine-rayed *erythruri* with small ones. Within the limit of 42 to 50 I therefore do not consider the number of scales as a permanent specific character. The greater prominence of the muzzle in *duquesnei*, as observed by Professor Cope, is perhaps accidental or individual. At all events, it is too uncertain a feature to base a species on.

The *Rutilus melanurus* of Rafinesque is, as I have elsewhere shown, probably a young Red Horse, with a dusky-shaded dorsal and caudal, which that acute, but superficial, observer mistook for a species of Dace.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
	<i>Var. macrolepidotum.</i>	
7995	.....	
8754	"Probably North Carolina" .....	
9056	.....	
10631	Potomac River .....	J. W. Milner.
10682	Potomac River .....	J. W. Milner.
10689	Potomac River .....	J. W. Milner.
11106	Potomac River .....	J. W. Milner.
12316	Potomac River .....	J. W. Milner.
12317	Potomac River .....	J. W. Milner.
12318	Potomac River .....	J. W. Milner.
12319	Potomac River .....	J. W. Milner.
16755	Ash Creek, Arizona (" <i>congestus</i> ") .....	Dr. J. T. Rockrock.
18251	Potomac River .....	G. B. Goode.
18253	Potomac River .....	G. B. Goode.
18254	Potomac River .....	G. B. Goode.
18255	Potomac River .....	G. B. Goode.
18256	Potomac River .....	G. B. Goode.
18257	Potomac River .....	G. B. Goode.
19451	Potomac River .....	J. W. Milner.
20230	Black River, New York. ....	S. F. Baird.
20263	Nebraska, Pacific Railroad Survey .....	Governor Stevens.
20278	"Brooklyn" .....	J. C. Brevoort.
	<i>Var. duquesnii.</i>	
8025	Yellow Creek, Ohio .....	S. F. Baird.
8526	.....	
10794	Cincinnati, Ohio .....	J. W. Milner
12268	Cincinnati, Ohio .....	J. W. Milner.
12269	Cincinnati, Ohio .....	J. W. Milner.
12272	Cincinnati, Ohio .....	J. W. Milner.
20040	Cumberland River, Tennessee .....	A. Winchell.
20075	.....	
20773	Normal, Illinois .....	S. A. Forbes.

6. MYXOSTOMA AUREOLUM (*Le Sueur*) Jordan.*Golden Red Horse. Lake Mullet.*1817—*Catostomus aureolus* LE SUEUR, Journ. Ac. Nat. Sci. Phila. i, 95.*Catostomus aureolus* KIRTLAND, Rept. Zool. Ohio, 168, 1838.*Catostomus aureolus* KIRTLAND, Boston Journ. Nat. Hist. iii, 349, 1840.*Catostomus aureolus* DEKAY, New York Fauna, part iv, Fishes, 201, 1842.

*Catostomus aureolus* STORER, Synopsis, 420, 1846.

*Catostomus aureolus* AGASSIZ, Lake Superior, 357, 1850.

*Ptychostomus aurcolus* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 204, 1855.

*Ptychostomus aureolus* PUTNAM, Bull. Mus. Comp. Zool. 10, 1863.

*Ptychostomus aureolus* COPE, Proc. Ac. Nat. Sc. Phila. 285, 1864.

*Catostomus aureolus* GÜNTHER, Cat. Fishes Brit. Mus. vii, 16, 1868. (In part; description apparently copied and confused.)

*Ptychostomus cope* COPE, Proc. Am. Philos. Soc. Phila. 476, 1870

*Moxostoma aurcolum* JORDAN, Man. Vert. 295, 1876.

*Teretulus aureolum* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49, 1876.

*Teretulus aurcolus* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)

*Moxostoma aureola* JORDAN & GILBERT, in Klippart's Rept. 53, 1876. (Name only.)

*Myxostoma aureola* JORDAN, Man. Vert. E. U. S. ed. 2d, 314, 1878.

1823—*Catostomus lesueurii* RICHARDSON, Franklin's Journal, 772, 1823.

1836—*Cyprinus* (*Catostomus*) *sueurii* RICHARDSON, Faun. Bor.-Am. Fishes, pp. 118, 303, 1836.

*Catostomus sueurii* CUV. & VAL., Hist. Nat. des Poissons, xvii, 465, 1844.

*Catostomus sueurii* DEKAY, New York Fauna, part iv, Fishes, 203, 1842.

*Catostomus sueurii* STORER, Synopsis, 425, 1846.

*Ptychostomus sueurii* COPE, Proc. Am. Philos. Soc. Phila. 477, 1870.

*Teretulus sueurii* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)

1868—*Catostomus macrolepidotus* GÜNTHER, Cat. Fishes Brit. Mus. vii, 18, 1868. (Excl. syn. part. Not of Le Sueur.)

HABITAT.—Great Lake Region, Upper Missouri and Ohio Valleys, and northward.

This species is very closely related to the last, and may possibly be a variety of it, as specimens of var. *macrolepidotum* often occur which are with difficulty distinguished from it. In general, however, the smaller head, smaller mouth, and deeper body of *aureolum* sufficiently distinguish them. This species is less abundant than *macrolepidotum*, and is apparently more northerly in its distribution. It has been well figured by DeKay.

The synonymy of this species needs no special remark. It seems probable that *C. lesueurii* belongs here, although the statement that "the muzzle projects an inch beyond the mouth" in a specimen 19 inches long, if correct, would indicate difference. The name "*le sueurii*" was first given, and afterwards changed to "*sueurii*" on the ground that the article "*le*" is not an integral part of Le Sueur's name.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
7756	.....	
8252	Carlisle, Pa .....	S. F. Baird.
11074	Sandusky, Ohio .....	J. W. Milner.
11151	Sandusky, Ohio .....	J. W. Milner.
12267	Cincinnati, Ohio .....	J. W. Milner.
12294	Cincinnati, Ohio .....	J. W. Milner.
12446	Écorse, Mich. ....	J. W. Milner.
20272	Root River, Wisconsin.....	S. F. Baird.

7. MYXOSTOMA CRASSILABRE (*Cope*) Jordan.*Thick-lipped Mullet.*1870—*Ptychostomus crassilabris* COPE, Proc. Am. Philos. Soc. Phila. 477, 1870.*Teretulus crassilabris* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)*Myxostoma crassilabris* JORDAN, Man. Vert. ed. 2d, 314, 1878.

HABITAT.—Neuse River, North Carolina.

This species is known only from Professor Cope's description. It appears to be distinct from *M. aureolum*, which is probably its nearest relative. Nothing has been noted in regard to its habits.

8. MYXOSTOMA CONUS (*Cope*) Jordan.*Long-nosed Mullet.*1870—*Ptychostomus conus*, COPE, Proc. Am. Philos. Soc. Phila. 478.*Teretulus conus*, JORDAN & COPELAND, Check List, 157, 1876. (Name only.)*Myxostoma conus*, JORDAN, Man. Vert. ed. 2d, 314, 1878.

HABITAT.—Yadkin River, North Carolina.

This species is also known only from Professor Cope's account. There appears, however, to be no room for doubt as to its specific distinction. As stated by Professor Cope, "this fish represents the *P. coregonus* in the section with fully-developed lips."

It is taken in large numbers in the Yadkin River, "with *Pt. collapsus*, *Pt. robustus*, etc., but is of less value than they."

9. MYXOSTOMA ANISURA (*Rafinesque*) Jordan.*Long-tailed Red Horse.*1820—*Catostomus anisurus* RAFINESQUE, Ichthyologia Obiensis, 54.*Myxostoma anisura* JORDAN, Man. Vert. ed. 2d, 315, 1878.

1870—*Ptychostomus breviceps* COPE, Proc. Am. Philos. Soc. Phila. 478.

*Teretulus breviceps* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)

*Moxostoma breviceps* JORDAN & GILBERT, in Klippart's Rept. 53, 1876. (Name only.)

*Myxostoma breviceps* JORDAN, Bull. U. S. Nat. Mus. 9, 50, 1877. (Name only.)

HABITAT.—Ohio Valley and Great Lakes.

This species, first described by Rafinesque in 1820, has been entirely lost sight of by succeeding writers, and I, doubting the existence in the Ohio River of a species characterized by the marked inequality of the caudal lobes, have hitherto followed Dr. Kirtland in using the name *anisura* for the fish recently named *collapsus* by Professor Cope. Some specimens lately examined by me from the Ohio River have shown the existence of a fish corresponding very closely to Rafinesque's account, and which really has the inequality of the caudal fin, on which he lays such emphasis, and which suggested the name *anisurus* (unequal-tail). This fish appears to be the same as that to which Professor Cope has given the name of *breviceps*. Professor Cope had, however, but a single specimen, in poor condition, and did not notice the falcation of the caudal, or, more likely, that fin was not preserved intact. I have, some time since, examined Professor Cope's type, preserved in the Museum of the Academy of Natural Sciences, at Philadelphia, and believe it to be identical with *M. anisura* Raf. The form of the head and body and of the mouth are similar in the two, and the dorsal in both is similarly falcate.

This species resembles *aureolum* in every respect, except that the dorsal fin is shorter, and elevated or falcate in front, the free border being deeply incised, and that the caudal fin is similarly elongated, the upper lobe being much the longer and greatly attenuated.

The following are the measurements of three specimens: 10,788, from Sandusky, and 12,267 and 12,294 from Cincinnati. The fractions indicate percentage of the length to the base of the caudal:—

*Measurements of three specimens of Myxostoma auisura.*

	10788.	12267.	12194.
Length, inches.....	2 $\frac{1}{4}$	8 $\frac{3}{4}$	10 $\frac{1}{4}$
Depth.....	.28	.27	.26
Length of head.....	.18	.17	.18
Width of interorbital area.....	.08		
Length of snout.....	.07 $\frac{1}{2}$		
Eye.....	.05		
Length of base of dorsal.....	.15 $\frac{1}{2}$	.14 $\frac{1}{2}$	.16
Height of longest ray of dorsal.....	.22	.22	.23 $\frac{1}{2}$
Height of last ray of dorsal.....	.10		
Length of upper caudal lobe.....	.31	.29	.31
Length of lower caudal lobe.....	.26	.25	.25
Length of middle caudal rays.....	.13		
Dorsal rays.....	2, 13	2, 12	2, 13
Scales.....	6-46-5	6-47-5	

It is perhaps barely possible that this fish is the male of *aureolum* at a certain age, but it seems to me decidedly improbable. The resemblance between the two is, however, very strong, and, except for the fins, they could hardly be distinguished.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
8505	.....	
10788	Sandusky, Ohio.....	J. W. Milner.
11105	Cincinnati, Ohio.....	J. W. Milner.
11107	Cincinnati, Ohio.....	J. W. Milner.
11108	Cincinnati, Ohio.....	J. W. Milner.

10. MYXOSTOMA PÆCILURA *Jordan.**Variegated-tailed Red Horse.*

1877—*Myxostoma pæcilura* JORDAN, Bull. U. S. Nat. Mus. x, 66, 1877.

*Myxostoma pæcilura* JORDAN, Man. Vert. ed. 2d, 315, 1878.

HABITAT.—Tangipahoa River, Southeastern Louisiana.

This singular species is known only from two specimens in the United States National Museum, recently collected by Mr. Fred. Mather, of the United States Fish Commission. Whether the peculiar form and coloration of the caudal is general or is confined to the male sex is not certain. In any event, it will serve to sharply distinguish this species from all the others now known. In other respects, it most approaches *M. macrolepidotum lachrymale*.

Specimens in United States National Museum.

Number.	Locality.	Collector.
*16928	Tangipahoa River, Louisiana.....	Fred. Mather.

11. MYXOSTOMA ALBIDUM (*Girard*) *Jordan*.*Small-scaled Red Horse.*1856—*Ptychostomus albidus* GIRARD, Proc. Ac. Nat. Sci. Phila. 172.*Ptychostomus albidus* GIRARD, U. S. Mex. Bonud. Surv. Ichth. 36, pl. xix, f. 5-8, 1859.*Teretulus albidus* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)*Myxostoma albidum* JORDAN, Man. Vert. E. U. S. 315, 1878.

HABITAT.—Rio San Juan, near Monterey, New Leon, in Mexico.

This species is known only from Girard's figure and description. No account of the lips is given, but the mouth is said to be a "great deal larger" than in *M. congestum*. The description is trivial, but the figure, if at all correct, represents a species quite unlike our other members of the genus; the chief character being the much smaller size of the scales, which in the description are merely stated to be "smaller than in *congestus*". The species may possibly belong to some section of the genus other than the one in which it is here placed. The original types, No. 170, U. S. Nat. Museum, from Rio San Juan, near Monterey, New Leon, are no longer to be found.

12. MYXOSTOMA CERVINUM (*Cope*) *Jordan*.*Jump-rocks. Jumping Mullet.*1868—*Teretulus cervinus* COPE, Journ. Ac. Nat. Sci. Phila. 236.*Ptychostomus cervinus* COPE, Proc. Am. Philos. Soc. Phila. 47<sup>r</sup>, 1870.*Moxostoma cervinum* JORDAN, Man. Vert. 296, 1876.*Teretulus cervinus* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)*Myxostoma cervinum* JORDAN, Ann. Lyc. Nat. Hist. N. Y. xi, 365, 1877.*Myxostoma cervinum* JORDAN, Man. Vert. E. U. S. ed. 2d, 315, 1878.1868—*Catostomus duquesnii* GÜNTHER, Cat. Fishes Brit. Mus. vii, 483. (Not of Lo Sneur, nor of p. 18.)

HABITAT.—Rivers of the South Atlantic States, from the James to the Chattahoochee.

This is a strongly marked and very abundant species, the smallest of its genus, and one of the smallest of the *Catostomidae*. It occurs in the

\*Two specimens, types of the species.

greatest abundance in the swift streams of the South, frequenting especially the rapids or "shoals", and often throwing itself from the water in its endeavors to reach some higher rock-pool. It is too small and the flesh spoils too quickly to be much valued for food, but great numbers are caught for "fun" by negroes and boys. The largest specimens which I have seen were taken in the Chattahoochee, and are about ten inches in length; ordinary individuals are four to six inches long.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
7633	.....	
8835	.....	
†14994	Catawba River.....	E. D. Cope.
—	Oemulgee River.....	D. S. Jordan.
—	Saluda River.....	D. S. Jordan.
—	Chattahoochee River.....	D. S. Jordan.

### 13. MYXOSTOMA ALBUM (*Cope*) *Jordan*.

*White Mullet.*

1870—*Ptychostomus albus* COPE, Proc. Am. Philos. Soc. Phila. 472.

*Tretulus albus* JORDAN & COPELAND, Check List, 158, 1876. (Name only.)

*Myxostoma alba* JORDAN, Man. Vert. ed. 2d, 316, 1878.

HABITAT.—Catawba and other rivers of Eastern North Carolina.

This species is well marked by the peculiar form of the under lip, which is quite small—a narrow, regular crescent following the boundary of the mandible, not full, as in the species previously noted, nor with the sides folding so as to meet on the middle line, as in the remaining species (excepting *thalassinum*). Specimens from North Carolina in the National Museum correspond well to Professor Cope's description, except that the back is rather more elevated than one would infer from Professor Cope's remarks. The dorsal rays are 12 and 13 instead of 14. The following are the measurements of two of them, 18,535 and 14,943, both from Kinston, N. C. :—

\* Types.

Measurements of two specimens of *Myxostoma album*.

	18535.	14943.
Length, inches.....	13	11½
Depth (percentage of length to base of caudal).....	.32	.30
Length of head.....	.20	.20
Width of interorbital area.....	.10	.10
Length of snout.....	.08½	.....
Diameter of orbit.....	.04	.....
Length of base of dorsal.....	.19	.17
Height of dorsal.....	.22	.18½
Height of last ray of dorsal.....	.09	.....
Length of outer caudal rays.....	.24	.....
Length of middle caudal rays.....	.24	.....
Length of pectorals.....	.21	.....
Number of dorsal rays.....	2, 13	2, 12
Scales.....	6-45-5	.....

The form is elliptical, not much compressed, but rather elevated, somewhat as in *Erimyzon sucetta*. Head short and stout, bluntish, broad, and rounded above; mouth somewhat inferior; the plicæ of the lips few and rather broken; dorsal fin high, its free border somewhat concave; caudal strongly forked; color lustrous white, with greenish reflections.

This is one of the largest species, reaching the weight of four pounds or more. Professor Cope states that it is much valued as a food-fish by people living in the neighborhood of Catawba River, where it is known as the White Mullet.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
10632	North Carolina.....	G. B. Goode.
14943	Kinston, N. C.....	G. B. Goode.
14990	North Carolina.....	G. B. Goode.
18535	Kinston, N. C.....	J. W. Milner.
19450	North Carolina.....	G. B. Goode.

#### 14. MYXOSTOMA THALASSINUM (Cope) Jordan.

*Green Mullet.*

1870—*Ptychostomus thalassinus* COPE, Proc. Am. Philos. Soc. Phila. 472, 1870.

*Teretulus thalassinus* JORDAN & COPELAND, Check List, 158, 1876. (Name only.)

*Myxostoma thalassinina* JORDAN, Man. Vert. ed. 2d, 316, 1878.

HABITAT.—Yadkin River.

I have not seen this species. From Professor Cope's description, it would appear to be allied to *M. album*, but distinguishable by the longer head. It is a large species, abundant in the Yadkin River, where it is used for food.

### 15. MYXOSTOMA VELATUM (Cope) Jordan.

*Small-mouthed Red Horse.*

1845—*Catostomus anisurus* KIRTLAND, Boston Journ. Nat. Hist. v, 269 (with plate).

(Not of Rafinesque.)

*Catostomus anisurus* STORER, Synopsis, 424, 1846.

*Ptychostomus anisurus* JORDAN, Bull. Buffalo Soc. Nat. Hist. 94, 1876. (Name only.)

*Moxostoma anisurus* JORDAN, Man. Vert. 295, 1876.

*Teretulus anisurus* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49, 1876.

*Teretulus anisurus* JORDAN & COPELAND, Check List, 158, 1876. (Name only.)

*Moxostoma anisurum* JORDAN, Proc. Ac. Nat. Sc. Phila. 72, 1877.

*Moxostoma anisurum* JORDAN, Proc. Ac. Nat. Sc. Phila. 80, 1877.

*Moxostoma anisura* JORDAN & GILBERT, in Klippart's Rept. 53, 1877. (Name only.)

*Myxostoma anisura* JORDAN, Bull. U. S. Nat. Mus. ix, 33, 1877.

1870—*Ptychostomus velatus* COPE, Proc. Am. Philos. Soc. Phila. 471.

*Moxostoma velatum* JORDAN, Man. Vert. 296, 1876.

*Teretulus velatum* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49, 1876.

*Teretulus velatus* JORDAN & COPELAND, Check List, 158, 1876. (Name only.)

*Moxostoma velata* JORDAN & GILBERT, in Klippart's Rept. 53, 1876. (Name only.)

*Myxostoma velata* JORDAN, Man. Vert. ed. 2d, 317, 1878.

1870—*Ptychostomus collapsus* COPE, Proc. Am. Philos. Soc. Phila. 471.

HABITAT.—Upper Mississippi Valley to Georgia and South Carolina. Neuse, Yadkin, Catawba, Clinch, Youghiogheny and Wabash Rivers (Cope). Chickamauga, Ohio Wabash, Illinois, Rock, and Wisconsin Rivers (Jordan). Lake Erie (Jordan).

This species is one of the most widely distributed species, although it does not seem to be as abundant in individuals as several others. There is considerable variation in form among different specimens, but all the species with long dorsal fin and small  $\Lambda$ -shaped mouth appear to belong to one species, for which the name *velatum* should be retained.

The finding of a species with unequal caudal lobes renders it evident that the identification of Rafinesque's *anisurus* with this species is incorrect. The name next in order is *velatus* Cope. The difference in the size of the eye between *collapsus* Cope and *velatus* Cope appears to be due to difference in age merely. Younger specimens have the eye proportionally larger.

I did not find any specimens of this species in the United States National Museum. The types of *velatus* and *collapsus*, preserved in the Museum of the Academy of Natural Sciences, at Philadelphia, I have examined.

### 16. MYXOSTOMA CONGESTUM (*Baird & Girard*) *Jordan*.

*Gibbous Sucker.* •

1854—*Catostomus congestus* BAIRD & GIRARD, Proc. Ac. Nat. Sc. Phila. 27.

*Ptychostomus congestus* GIRARD, Proc. Ac. Nat. Sc. Phila. 172, 1856.

*Ptychostomus congestus* GIRARD, U. S. Mex. Bound. Surv. Ichth. 36, pl. xxi, f. 5-8, 1859.

*Catostomus congestus* GÜNTHER, Cat. Fishes Brit. Mus. vii, 19, 1868.

*Teretulus congestus* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)

*Myxostoma congesta* JORDAN, Man. Vert. ed. 2d, 317, 1878.

1872—*Ptychostomus bucco* COPE, Hayden's Geol. Surv. Wyoming, 1870, 437.

*Teretulus bucco* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)

HABITAT.—Kansas to Texas.

The original type of *congestus*, No. 171, from Rio Salado, Texas, collected in 1851 by John H. Clark, seems to have disappeared from the Museum. No description of the mouth has been given, except that it is "very small". The species, therefore, probably has a mouth similar to that of *velatum*, and, if so, is probably identical with the species since described as *P. bucco* by Professor Cope. I have not seen the type of *P. bucco*, and, therefore, can only suggest the probable identity of the two; but, as the matter is likely to remain long unsettled, it seems best provisionally to unite them. "*P. congestus*" Cope & Yarrow is certainly not this species; more likely a form of *M. macrolepidotum*.

### 17. MYXOSTOMA PIDIENSE (*Cope*) *Jordan*.

*Mullet of the Great Pedee.*

1870—*Ptychostomus pidiensis* COPE, Proc. Am. Philos. Soc. Phila. 471.

*Teretulus pidiensis* JORDAN & COPELAND, Check List, 158, 1876. (Name only.)

*Myxostoma pidiensis* JORDAN, Man. Vert. ed. 2d, 317, 1878.

HABITAT.—Great Pedee River, North Carolina.

This appears to be a slender species, resembling "*P. cervinus* in color, form, and size". Professor Cope obtained it in the Yadkin River. I have not seen it. No specimens are in the National Museum.

18. MYXOSTOMA COREGONUS (*Cope*) *Jordan*.*Blue Mullet.*1870—*Ptychostomus coregonus* COPE, Proc. Am. Philos. Soc. Phila. 472.*Teretulus coregonus* JORDAN & COPELAND, Check List, 158, 1876. (Name only.)*Myxostoma coregonus* JORDAN, Man. Vert. ed. 2d, 317, 1878.

HABITAT.—Catawba and Yadkin Rivers, North Carolina.

I have not seen this species. Professor Cope states that "it never exceeds a foot in length, and is very abundant in the Catawba and Yadkin Rivers. It is caught with the preceding two species and is used for food, but is the least valued of all the species. It is called at Morganton, Blue Mullet." There are no specimens in the National Museum.

19. MYXOSTOMA PAPILLOSUM (*Cope*) *Jordan*.*Papillose Mullet.*1870—*Ptychostomus pappilosus* COPE, Proc. Am. Philos. Soc. Phila. 470.*Teretulus pappilosus* JORDAN & COPELAND, Check List, 158, 1876. (Name only.)*Myxostoma papillosum* JORDAN, Ann. Lyc. Nat. Hist. N. Y. xi, 366, 1877. (Ocmulgee River.)*Myxostoma papillosa* JORDAN, Man. Vert. ed. 2d, 318, 1878.

HABITAT.—North Carolina to Georgia.

This species appears to be very abundant in all the streams from the Great Pedee to the Altamaha. In its general character and appearance, it is very similar to the rest of the genus; but the mouth is remarkably different, the lower lip being full, thick, decidedly papillose, strongly incised behind, being very much as in *Catostomus nigricans*.

My specimens do not agree very well with Professor Cope's description; but this is probably due to their greater size. Still, a possibility exists that two species of this type inhabit our South Atlantic States.

The head in my specimens is very large, flattish above, narrowed forwards, and more than one fourth of the length, without caudal. The mouth is very large and inferior. The body is oblong, compressed, heavy forwards; the back moderately elevated. The eye is quite large, high up, and well back. The free border of the dorsal fin is sometimes

convex, sometimes concave. The following are the measurements of two specimens:—

	14989.	18536.
Length, inches.....	16½	12
Depth (percentage of length).....	.29	.27
Head.....	.26	.24
Width of interorbital area.....	.10	.....
Length of snout.....	.12	.....
Diameter of orbit.....	.05	.....
Length of base of dorsal.....	.19	.....
Height of longest ray.....	.16	.19
Height of last ray.....	.10	.....
Dorsal rays.....	2, 14	2, 10
Scales.....	6-46-5	.....

In color, this species is smoky above, the sides silvery, the lower fins white.

Professor Cope says that "they attain one foot in length, and do not exceed one pound in weight". I have specimens a foot and a half long and of three pounds or more weight.

In the Ocmulgee, the species is next to *M. cervinum* the most abundant, and is called the White Mullet, or Sucker. Professor Cope found it quite abundant in the Catawba and the Yadkin Rivers, where it "is highly valued by the inhabitants as an article of food. It is regarded as the best of the Catostomi for that purpose. It is less frequently caught on the hook than some other species, but in the autumn, they come upon the weirs in considerable numbers. The fishermen call it the 'Shiner'."

*Specimens in the United States National Museum.*

Number.	Locality.	Collector.
14989	Kinston, N. C .....	J. W. Milner.
18536	Kinston, N. C .....	J. W. Milner.
18537	Kinston, N. C .....	J. W. Milner.
18538	Kinston, N. C .....	J. W. Milner.
18970	Kinston, N. C .....	J. W. Milner.
20906	Kinston, N. C .....	J. W. Milner.
—	Ocmulgee River, Ga.....	D. S. Jordan.

Genus *MINYTREMA* Jordan.

*Minytrema* JORDAN, Man. Vert. ed. 2d, 318, 1878.

*Catostomus*, *Ptychostomus*, *Moxostoma*, and *Erimyzon* sp., AUTHORS.

Type, *Catostomus melanops* Rafinesque.

Etymology,  $\mu\upsilon\nu\upsilon\varsigma$ , reduced;  $\tau\rho\tilde{\eta}\mu\alpha$ , aperture, in allusion to the imperfections of the lateral line.

Species with the form, squamation, and general appearance of *Myxostoma*, but with the air-bladder in two parts, as in *Erimyzon*, and the lateral line imperfect—in the very young entirely obsolete, in half-grown specimens showing as a succession of deepened furrows, in the adult with perfect tubes, but interrupted, these tubes being wanting on some of the scales, especially posteriorly.

Head moderate, rather broad above; mouth moderate, inferior, horizontal, the upper lip well developed, freely protractile, the lower rather small, infolded, A-shaped in outline, plicate, with 12 to 20 plicæ on each side; lower jaw without cartilaginous sheath; eye moderate, rather high up, placed about midway of the head. Suborbital bones considerably developed, not very much narrower than the fleshy portion of the cheek below them, the posterior suborbital concavo-convex, about twice as long as deep, sometimes divided, the anterior somewhat deeper than long, often divided into two, sometimes united with the preorbital, which is well developed and much longer than broad. The number and form of these bones, except as to their depth, are not constant in the same species, and do not afford specific characters. Opercular bones well developed, not much rugose. Fontanelle evident, rather large. Gill-rakers rather long, in length about half the diameter of the eye. Isthmus moderate. Pharyngeal bones essentially as in *Myxostoma*.

Body rather elongate, subterete, becoming deep and rather compressed with age. Scales rather large, nearly equal over the body, the radiating furrows not specially marked. Lateral line as above described, interrupted in the adult, but with perfect tubes, imperfect in partly grown specimens, entirely obsolete in the young. Scales in a longitudinal series 44 to 47 in number, 12 to 14 in a transverse series from dorsal to ventrals.

Dorsal fin rather short and high, with about 12 developed rays, beginning rather nearer the snout than the base of the caudal. Pectoral fins moderate, not reaching ventrals, the latter not to vent. Ventrals rather in advance of the middle of the dorsal, their rays normally 9,

rarely 8 or 10. Anal fin high and short, often more or less emarginate in males. Caudal fin moderately forked, the lobes about equal.

Air-bladder with two chambers.

Males in spring with the head covered with many small tubercles.

But one species of this genus seems to be known. It is widely distributed in the waters of the Western and Southern States.

This genus has been recently separated from *Erimyzon*, on account of the peculiarities of the lateral line. The form of the body, the form of the mouth, and the character of the squamation differ considerably in the two genera.

*Generic Characterizations.*

MINYTREMA Jordan, 1878.--"Young specimens of this species (*melanops*) have no trace of a lateral line, as in *Erimyzon*. Older ones (6 to 8 inches) show a deepening of the furrows along the median series of scales. Adults of 12 to 18 inches show a series of completely developed tubes, which, however, are wanting on some of the scales, especially behind. As *Erimyzon* never shows any traces of the tubes of the lateral line, these peculiarities may be held to indicate generic distinction, and the name *Minytrema* is here proposed for *E. melanops*."—(JORDAN, *Man. Vert.* ed. 2d, 318, 1878.)

ANALYSIS OF SPECIES OF MINYTREMA.

\* Body oblong, little compressed; the young nearly terete; the adults deeper-bodied; the dorsal region not elevated: depth about 4 in length, varying from about 3 in adults to  $4\frac{1}{2}$  in the young: head not very large,  $4\frac{1}{2}$  in length of body ( $4\frac{1}{4}$  to  $4\frac{1}{2}$ ), not specially depressed: mucous pores rather strong: eye small, 5 to 6 in head: mouth quite inferior, horizontal, rather small: scales large, firm, regularly and smoothly imbricated, in 46 (44-47) longitudinal series and 13 (12 to 14) transverse series, the scales not crowded forwards: fin-rays usually, dorsal 12,\* anal 7, ventrals 9.

Coloration dusky above, with usually a black blotch behind the dorsal fin: each scale along the sides with a small, more or less distinct blackish spot at its base, these spots forming interrupted longitudinal lines along the rows of scales. These lines are usually very distinct, especially in the adult, but young specimens often show them faintly: sides and belly silvery, with a coppery lustre: sexual peculiarities moderately marked; very old males with the head covered with small tubercles in spring: no great changes with age, either in form or coloration: size large; maximum length about 18 inches ..... MELANOPS, 20.

\* As in all cases in the present paper, the number of developed rays is here understood, the one, two, or three rudimentary rays not being counted, and the last or double ray of the dorsal and anal being counted as one.

20. MINYTREMA MELANOPS (*Rafinesque*) Jordan.*Striped Sucker. Sand Sucker.*

- 1820—*Catostomus melanops* RAFINESQUE, Ich. Oh. 57.  
*Catostomus melanopsis* KIRTLAND, Zool. Ohio, 163, 1838.  
*Catostomus melanops* KIRTLAND, Boston Journ. Nat. Hist. v, 271, 1845.  
*Catostomus melanops* STORER, Synopsis, 424, 1846.  
*Ptychostomus melanops* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 204, 1855.  
*Ptychostomus melanops* COPE, Proc. Am. Philos. Soc. Phila. 478, 1870.  
*Erimyzon melanops* JORDAN, Bull. Buffalo Soc. Nat. Hist. 95, 1876.  
*Erimyzon melanops* JORDAN, Man. Vert. 294, 1876.  
*Erimyzon melanops* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 48, 1876.  
*Erimyzon melanops* JORDAN & COPELAND, Check List, 157, 1876.  
*Erimyzon melanops* JORDAN, Ann. Lye. Nat. Hist. N. Y. xi, 347, 1877.  
*Minytrema melanops* JORDAN, Man. Vert. ed. 2d, 318, 1878.
- 1844—*Catostomus fasciatus* (LE SUEUR MSS.) CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 449.  
*Catostomus fasciatus* STORER, Synopsis, 426, 1846.  
*Catostomus fasciatus* GÜNTHER, Cat. Fishes Brit. Mus. vii, 19, 1868.
- 1856—*Moxostoma victoriæ* GIRARD, Proc. Ac. Nat. Sc. Phila. 171.  
*Moxostoma victoriæ* GIRARD, U. S. Mex. Bound. Surv. Ichth. 35, pl. xx, f. 1-3, 1859.
- 1856—*Ptychostomus haydeni* GIRARD, Proc. Ac. Nat. Sc. Phila. 172.  
*Ptychostomus haydeni* GIRARD, U. S. Pac. R. R. Expl. x, 220, pl. xlix, f. 1-4, 1858.  
*Terctulus haydeni* JORDAN & COPELAND, Check List, 157, 1876.
- 1877—*Terctulus suetta* JORDAN & GILBERT, in Klippart's Rept. Fish Commr. Ohio, 53.  
(Supposed to be *C. suetta* Lacépède, as it was perhaps in part the *C. suetti* of Cuv. & Val. and of Bosc.)  
*Erimyzon suetta* JORDAN, Bull. U. S. Nat. Mus. x, 35, 1877.

HABITAT.—Great Lake Region to South Carolina and Texas.

This fish, although a very abundant one in the Mississippi Basin, seems to have been overlooked by most recent writers. Rafinesque described it rather poorly. Dr. Kirtland was able to recognize the fish from Rafinesque's account, and has given a very good description and an indifferent figure. Valenciennes described it fairly, and Agassiz seems to have been acquainted with it, although, deceived by its external appearance, he took it for a *Myxostoma* (*Ptychostomus*). Girard next described and figured it as two species, belonging to two different genera. Professor Cope, for some reason, did not obtain it in any of his collections, and seems to have had much difficulty in identifying Kirtland's account. In 1875, the writer, noticing certain resemblances to *Erimyzon oblongus*, was led to dissect a number of individuals, and found that the

air-bladder in all cases was bicellular, as in the genus *Erimyzon*. At that time he had never seen any specimens with a developed lateral line and then unquestioningly referred the species to *Erimyzon*. Later, Mr. Nelson noticed the occasional partial development of the lateral line, and recently, by the examination of a full series of specimens, the writer has been enabled to trace the stages in its growth.

This fish inhabits all the Western streams and lakes, usually in company with *Erimyzon sucetta*. It is fond of clear sluggish waters, and abounds in ponds and bayous. It is used for food, and is pretty good for a "Sucker", which is not saying much. This species is more than usually tenacious of life, and young specimens are rather interesting as aquarium fishes.

The synonymy of this species needs a few words. It was originally described by Rafinesque as a species with a lateral line. This first description is quite indifferent, but the account of the coloration, and the name, Striped Sucker, enabled Dr. Kirtland readily to identify it, but the latter writer found the "lateral line obsolete". Later, Valenciennes described it under Le Sueur's MSS. name of *fasciatus*, and found a lateral line. As Le Sueur's specimens were from the Wabash, there can be no doubt of their identity with *melanops*. Later, Dr. Girard described and figured Texan specimens without the lateral line under the name of *Moxostoma victoria*, and specimens with the lateral line from the Upper Missouri Region as *Ptychostomus haydeni*. The types of neither of these species are preserved, but no distinctions from *melanops* are noticed in either case by the describer, and the range of *melanops* certainly includes the Missouri river and the waters of Texas.

The name *sucetta* has been once or twice employed by me for this species, erroneously, as I am now convinced. I found this species in abundance in South Carolina; and Le Sueur, apparently quoting from Lacépède, says:—"Sides silvery, with brown spots at the base of the scales." Nevertheless, on inspection of Lacépède's description, and especially of the colored figure which he gives from a drawing by Bose, it becomes evident that the *Cyprinus sucetta* Lacépède is the same as *Cyprinus oblongus* of Mitchill, a species equally abundant in the same waters. Bose's drawing, although not giving the details of structure minutely, represents the general form and coloration of the body and fins, and this figure can only represent the *Cyprinus oblongus*. As the *Cyprinus sucetta* Lacépède is based entirely on information derived from Bose, the name must be retained for the species which Bose had fig-

ured. As for the expression, "brown spots at the base of the scales," if really originating with Bosc, as appears to be the case, it may have arisen from the confusion of *sucetta* with *melanops*, which species inhabits the same waters, or it may simply refer to the obscure duskiness of the bases of the scales, common to both species.

I have examined many specimens of *Minytrema melanops* from the Great Lakes, from various places in the Mississippi Valley, and from the Tennessee, Alabama, Santee, and other Southern rivers, and can find no differences of any importance. Indeed, the species seems to be very little variable for one so widely distributed.

*Specimens in the United States National Museum.*

Number.	Locality.	Collector.
7694	.....	
7768	.....	
8434	.....	
11050	Sandusky, Ohio.....	J. W. Milner.
11144	Sandusky, Ohio.....	J. W. Milner.
11145	Sandusky, Ohio.....	J. W. Milner.
12449	Sandusky, Ohio.....	J. W. Milner.
17800	Round Lake, Montgomery, Ala.....	Kumlien & Bean.
17808	Hempstead, Tex.....	Kumlien & Earle.
20275	.....	Dr. Kenners.
—	White River, Indiana.....	D. S. Jordan.
—	Etowah River, Georgia.....	D. S. Jordan.
—	Saluda River, South Carolina.....	D. S. Jordan.

Genus ERIMYZON *Jordan.*

*Moxostoma* AGASSIZ, Am. Journ. Sc. Arts, 1854, 200. (Not of Rafinesque.)

*Erimyzon* JORDAN, Bull. Buff. Soc. Nat. Hist. 1876, 95.

*Teretulus* COPE, Synopsis of Fishes of N. C. 2d ed. Addenda, 1877. (Not of Rafinesque.)

*Cyprinus*, *Catostomus*, and *Labeo* sp., EARLY AUTHORS.

Type, *Cyprinus oblongus* Mitchill = *Cyprinus sucetta* Lac.

Etymology, ἐρι, an intensive particle; μύζω, to suck.

Head moderate, rather broad above: mouth moderate, somewhat inferior, the upper lip well developed, freely protractile, the lower moderate, infolded, Λ-shaped in outline, plicate, with 12–20 plicæ on each side: lower jaw without cartilaginous sheath, rather stronger than usual,

and oblique in position when the mouth is closed, the mouth thus similar to that of *Ichthyobus*. Eye moderate, rather high up, placed about midway of the head: suborbital bones considerably developed, not very much narrower than the fleshy portion of the cheek below them, the posterior suborbital concavo-convex, about twice as long as deep, sometimes divided, the anterior somewhat deeper than long, sometimes divided into two, sometimes united with the preorbital bone, which is well developed and much longer than broad. Opercular bones moderately developed, scarcely or not rugose. Fontanelle evident, rather large. Gill-rakers rather long, about half the diameter of the eye in length. Isthmus moderately developed, about the width of the eye.

Pharyngeal bones weak, the teeth quite small, slender, and weak, rapidly diminishing in length upwards, each tooth narrowly compressed, with a cusp on the inner margin-of the cutting surface, and some inequalities besides.

Body oblong, rather shortened, heavy forwards and considerably compressed.

Scales rather large, more or less crowded forwards, sometimes showing irregularities of arrangement, the longitudinal radiating furrows much stronger than usual, the scales rather longer than deep, but so imbricated in the adult that the exposed surfaces appear deeper than long.

Lateral line entirely wanting. Scales in the longitudinal series from head to base of caudal 35 to 45 in number; scales in transverse row from base of ventral to dorsal 12 to 18.

Dorsal fin rather short and high, with from 10 to 14 developed rays, the number usually 11 or 12.

Beginning of dorsal fin rather nearer snout than base of caudal. Pectoral fins moderate, not reaching ventrals; the latter not to vent.

Ventrals under a point rather in advance of the middle of dorsal; their rays normally 9, but occasionally 8 or 10.

Anal fin high and short, more or less emarginate or bilobed in adult males; caudal fin moderately forked or merely lunate, its two lobes about equal.

Air-bladder with two chambers.

This genus has a very wide range, one of its two known species probably occurring in all the streams of the United States east of the Rocky Mountains.

The existence of this genus seems to have been first noticed by DeKay, who, however, erroneously supposed it to be identical with the Afri-

can genus *Labeo* of Cuvier and Valenciennes. Its essential character—the absence of the lateral line—was first noticed by Professor Agassiz, who identified its typical species with *Catostomus* (*Moxostoma*) *anisurus* Rafinesque, and therefore erroneously called the genus *Moxostoma*. The application of the name *Moxostoma* to the Red Horse group was pointed out by the present writer in 1876; the name *Erimyzon* being then suggested for the group now under consideration.

The use of the name *Teretulus* for this genus has been lately suggested by Professor Cope, its species being among those enumerated by Rafinesque as composing his “*omnium gatherum*” to which the name *Teretulus* was applied. If we subtract from the original group *Teretulus*, the different component genera in order of time of proposal, the last one left would be *Erimyzon*, or rather *Minytrema*. But the name *Teretulus* has already been restricted by Professor Cope to the Red Horse group, the principal component of Rafinesque’s *Teretulus*. In my opinion, it should remain there, although the earlier name *Myxostoma* renders it but a synonym. We cannot afford to reconsider our use of these old collective generic names whenever a new genus is proposed. The “rule of exclusion”, if stiffly adhered to, would require the substitution of *Acomus* for *Pantosteus*, inasmuch as a species of the latter genus was referred by Girard to the former. This question is further discussed under *Myxostoma*.

#### Generic Characterizations.

LABEO DeKay, 1842.—“Dorsal long. No spines nor barbels. Lips fleshy, and frequently crenated.”—(DEKAY, *New York Fauna, Fishes*, 192.)

MOXOSTOMA Agassiz, 1855.—“The species of this genus contrast greatly with those of all other genera of the family of Cyprinoids, by the total absence of external openings in the lateral line, visible upon the scales. There is indeed no *row of perforated scales upon the sides of the body*, to mark the main course of the system of tubes pervading the skin in most fishes, and the pores traversing the skin which covers the skull and cheeks, as well as the lower jaw, are so minute as to escape the unarmèd eye. In this respect the genus *Moxostoma* differs greatly from all other abdominal fishes in which the lateral line is distinctly marked by a series of tubes traversing a prominent row of scales along the sides, and extending through the mastoids to the forehead, and along the preopercle to the symphysis of the lower jaw. This total absence of a lateral line is compensated by the presence of a few deeper radiating furrows in the posterior field of all the scales.

“The longitudinal diameter of the scales exceeds greatly the transverse, but the scales are imbricated in such a manner that the portion visible externally appears higher than long. The centre of radiation is placed in the middle of the scales; there are no radiating furrows upon the lateral fields, those of the posterior field are fewer and deeper than those of the anterior field; the concentric ornamental ridges of the

posterior field are also much broader and farther apart than those of the lateral and anterior fields. The scales are smaller upon the anterior portion of the body than upon the sides. Another remarkable peculiarity of this genus consists in the great difference there is among the adults in the form of their fins in the several sexes. The young also differ strikingly from the adults both in form and coloration. . . . The body of *Moxostoma* is elongated and somewhat compressed, though stouter than that of *Ptychostomus* and *Catostomus* proper. The greatest depth is over the ventrals.

"The head is small; the small mouth opens obliquely forwards and downwards; when open the lower jaw is quite prominent. The lips are small and transversely ridged; the lower one is slightly bilobed. The dorsal is over the ventrals; its length considerably exceeds its height in the males; in the females its dimensions are more nearly equal. The pectorals and ventrals are more pointed and longer in the males than in the females. The lower margin of the anal fin is bilobed in the males, while in the females it is simply emarginated; in both sexes, the anal when bent backwards reaches the caudal.

"The pharyngeal bones have a greater resemblance to those of the genus *Ichthyobus* than to any other of the tribe of *Catostomi*; the symphysis however is shorter, and the teeth are neither so minute nor so numerous; they increase also more rapidly in size from above downwards, and are more strongly curved inwards, the innermost edge rising into an acute point, which is more prominent in the middle and upper teeth, than in the lower ones."—(AGASSIZ, *Am. Journ. Sci. Arts*, 1855, p. 200.)

MOXOSTOMA Girard, 1856.—"May be circumscribed by characters more natural than the preceding ones. And the most striking of these, it must be conceded, is the absence of that lateral line possessed by almost all fishes. The body is elongated and compressed; the head small; the mouth small also, opening obliquely forwards and downwards. The lips being small and transversally ridged; the inferior one being slightly bilobed. The anterior margin of the dorsal is situated in advance of the insertion of the ventrals. The dorsal fin is either higher than long or else its length is equal to its height, varying somewhat according to the sexes, as well as the anal, which is, however, always deeper than long. The shaft of the pharyngeal bones constitutes a very open curve, the convex margin of which is regular and entire. The teeth themselves are very much compressed, strongly curved inwardly, and much larger inferiorly than superiorly."—(GIRARD, *Proc. Ac. Nat. Sc. Phila.* 1856, p. 171.)

MOXOSTOMA Günther, 1868.—"Scales of moderate size; lateral line none; fins, mouth, gills and pharyngeal teeth, identical with those of *Catostomus* in all essential points."—GÜNTHER, *Cat. Fishes Brit. Mus.* vii, p. 20.)

ERIMYZON Jordan, 1876.—[Name suggested as a substitute for *Moxostoma* Ag., the type of *Moxostoma* Raf. (*Catostomus anisurus* Raf.) not being a member of this genus.]—(JORDAN, *Bull. Buff. Soc. Nat. Hist.* p. 95.)

ERIMYZON Jordan, 1876.—"Dorsal moderate; air-bladder in two parts; no lateral line; lips usually plicate."—(JORDAN, *Man. Vert.* ed. 1st, p. 292.)

## ANALYSIS OF SPECIES OF ERIMYZON.

\*Body oblong, compressed, becoming gibbous with age, the ante-dorsal region more or less elevated in the adults; the depth  $3\frac{1}{2}$  in length, ranging from  $2\frac{1}{4}$  in adults

to 4 in young: head stout, short, about  $4\frac{1}{2}$  in length (4 to  $4\frac{1}{2}$ ), the interorbital space wide and depressed, the lower parts narrower, so that it is somewhat wedge-shaped downwards: eye not large,  $4\frac{3}{4}$  in head ( $4\frac{1}{2}$  to  $5\frac{1}{2}$ ): mouth protractile downwards and forwards, the mandible oblique: scales usually closely imbricated and more or less crowded forwards, but often showing various irregularities in arrangement, about 43 (39–45) in a longitudinal series and 15 (14 to 16) in a transverse series between the ventrals and the dorsal. Fin-rays somewhat variable, the dorsal with 11 (10 to 13) developed rays, the anal with 7, and the ventrals with 9 (rarely 8).

Coloration varying with age; never distinct series of black spots along the rows of scales; young with a broad black lateral band bordered above by paler; in some specimens from clear water, this band is of a jet-black color and very distinct; in others, it is duller; later this band becomes broken into a series of blotches, which often assume the form of broad transverse bars; in adult specimens, these bars disappear, and the color is nearly uniform brown, dusky above, paler below, everywhere with a coppery or brassy, never silvery, lustre; the fins are dusky or smoky brown, rarely reddish-tinged: sexual differences strong; the males in spring with usually three large tubercles on each side of the snout, and with the anal fin more or less swollen and emarginate: adult specimens with the back gibbous and the body strongly compressed, in appearance quite unlike the young. Maximum length about 10 inches.....SUCETTA, 21.

\*\* Body oblong, the back more elevated, the body deeper and more compressed than in the preceding, the greatest depth in advance of the dorsal fin being contained about  $2\frac{3}{4}$  times in the length; nape less gibbous than in *sucetta*; head quite small and short, the large eye being almost exactly midway in its length, its length  $4\frac{1}{2}$  in that of the body; eye  $4\frac{1}{4}$  in head; interorbital space rather narrow, strongly transversely convex, less than half the length of the head: mouth small, protractile forwards, the lower jaw oblique; lips as in the preceding.

Scales large, much larger and much more uniform in their imbrication than in *E. sucetta*; 36 in a longitudinal series, and about 13 in a transverse series from the ventrals to the dorsal. Dorsal fin high, of 12 developed rays; anal moderate, with 7; ventrals large, with 10. Color dark olivaceous above, each scale along the sides reflecting pale from the strongly ridged middle part; these giving in certain lights the appearance of pale stripes along the rows of scales: fins dusky, especially at their tips.....GOODEL, 22.

## 21. ERIMYZON SUCETTA (*Lacépède*) Jordan.

*Chub Sucker. Creek Fish. Mullet.*

1803—*Cyprinus sucetta* LACÉPÈDE, Hist. Nat. des Poissons, v, 606, 610.

*Catostomus sucetta* LE SUEUR, Journ. Ac. Nat. Sc. Phila. 109, 1817.

*Catostomus sucetta* DEKAY, New York Fauna, part iv, Fishes, 203, 1842.

*Catostomus suceti* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 466, 1844.

*Catostomus suceti* STORER, Synopsis, 419, 1846.

*Moxostoma sucetta* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 202, 1855.

*Moxostoma sucetta* PUTNAM, Bull. Mus. Comp. Zool. 10, 1863.

- Erimyzon sucetta* JORDAN, Man. Vert. 295, 1876.
- Erimyzon sucetta* JORDAN & COPELAND, Check List, 157, 1876.
- Erimyzon sucetta*, JORDAN, Man. Vert. ed. 2d, 319, 1878.
- 1814—*Cyprinus oblongus* MITCHILL, Lit. & Phil. Trans. New York, 1, 459.
- Catostomus oblongus* LE SUEUR, Journ. Ac. Nat. Sc. 108, 1817.
- Catostomus oblongus* THOMPSON, Hist. Vt. 134, 1842. (Synonymy, but not description, which applies to *M. macrolepidotum*.)
- Labeo oblongus* DEKAY, New York Fauna, part iv, Fishes, 193, 1842.
- Catostomus oblongus* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 441, 1844.
- Catostomus oblongus* STORER, Synopsis, 423, 1846.
- Moxostoma oblongum* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 203, 1855.
- Moxostoma oblongum* PUTNAM, Bull. Mus. Comp. Zool. 10, 1863.
- Moxostoma oblongum* GILL, Canadian Nat. p. 19, Aug. 1865.
- Moxostoma oblongum* GÜNTHER, Cat. Fishes Brit. Mus. vii, 21, 1868.
- Moxostoma oblongum* COPE, Proc. Am. Philos. Soc. Phila. 468, 1870.
- Moxostoma oblongum* JORDAN, Fishes of Ind. 221, 1875. (Name only.)
- Erimyzon oblongus* JORDAN, Bull. Buffalo Soc. Nat. Hist. 95, 1876. (Name only; generic diagnosis of *Erimyzon*.)
- Erimyzon oblongus* JORDAN, Man. Vert. 294, 1876.
- Moxostoma oblongum* UHLÉR & LUGGER, Fishes of Maryland, 140, 1876.
- Erimyzon oblongus* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 48, 1876.
- Erimyzon oblongus* JORDAN & COPELAND, Check List, 157, 1876. (Name only.)
- Teretulus oblongus* JORDAN & GILBERT, in Klippart's Rept. 53, 1876. (Name only.)
- Teretulus oblongus* JORDAN & GILBERT, in Klippart's First Report, Ohio Fish Commission, 85, pl. xii, f. 20, 1877.
- Erimyzon oblongus* JORDAN, Ann. Lyc. Nat. Hist. N. Y. xi, 346, 1877.
- Erimyzon oblongus* JORDAN, Ann. Lyc. Nat. Hist. N. Y. xi, 365, 1877.
- Erimyzon oblongus* JORDAN, Bull. U. S. Nat. Mus. ix, 36, 1877.
- 1817—*Catostomus gibbosus* LE SUEUR, Journ. Ac. Nat. Sc. Phila. i, 92.
- Catostomus gibbosus* STORER, Rept. Ichthy. Mass. 183, 1838.
- Labeo gibbosus* DEKAY, New York Fauna, part iv, Fishes, 194, 1842.
- Catostomus gibbosus* STORER, Synopsis, 420, 1846.
- Catostomus gibbosus* KIRTLAND, Hamilton Smith's Annals of Science.
- Catostomus gibbosus* STORER, Hist. Fishes Mass. 291, pl. xxii, f. 4, 1867.
- 1817—*Catostomus tuberculatus* LE SUEUR, Journ. Ac. Nat. Sc. Phila. i, 93.
- Catostomus tuberculatus* DEKAY, New York Fauna, part iv, Fishes, 199, 1842.
- Catostomus tuberculatus* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 444, 1844.
- Catostomus tuberculatus* THOREAU, Week on Concord and Merrimack, 38, 1868.
- 1817—*Catostomus vittatus* LE SUEUR, Journ. Ac. Nat. Sc. Phila. 104.
- Catostomus vittatus* DEKAY, New York Fauna, part iv, Fishes, 203, 1842.
- Catostomus vittatus* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 459, 1844.
- Catostomus vittatus* STORER, Synopsis, 422, 1846.
- 1820—*Catostomus fasciolaris* RAFINESQUE, Ich. Oh. 53.
- Bull. N. M. No. 12—10

- 1842—*Labeo elegans* DEKAY, New York Fauna, part iv, Fishes, 192.  
*Catostomus elegans* STORER, Synopsis, 425, 1846.
- 1842—*Labeo esopus* DEKAY, New York Fauna, part iv, Fishes, 195.  
*Catostomus esopus* STORER, Synopsis, 425, 1846.
- 1842—*Labeo elongatus* DEKAY, New York Fauna, part iv, Fishes, 394.
- 1855—*Moxostoma anisurus* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 202. (Not of Rafinesque.)
- 1855—*Moxostoma tenue* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 203.  
*Moxostoma tenue* PUTNAM, Bull. Mus. Comp. Zool. 10, 1863.  
*Moxostoma tenue* GÜNTHER, Cat. Fishes Brit. Mus. vii, 21, 1865.  
*Erimyzon tenuis* JORDAN & COPELAND, Check List, 157, 1876.
- 1856—*Moxostoma claviformis* GIRARD, Proc. Ac. Nat. Sc. Phila. 171.  
*Moxostoma claviformis* GIRARD, U. S. Pac. R. R. Expl. x, 219, pl. xlviii, f. 5-9, 1853.  
*Erimyzon claviformis* JORDAN & COPELAND, Check List, 157, 1876.
- 1856—*Moxostoma kennerlyi* GIRARD, Proc. Ac. Nat. Sc. Phila. 171.  
*Moxostoma kennerlyi* GIRARD, U. S. Mex. Bound. Surv. Ichth. 34, pl. xx, f. 7-9, 1859.
- 1856—*Moxostoma campbelli* GIRARD, Proc. Ac. Nat. Sc. Phila. 172.  
*Moxostoma campbelli* GIRARD, U. S. Mex. Bound. Surv. Ichth. 35, pl. xx, f. 4-6, 1859.  
*Erimyzon campbelli* JORDAN & COPELAND, Check List, 157, 1876.

HABITAT.—All waters of the United States east of the Rocky Mountains.

This protean species is, next to *Catostomus teres*, the most abundant and the most widely diffused of our species of Suckers. It occurs in every stream from Maine to Texas, and thrives in all sorts of waters, from the Great Lakes to the smallest ponds and brooks. Its variations in color and form are remarkable; but after the elimination of those which are known to be due to differences of sex, age, and surroundings, I find nothing left on which a difference of species or even a varietal difference may be based. I therefore unite all the nominal species of this genus, with a single exception, under the oldest specific name applied to any of them, *sucetta* of Lacépède.

The name *sucetta* has been passed from author to author for a long time, all the descriptions being based on the notes of Bose and the account given by Lacépède, no one seeming to have any clear idea of what the original species was. The reasons for identifying *sucetta* with *oblongus* have been already given.

The name *sucetta* was spelled *suceti* by Valenciennes. I see no reason for this change. The derivation of the word is from the French *sucet*, a sucker; and *sucetta* is an agreeable latinization of the barbarous word. The identity of the nominal species *oblongus*, *gibbosus*, *tuberculatus*, *vittatus*, *esopus*, *elongatus*, and *elegans* was conclusively shown by Professor Agassiz. The *fasciolaris* of Rafinesque, as I have shown, is probably this species, which Rafinesque could hardly have overlooked.

Professor Agassiz's *anisurus*, considered by him as the Western representative of *oblongus*, must belong here. Professor Agassiz's *tenuis* from Mobile is not described; but as *sucetta* occurs abundantly in Alabama, it is safe to presume their identity. The type of *Moxostoma claviformis* Girard is now lost. Both figure and description point to the young of *sucetta*. The figure represents the scales rather smaller than usual, but it may not be correct. The types of *Moxostoma kennerlyi* Girard and of *Moxostoma campbelli* Girard, from Texas, have also disappeared; but they too seem to have been based on the young of the present species, and as *sucetta* certainly occurs in Texas, these nominal species must fall into the synonymy.

The Chub Sucker is one of the smallest species, rarely reaching a length of more than a foot. It is tenacious of life, and bites readily at a small hook, but is not much valued for food. The young are rather handsome, the black lateral band being sometimes very distinct. In the aquarium, they act as scavengers. The adult fishes, especially the males, are very dusky in color, and the males in spring are provided with three large tubercles arranged in a triangle on each side of the head. The fins of the adults are usually black, sometimes tinged with red.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
144	Sugar Loaf Creek, Arkansas.....	H. B. Möllhausen.
6860	Nova Scotia .....	
7638	.....	
7646	Boston, Mass .....	
7771	Riverhead, L. I.....	S. F. Baird.
7776	.....	
8280	.....	S. F. Baird.
8376	North Carolina.....	McNair.
8459	Potomac River.....	
8497	.....	
8700	Holliston, Mass.....	
8742	Detroit River.....	S. F. Baird.
8933	Brimfield .....	
8975	.....	
9007	Delaware County .....	
9042	.....	
9082	.....	
9160	.....	
9162	Jackson, Ill.....	R. Kennicott.

*Specimens in United States National Museum—Continued.*

Number.	Locality.	Collector.
9166	Abbeville, S. C. ....	
9275	.....	
9446	Aux Plaines River, Illinois.....	R. Kennicott.
9551	Lake Oconomowoc, Wisconsin.....	S. F. Baird.
9660	.....	
10631	Potomac River.....	J. W. Milner.
10814	Sandnsky, Ohio.....	Do.
11033	.....do.....	Do.
11034	.....do.....	Do.
11035	.....do.....	Do.
11199	.....do.....	Do.
11200	.....do.....	Do.
12441	Halifax, Nova Scotia.....	Do.
14977	Potomac River.....	G. B. Goode.
16990	.....do.....	J. W. Milner.
16991	.....do.....	Do.
16992	.....do.....	Do.
16993	.....do.....	Do.
16994	.....do.....	Do.
17816	Clear Creek, Texas.....	Kumlien & Earll.
17821	.....do.....	Do.
17838	New Bedford, Mass.....	Thomas.
19158	Aux Plaines River, Illinois.....	R. Kennicott.
20061	Cedar Swamp, New Jersey.....	S. F. Baird.
20064	Schnylkill, River.....	J. H. Richard.
20105	Fox River, Wisconsin.....	S. F. Baird.
20157	Montgomery, Ala.....	Kumlien & Maxson.
20231	Riverhead, L. I.....	S. F. Baird.
20254	Piermont, N. Y.....	Do.
20269	Sing Sing, N. Y.....	Do.
20360	Trenton, N. J.....	C. C. Abbott.
—	Cumberland River.....	A. Winchell.
—	White River, Indiana.....	D. S. Jordan.
—	Etowah River, Georgia.....	Do.
—	Saluda River, South Carolina.....	Do.

22. *ERIMYZON GOODEI*, *sp. nov.**Goode's Sucker.*

This species differs from *E. sucetta* in form, in the smaller size of the head, in its greater convexity above, and in the larger size and greater uniformity of the scales, which are not at all crowded or reduced forwards.

The type is a fine specimen,  $10\frac{1}{4}$  inches long, collected by Professor G. Brown Goode in the Saint John's River, Florida. It is numbered 19071 on the Museum Register. I have named the species for my friend, Professor Goode, one of the best of American ichthyologists, to whom we are indebted for the discovery of the species.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
19071	Saint John's River, Fla .....	G. Brown Goode.

### Genus CHASMISTES *Jordan.*

*Chasmistes* JORDAN, Bull. Hayden Geol. Surv. Terr. 417, 1878.

Type, *Catostomus fecundus* Cope & Yarrow.

Etymology, *χασμῖω*, to yawn or gape.

Fishes related to *Catostomus*, having the teeth, scales, and air-bladder as in that genus, but distinguished by the size and position of the mouth, the great development of the mandible, and by the small, smooth lips.

Head disproportionally large, forming more than one-fourth of the length, broad and flattish above; sides of head vertical, slightly directed inwards, the breadth through the cheeks less than the breadth above the eyes; eyes small, high up, rather posterior: mouth exceedingly large, terminal, the lower jaw in the closed mouth being very oblique, placed at an angle of about 45 degrees; the lower jaw very long and strong, its length more than one-third the length of the head, nearly half the length of the head in the adult, its tip when the mouth is closed about on a level with the eye; upper jaw very protractile; upper lip very thin (for a Sucker), and nearly smooth; snout elevated above the rest of the head, notably so when the mouth is closed; lower lip moderate, consisting of a broad flap on each side of the mandible, in front reduced to a narrow rim, the surface of the lip nearly smooth, without evident papillæ: nostrils large; suborbital bones narrow, but rather broader than in *Catostomus*; preorbital unusually large: mucous channels moderately developed; fontanelle very large; isthmus rather narrow: pharyngeal bones and teeth essentially as in *Catostomus*.

Body rather slender, tapering pretty regularly from the shoulders to the tail, but little compressed: caudal peduncle rather stout.

Fins moderate, the dorsal rays about 12, the anal 7: pectorals rather long, not quite reaching ventrals: ventrals reaching vent: anal fin high, reaching caudal: caudal fin rather long, its lobes equal.

Scales moderate, large on the caudal peduncle, much smaller and crowded anteriorly, 60 to 65 in the lateral line, about 18 in a transverse series from dorsal to ventrals.

Sexual peculiarities unknown.

Coloration usual.

Air-bladder in two parts.

Size moderate or rather large.

The single species now included in this genus is known only from Utah Lake. Its describers referred it to the genus *Catostomus*, but made no mention of its singular mouth and lips. The original type of the species is in very bad condition, the mouth being shrunken and distorted, and the bones of the head protruding through the skin, so that the peculiarities of the species are hardly recognizable.\*

#### Generic Characterizations.

CHASMISTES Jordan, 1878.—“This genus is distinguished from *Catostomus* by the very large, terminal mouth, the lower jaw being very strong, oblique, its length about one-third that of the head. The lips are little developed, and are very nearly smooth. The type of the genus is *C. fecundus* Cope & Yarrow.”—(JORDAN, *Bull. U. S. Geol. Surv. Terr.* vol. iv, No. 2, p. 417, 1878.)

#### ANALYSIS OF SPECIES OF CHASMISTES.

\* Depth about 5 in length; head  $3\frac{3}{8}$ ; interorbital space broad,  $2\frac{1}{4}$  in head; eye 6 to 7 in head; width of the open mouth  $3\frac{1}{2}$  in head. Dorsal 12. Anal 7. Scales 9-63-8. Color dusky above, pale below; the scales of the back and sides profusely covered with dark punctulations.....FECUNDUS, 23.

### 23. CHASMISTES FECUNDUS (Cope & Yarrow) Jordan.

*Sucker of Utah Lake.*

1876—*Catostomus fecundus* COPE & YARROW, Wheeler's Expl. W. 100th Mer. v, Zool. 678, pl. xxxii, f. 1, 1 a.

*Catostomus fecundus* JORDAN & COPELAND, Check List, 156, 1876.

*Chasmistes fecundus* JORDAN, Bull. Hayden's Geol. Surv. Terr. vol. iv, No. 2, 417, 1878.

HABITAT.—Utah Lake, Utah, where it is excessively abundant. Not yet noticed elsewhere.

This singular species has been overlooked until quite lately. Dr. Yarrow states that it “is abundant in Utah Lake, and is called Sucker

\* In fact, this specimen in its present condition looks to me more like *Catostomus occidentalis*, but the figure published by Cope & Yarrow represents *C. fecundus*. Both species occur in Utah Lake.

by the inhabitants. They run up the rivers to spawn in June; feed on the bottom and eat the spawn of better fish; spawning beds on gravel; bite at hook sometimes; are extremely numerous, and are considered a nuisance by the fishermen, but they meet with a ready sale in winter at an average price of 2½ cents per pound."

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
12894	Utah Lake, Utah .....	Yarrow & Henshaw.
20337	Utah Lake, Utah .....	Dr. H. C. Yarrow. (Many specimens)
20932	Utah Lake, Utah .....	Dr. H. C. Yarrow. (Type <i>Chasmistes</i> .)
—	Utah Lake, Utah .....	Dr. H. C. Yarrow. (Types of the species.)

Genus CATOSTOMUS *Le Sueur*.

*Catostomus* LE SUEUR, Journ. Ac. Nat. Sc. Phila. i, 1817, 89. (Equivalent to family *Catostomida*.)

*Hypentelium* RAFINESQUE, Journ. Ac. Nat. Sc. Phila. i, 1818, 421. (As subgenus of *Ezoglossum*.)

*Decactylus* RAFINESQUE, Ichthyologia Ohiensis, 1820, 60. (As subgenus of *Catostomus*, including the 10-rayed species.)

*Hylomyzon* AGASSIZ, Am. Journ. Sc. Arts, 1855, 205.

*Minomus* GIRARD, Proc. Ac. Nat. Sc. Phila. 1856, 173.

*Acomus* GIRARD, Proc. Ac. Nat. Sc. Phila. 1856, 173.

*Catostomus* GILL, Canadian Naturalist, 1865, August.

*Decadactylus* JORDAN, Man. Vert. 2d ed. 1878, 319. (As subgenus.)

Type, *Cyprinus catostomus* Forster, = *Catostomus hudsonius* Le Sueur, = *Catostomus longirostrum* Le Sueur.

Etymology, *κατο*, low; *στόμα*, mouth.

*Etymology of Synonyms.*

*Hypentelium*: probably *ὑπὸ*, below; *πέντε*, five; *λοβος*, lobe, as the name is said to refer to the 5-lobed lower lip, supposed to distinguish it from the 3-lobed subgenus *Maxillingua*; possibly, however, from *ὑπὸ*, below; *εντελής*, perfect.

*Decactylus*: *δεκάς*, ten; *δάκτυλος*, toe, i. e., 10 ventral rays, hence properly *Decadactylus*.

*Hylomyzon*: *ῥλε*, mud; *μυζῶω*, to suck.

*Acomus* and *Minomus* are probably meaningless words, without etymology.

Head more or less elongate, its length ranging from 3½ to 5 times in that of the body, its form varying considerably in the different subgenera. Eye usually rather small, high up and median or more or less pos-

terior in position: suborbital bones narrow, longer than broad, much as in *Myxostoma*: fontanelle always present, usually widely open, in two species reduced to a narrow slit, but never wholly obliterated.

Mouth rather large, always inferior, and sometimes notably so; the upper lip thick, protractile, papillose; the lower lip greatly developed, with a broad free margin, deeply incised behind, so that it forms two lobes, which are often more or less separated: mandible horizontal, short, not one-third the length of the head and not reaching to opposite the eye: lower jaw usually without distinct cartilaginous sheath: opercular apparatus moderately developed, not rugose: pharyngeal bones moderately strong, the teeth shortish, vertically compressed, rapidly diminishing in size upwards, the upper surface of the teeth nearly even, or somewhat cuspidate.

Body oblong or elongate, more or less fusiform, subterete, more or less compressed.

Scales comparatively small, typically much smaller and crowded anteriorly, the number in the lateral line ranging from about 50 to 115, the number in a transverse series between dorsal and ventrals from 15 to 40: lateral line well developed, straightish, somewhat decurved anteriorly.

Fins variously developed: dorsal with its first ray nearly midway of the body, with from 9 to 14 developed rays; anal fin short and high, with probably always 7 developed rays; ventrals inserted under the middle or posterior part of the dorsal, typically with 10 rays, in one subgenus usually 9, the number often subject to variation of one; caudal fin usually deeply forked, the lobes nearly equal.

Sexual peculiarities not much marked, the fins higher in the male and the anal somewhat swollen and tuberculate in the spring: breeding males in some species with a rosy or orange lateral band.

Air-bladder with two chambers. Vertebræ in *C. teres* and *C. nigricans* 45 to 47.

"The skeleton in *Catostomus* has been well described by Valenciennes (XVII. p. 433). It is distinguished by the comparative want of solidity, certain bones consisting merely of a network of osseous matter. There is a large and broad fontanelle on the upper surface of the head, separating the parietal bones, and leading directly into the cerebral cavity. The occipital process is, below the anterior vertebræ, enlarged into a bladder-like swelling, which is not solid, but consists of a delicate network only. The prefrontal is advanced to the anterior part of the orbit.

The jaw-bones are very feeble, the intermaxillary being reduced to a thin lamella, which does not descend to the middle of the maxillary. The anterior part of the mandible is horizontal, thin and slightly dilated. The apophyses of the four anterior vertebræ are very strong and long."—(GÜNTHER, *Cat. Fishes Brit. Mus.* vii, 13.)

This genus as at present restricted comprises three well-marked groups, which may be accepted as subgenera, under the names *Catostomus*, *Decadactylus*, and *Hypentelium*. One of these groups, *Hypentelium*, has been usually considered as a distinct genus, on account of the differences in the form of the head and in the squamation. These differences are, however, individually of subordinate value, and should probably be held to designate a subgeneric section, rather than a distinct genus.

The group *Decadactylus* as here given is nearly equivalent to *Minomus* and *Catostomus* of Girard, while our *Catostomus* is Girard's *Acomus*. The type of *Catostomus*, as restricted by Agassiz, prior to Girard being *Cyprinus catostomus* Forster, one of the small-scaled group, the name belongs properly to that group, and *Acomus* is a simple synonym. *Decactylus* Rafinesque was not originally defined in any very tangible way, inasmuch as its author included in it species of *Myxostoma* and *Cycleptus*. As, however, it was intended for 10-rayed species, and as one among those originally placed in it was *C. tercs* (as *C. bostoniensis*), the the name *Decactylus* (*Decadactylus*) may be used instead of *Minomus* as a designation for the subgenus to which *C. tercs* belongs.

The genus *Catostomus* is, next to *Myxostoma*, the most rich in species. It is much the most widely distributed of the genera of Suckers, some of its members abounding in every river of North America, and one of them being found in Asia.

#### Generic Characterizations.

"CATOSTOMUS Le Sueur, 1817.

"Back with a single fin.

"Gill-membrane three-rayed.

"Head and opercula smooth.

"Jaws toothless and retractile.

"Mouth beneath the snout; lips plaited, lobed, or carunculated, suitable for sucking.

"Throat with pectinated teeth.

"The species which are here described are all possessed of the following general characters:—

"Body.—The body in general is elongated and varied in its form.

"Scales.—The scales in almost all the species are marked with radiated lines, and fimbriated on their edges; their form more or less rhomboidal or roundish.

*Gill-covers.*—The gill-covers are large, and composed of three pieces; the anterior piece small in some, as is exemplified in the *C. macrolepidotus*, and in others large, as in the *C. communis*; opening or expansion wide.

*Nostrils.*—The nostrils are double on each side, and separated by a membrane; the largest aperture near the eyes.

*Eyes.*—The eyes in general are pretty large, a little oblong, without nictitating membrane: pupil black and roundish: irides yellowish, sometimes brown, as in the *C. gibbosus*.

*Teeth.*—No teeth in the jaws, but those of the throat, on each side, are composed of a range of bones, generally blunt and thick at their summits, placed in a pectinated form, on an osseous, arcuated base, of which they are a component part, and sometimes terminate in a hooked point, as in the *C. maculosus*; these teeth are enveloped in a thick mass of whitish substance, which covers the throat, and supplies the place of a tongue.

*Mouth.*—The mouth is generally lunated; to the palate is attached a membrane.

*Viscera.*—The *intestinal canal* is very much developed, and it has its origin near the throat; the *stomach*, which is simple, and without plaits and curvatures, being a continuation of this canal, and appears to be confounded with it. The intestines make a number of circumvolutions; in a specimen of the *C. macrolepidotus* of 16 inches in length, they were 3 feet 5 inches in length. The *liver* is deliquescent, and soon passes into oil after exposure to the atmosphere. The *air-bladder* is subcylindrical, and divided, in most species, into two parts; in the *C. macrolepidotus*, it is separated into four parts. I have remarked in the intestines of these fishes river-shells of the genera *Lymnaea*, *Bulimus*, etc., which dwell on aquatic plants and on the rock at the bottom of the rivers; these shells the *Catostomi* are enabled to take with their lips, which are protruded forwards by means of their jaws.

"It is necessary to remark that in all the species which I have examined there is a line which runs from the nape, beneath the eyes, and another along the head, above the eyes, of small orifices, for the passage of mucus, which lines are well defined after the fish is dead and desiccated, but not so conspicuous when recent; these lines Forster improperly terms sutures. I will add that some species, in a dried state, have also a tuberculated appearance on the head, which tubercles are not discernible when the animals are living."—(LE SUEUR, *Journ. Ac. Nat. Sc.* i, p. 89.)

HYPENTELIUM Rafinesque, 1818.—"This species [*Eroglossum macropteron*] distinguished by so many secondary characters may be the type of a subgenus, which may be called *Hypentelium*, in reference to the five lobes of the lower jaw. The species with a three-lobed jaw may form then another section under the former name of *Maxillingua*."—(RAFINESQUE, *Journ. Acad. Nat. Sc.* p. 420, 1818.)

CATOSTOMUS Rafinesque, 1820.—"Body oblong cylindrical, scaly. Vent posterior or nearer to the tail. Head and opercles scaleless and smooth. Mouth beneath the snout, with fleshy, thick or lobed sucking lips. Jaws toothless and retractible. Throat with pectinated teeth. Nostrils double. Gill-cover double or triple. Three branchial rays to the gill membrane. A single dorsal fin commonly opposite to the abdominal fins, which have from eight to ten rays."—(RAFINESQUE, *Ich. Oh.* p. 53.)

DECACTYLUS Rafinesque, 1820.—"Body nearly cylindrical, abdominal fins with ten

rays; tail equally forked. Besides the two following species (*C. duquesnii*; *C. elongatus*) the *C. bostoniensis* and *C. hudsonius* must be enumerated here."—(RAFINESQUE, *Ich. Oh.* p. 60.)

HYPENTELIUM Rafinesque, 1820.—"Body pyramidal slightly compressed, with very minute scales. Vent posterior. Head scaleless, nearly square, mouth terminal protruded beneath toothless, jaw shorter with five lobes, the middle one larger, lips very small. Abdominal fins anterior removed from the vent, dorsal fin anterior, opposed to them.

"This genus belongs to the family of the Cyprinidia, and is next to my genus *Exoglossum*, with which I had united it; but this last differs from it by an oblong body, flat head, lower lip trilobe not protruded, abdominal fins and dorsal fin medial, &c. The name expresses the character of the lower lip."—(RAFINESQUE, *Ich. Oh.* p. 68.)

CATOSTOMUS DeKay, 1842.—"Both lips thick, fleshy, and crenated or plaited; the lower lip pendant. Dorsal placed above the ventrals and usually short."—(DEKAY, *New York Fauna, Fishes*, p. 196.)

CATOSTOMUS Heckel, 1843.—"Os inferum; labia carnea, lata, rugosa, suctni apta; cirrhi nulli; præoperculum ante occiput. Pinna dorsalis brevis, rarius elongata; analis brevior, utraque radio osseo nullo. Dentes pharyngei pectiniformes.

$$\frac{D : 3 | 8 - 13 - 29}{A : 2 | 5 - 7}$$

(Characters of Tribus IV, including *Catostomus*, *Rhytidostomus*, and ♀ *Exoglossum*.)

"Dentes pectiniformes 40—40. Os inferum; labia carnea; lata, rugosa ad suctum apta; cirrhi nulli. Pinna dorsalis et analis brevis, illa ante pinnas ventrales incipiens; radius osseus nullus.—Tractus intestinalis  $2\frac{1}{2}$ —3 long. corp."—(HECKEL, *Fische Syriens*, p. 33.)

CATOSTOMUS Valenciennes, 1844.—"Ils diffèrent des ables [*Leuciscus*], avec lesquels ils ne sont pas sans affinité, par la position de leur bouche et par la forme des lèvres qui la bordent. Ces organes sont assez distincts de ceux des Chondrostomes.

"L'absence des barbillons les éloigne aussi des Labéons [*Labeo*], avec lesquels ils ont d'ailleurs moins de rapports que M. Cuvier ne le supposait quand il a rédigé le Règne Animal. Enfin ils diffèrent de tous ces genres par leurs dents pharyngiennes.

"Par la forme générale de leur corps, ils ressemblent à nos barbeaux [*Barbus*], dont ils ont presque tous la tête allongée, lisse et nue, et le museau un peu proéminent, mais ils n'ont pas leurs barbillons, et la dorsale manque de rayons épineux et dentelés. La bouche est située sous le museau; elle est sans dents, et les lèvres, élargies, lobées, caronculees, mais sans prolongements filiformes, servent à constituer une sorte de ventouse au moyen de laquelle ces poissons peuvent adhérer ou sucer. Les pharyngiens sont grands et arqués, presque en demi-cercle; tout le bord interne est garni de dents comprimées, à couronne striée, un peu plus large que la base; toutes ces dents décroissent régulièrement depuis les inférieures jusqu'aux supérieures, le nombre en varie selon les espèces; elles forment un peigne sur le corps l'os. Les opercules sont grands; les narines ont chacune, comme à l'ordinaire, deux ouvertures rapprochées; les yeux assez larges, sont elliptiques, et ont l'iris ordinairement jaune; les écailles sont en général petites sur la nuque et près de la tête, et elles vont ensuite en augmentant à mesure qu'on s'en approche de la queue; elles sont plus ou moins rhomboïdales et striées ou frangées.

“Les viscères rappellent ceux des cyprinoïdes en général, mais l'intestin, à cause de ses nombreux replis, a encore plus d'étendue. . . . Le foie se résout bientôt en huile; la vessie aérienne est communément divisé en deux et communique avec le haut de l'œsophage comme dans nos cyprins.”—(VALENCIENNES, *Hist. Nat. des Poissons*, xvii, pp. 423-424.)

HYLOMYZON Agassiz, 1855.—“The name of this genus is a mere translation of the vernacular name of its type, the Mud-Sucker of the West, framed in imitation of *Petromyzon*, but expressing its habits of living in the mud. The body is stout and heavy in front, and tapers off rapidly from the shoulders towards the tail; behind the dorsal it is nearly cylindrical in form.

“The short quadrangular head is broad and flat above, its sides are vertical. The eyes are of moderate size and elliptical in form; the superorbital ridges are elevated above the general level of the head. The mouth is inferior, and encircled by broad fleshy lips which are covered with small grains or papillæ. The lower lip is bilobed. The dorsal is over the ventrals, and nearer the head than the tail; its height and length are nearly equal. The pectorals and ventrals are broad and rounded, the anal fin is slender and reaches the caudal. The scales are largest on the anterior portion of the body. They are slightly longer than high, the ornamental concentric ridges of the posterior field are broader and farther apart than those of the lateral and anterior fields; those of the anterior and posterior fields rather remote, about equal in number. Tubes of the lateral line arising from the centre of radiation.

“The teeth are compressed, so that their sharp edge projects inwards; at the same time they are slightly arched inwards and inserted obliquely upon the pharyngeal bones. They increase gradually in size and thickness from above downwards. The masticating ridge of the teeth is transverse, compressed in the middle and sharp; its upper and lower edges are rounded and more projecting, the inner point, however, more projecting than the outer one.”—(AGASSIZ, *Am. Journ. Sci. Arts*, 1855, p. 205.)

CATOSTOMUS Agassiz, 1855.—“I have retained the name of *Catostomus* for the type to which it was originally applied by Forster. The body is elongated, fusiform and slightly compressed. The snout is short and blunt, and projects but little beyond the mouth, which is inferior. The lower jaw is short and broad. The lips are fleshy and strongly bilobed below; their surface is conspicuously granulated or papillated. The head is considerably longer than high. The dorsal is large and mostly in advance of the ventrals; its length is greater than its height. The anal fin is long and slender, and reaches the caudal. The sexual differences, so conspicuous in the genus *Moxostoma* and *Ptychostomus*, are hardly to be noticed in this genus. The other fins are of moderate size, and more or less pointed.

“The scales are much smaller on the anterior than on the posterior portion of the body; nearly quadrangular, with rounded angles, but somewhat longer than high; the ornamental concentric ridges of the posterior field broader than those of the lateral and anterior fields; the radiating furrows more numerous than in *Hylomyzon* and *Ptychostomus*, and encroaches upon the lateral fields, where, in some species, they are nearly as numerous as upon the anterior and posterior fields. Tubes of the lateral line wider than in *Hylomyzon* and *Ptychostomus*, extending from the centre of radiation to the posterior margin.

“The pharyngeals are stout and compact, the outer margin not so spreading as

in *Ptychostomus*; the teeth are blunter and larger comparatively than in any other genus of the tribe, increasing more rapidly in size from above downwards, so that those of the middle of the arch are already of the same cast as those of the lower part of the comb; their crown is blunt and the inner edge rises into a blunt cusp."—(AGASSIZ, *Am. Journ. Sc. Arts*, 1855, p. 207.)

*MINOMUS* Girard, 1856.—“We propose to include under the head of *Minomus*, such species as are characterized by an elongated and fusiform body, a head longer than deep; a dorsal fin either higher than long, or with both dimensions equal. The lips being tuberculated, moderately bilobed. The pharyngeals not expanded laterally, but considerably bent inwardly. The teeth compressed, decidedly bicuspid, but the inner projection more developed than the outer. The scales being nearly of the same size, but slightly smaller anteriorly than posteriorly.” (Includes *C. insignis*, *C. plebeius*, and *C. clarkii*).—(GIRARD, *Proc. Ac. Nat. Sc. Phila.* 1856, p. 173.)

*ACOMUS* Girard, 1856.—“And then giving the name of *Acomus* to those species in which the head is very elongated, the dorsal higher than long, and the scales much smaller upon the anterior region of the body than upon the posterior. The lips being papillated and very deeply cleft. The pharyngeals are gently arched and not expanded; the teeth compressed and bituberculated, the inner projection conspicuous; the outer one obsolete, though existing.” (Includes *C. forsterianus*, *C. aurora*, *C. latipinnis*, *C. guzmaniensis*, *C. generosus*, *C. griseus*, and *C. lactarius*).—(GIRARD, *Proc. Ac. Nat. Sc. Phila.* 1856, p. 174.)

*CATOSTOMUS* Girard, 1856.—“The genus *Catostomus*, Le Sueur, would then be restricted to such species in which the head is moderately elongated, the dorsal fin generally longer than high, and the size of the scales less disproportionate anteriorly and posteriorly than in *Acomus*. The lips are papillated and deeply cleft. The pharyngeals provided with a little expansion inferiorly. The teeth are compressed, with the inner projection of the crown alone developed.” (Includes *C. hudsonius*, *C. communis*, *C. occidentalis*, *C. labiatus*, *C. macrocheilus*, *C. sucklii*, and *C. bernardini*).—(GIRARD, *Proc. Ac. Nat. Sc. Phila.* 1856, p. 174.)

*CATOSTOMUS* Gill, 1865.—“Snout long. Lateral line present, nearly straight. Lips papillated.”—(GILL, *Canadian Naturalist*, Aug. 1865, p. 19, reprint.)

*CATOSTOMUS* Günther, 1863.—“Scales of small, moderate or large size. Lateral line present, running along the middle of the tail. Dorsal fin of moderate extent, with not more than about seventeen rays, opposite to the ventrals, without spine. Anal fin very short, but deep. Fins of the males generally more produced than those of the females, and frequently with horny tubercles. Mouth inferior, with the lips more or less thickened and papillose, the lower frequently bilobed. Barbels none. Gill-rakers well developed, soft, the upper lanceolate, the lower quite membranaceous, low folds crossing the bone. Pseudobranchiæ. Pharyngeal bones sickle-shaped, armed with a comb-like series of numerous compressed teeth, the teeth becoming larger and broader towards the lower end of the series.”—(GÜNTHER, *Cat. Fishes Brit. Mus.* vii, p. 12.)

*CATOSTOMUS* Jordan, 1876.—“Air bladder in two parts; lateral line well developed; lips papillose; scales much smaller anteriorly than posteriorly; interorbital space convex; body sub-terete.”—(JORDAN, *Man. Vert.* 1876, p. 292.)

*HYPENTELIUM* Jordan, 1876.—“Air bladder in two parts; lateral line well developed; lips papillose; scales about as large on front part of body as on tail; body

tapering rapidly from shoulders to tail; interorbital space concave; length of head greater than depth of body.”—(JORDAN, *Man. Vert.* 1876, p. 292.)

CATOSTOMUS Cope & Jordan, 1877.—“Body oblong or elongate, with a short, subquadrate dorsal fin; air bladder in two parts; lateral line well developed; fontanelle distinct.”—(JORDAN, *Proc. Ac. Nat. Sc. Phila.* 1877, p. 81.)

HYPENTELIUM Jordan, 1878.—“Body oblong or elongate, with a short subquadrate dorsal; anal rays uniformly 7; mouth normal, the lower lip undivided or deeply lobed; lips tuberculate; lateral line well developed; fontanelle distinct; no mandibular sheath; scales moderate, not crowded forwards, about equal over the body; body long, and little compressed; head transversely concave between orbits, long and flattened, the physiognomy being therefore peculiar; ventral rays 9.”—(JORDAN, *Man. Vert.* ed. 2d, 1878, pp. 309-310.)

CATOSTOMUS Jordan, 1878.—[As in the preceding except] “Scales small, smaller anteriorly and much crowded; head transversely convex between orbits; ventral rays normally 10.”—(JORDAN, *Man. Vert.* ed. 2d, 1878, pp. 309-310.)

DECACTYLUS Jordan, 1878 (as subgenus).—“Lateral line with 60 to 65 scales; snout comparatively short.”—(JORDAN, *Man. Vert.* ed. 2d, p. 319.)

CATOSTOMUS Jordan, 1878 (as subgenus).—“Lateral line with about 100 scales; snout much produced.”—(JORDAN, *Man. Vert.* ed. 2d, p. 320.)

The three subgenera here recognized are characterized below. The single species of *Hypentelium* is found only eastward of the Rocky Mountains. *Catostomus* and *Decadactylus* each have representatives on both sides of the mountains. It is a curious fact that the Southwestern representatives of each, as a rule, have the upper lip more developed, and with more numerous series of papillæ, than the Eastern ones. In this respect as in others, these Western species approach the genus *Pantosteus*, a group exclusively Western in its distribution.

#### ANALYSIS OF SPECIES OF CATOSTOMUS.

\* Scales moderate; not crowded anteriorly, nearly equal over the body; 48 to 55 in the lateral line; 12 to 15 in a transverse series from dorsal to ventrals: head flattened above, transversely concave between the orbits, the frontal bone thick, broad, and short, the physiognomy being therefore peculiar: ventral rays normally 9: upper lip very thick, strongly papillose, with a broad, free margin, which has upwards of 8 to 10 series of papillæ upon it. Lower lip greatly developed, strongly papillose, considerably incised behind, but less so than in *Catostomus* proper: fontanelle shorter and smaller than in *Decadactylus*: pectoral fins unusually large. (*Hypentelium*.)

x. Depth  $4\frac{1}{2}$  to 5 in length; head 4 to  $4\frac{1}{2}$ ; eye rather small,  $4\frac{1}{2}$  to 5 in head: color olivaceous; sides with brassy lustre; belly white; back brown, with several dark cross-blotches, irregularly arranged, these becoming obsolete in old individuals; lower fins dull red, with some dusky shading: size large; maximum length about two feet ..... NIGRICANS, 24.

y. Dorsal with 11 developed rays: scales 7-50-5: head rather longer, 4 to  $4\frac{1}{2}$  in length: pectoral fins rather longer: colors relatively dull; no distinct whitish stripes along the rows of scales.

*nigricans.*

yy. Dorsal with 10 developed rays: scales 6-48-5: head rather shorter,  $4\frac{1}{2}$  in length: pectoral fins rather shorter: colors brighter; blackish above; belly abruptly white; a pale spot at the base of each scale, these forming conspicuous whitish streaks along the rows of scales. .... *etovanus.*

\*\* Scales small, reduced, and crowded anteriorly more or less; 58 to 72 in the lateral line and about 20 to 25 in a transverse series from the ventrals to the dorsal: snout moderate or rather short. (*Decadactylus.*)

† Upper lip comparatively thin, with but few (2 or 3) rows of papillæ.

a. Dorsal fin with but 10 or 11 developed rays; scales but little reduced in size forwards.

b. Body moderately stout; depth  $4\frac{2}{3}$  in length; head very small and short, about 5 in length; eye moderate; fins all notably small: scales small, subequal, 9-70-9, larger on the middle of the body than on the caudal peduncle: body with scattered, dusky, nebulous spots ..... CLARKI, 25.

bb. Body rather elongate, subterete, heavy at the shoulders and tapering backwards, the depth about 5 in length; head moderate, about  $4\frac{1}{2}$  in length; mouth comparatively small; lips moderate, the upper narrow, with about two rows of large tubercles: scales little crowded forwards, 58 to 63 in the lateral line, 19 in a cross-series: a series of dusky spots along each row of scales, as in *Minytrema melanops*; the spots sometimes obscure.

INSIGNIS, 26.

aa. Dorsal with 11 to 13 developed rays: scales much reduced and crowded anteriorly.

c. Body moderately stout, varying with age, subterete, heavy at the shoulders, the depth 4 to  $4\frac{2}{3}$  in length: head rather large and stout, conical, flattish above, its length 4 to  $4\frac{1}{2}$  in body ( $3\frac{1}{2}$  to  $4\frac{1}{2}$  in young); snout moderately prominent, scarcely overpassing the mouth; mouth rather large, the lips strongly papillose, the upper moderate, with two or three rows of papillæ: scales crowded anteriorly, much larger on the sides than below; scales 10-64 to 70-9: coloration olivaceous; males in spring with a faint rosy lateral band; young brownish, more or less mottled, often with about three large confluent lateral blotches, which sometimes form an obscure lateral band.

TERES, 27.

†† Upper lip thick and full, with several (5 to 8) rows of papillæ: scales crowded forwards.

‡ Fontanelle well developed: lips without evident cartilaginous sheath.

d. Dorsal fin comparatively long, of 12 to 14 rays.

e. Mouth quite large, with very large lips, the upper full and pendent, with 6 to 8 rows of strong papillæ: head large,  $4\frac{1}{2}$  in length, rather narrow, quadrangular, the snout projecting: eye large: dorsal fin much longer than high, its rays about 14: scales 12-72-10: coloration rather dark; a dusky lateral stripe..... MACROCHILUS, 28.

ee. Mouth comparatively small, smaller than in *C. teres*; the upper lip thick, with 5 or 6 rows of papillæ, which are moderately large: head rounded above,  $4\frac{1}{2}$  in length, the profile steeper than in *C. teres*, the snout more pointed, the two sides of the head more convergent forwards: eye small: dorsal fin longer than high, its rays 12 to 14: scales 13-72-10.

OCCIDENTALIS, 29.

dd. Dorsal fin short, higher than long, of about 11 developed rays: head  $4\frac{1}{2}$  in length, rather bluntish: mouth moderate, the labial papillæ largely developed, the upper lip full, with about 5 rows of large but rather sparse papillæ: scales 12-74-10: color dark above; sides clouded with black and yellow... LABIATUS, 30.

‡‡ Fontanelle very small and narrow: both jaws with a weak cartilaginous sheath: body elongate, fusiform, subterete, the greatest depth  $4\frac{1}{2}$  to  $4\frac{3}{4}$  in length: head small, conical,  $4\frac{2}{3}$  in length: mouth quite large, with full, thick lips, the upper very wide and pendent, with about 6 rows of very strong papillæ: lower lip two-lobed, similarly papillose: interorbital space wide, convex: eye elevated, posterior, quite small: fins moderate; dorsal higher than long, with 10, rarely 11, rays: ventral rays 10: scales small, crowded forwards, 10 or 9-70-8: color dark; scales with dark punctulations..... ARÆOPUS, 31.

\*\*\* Scales very small, much reduced and crowded anteriorly; 83 to 115 in the lateral line, and 25 to 40 in a transverse series from the ventrals to the dorsal: body and head more or less elongate: sides with a broad rosy or orange lateral band in spring males. (*Catostomus*.)

§ Fontanelle well developed: jaws without evident cartilaginous sheath.

f. Upper lip comparatively thin and narrow, with but few (3 or 4) rows of papillæ.

g. Body shorter than in the next, but still elongated, its greatest depth  $4\frac{1}{2}$  to 5 in length: head very large and long-acuminate, the muzzle nearly one-half its length, overhanging the rather large mouth: lips moderate; the upper pendent, with about 3 rows of small papillæ; the lower rather full, similarly papillose: eye nearly median, rather small,  $8\frac{1}{2}$  in head: scales small and crowded forwards, closely imbricated, 83 to 87 in

the course of the lateral line and about 28 in a cross-series from dorsal to ventrals: coloration very dark; fins dusky; scales everywhere finely punctate. Size large. . . . .TAHOENSIS, 32.

gg. Body elongate, subterete, the depth  $4\frac{1}{4}$  to  $4\frac{3}{4}$  in length: head quite long and slender,  $4\frac{1}{4}$  to  $4\frac{3}{8}$  in length, depressed and flattened above, broad at base, but tapering into a long snout, which considerably overhangs the large mouth: lips thick, coarsely tuberculate, the upper lip narrow, with 2 or 3 rows of tubercles: eye rather small, behind the middle of the head: scales very small, much crowded forwards, 95 to 114 in the course of the lateral line, and about 29 (26 to 31) in a cross row from dorsal to ventrals: dorsal rays 10 or 11: males in spring with the head and anal fin profusely tuberculate, the tubercles on the head small; the sides at that season with a broad rosy band: size large; the largest species in the genus. . . . .LONGIROSTRIS, 34.

ff. Upper lip very broad, with several (5 or 6) rows of large papillæ.

i. Body long and slender, subterete, compressed behind, the form essentially that of *C. longirostris*, the depth contained  $5\frac{1}{2}$  times in the length: head large, 4 in length of body, the interorbital space broad and flat,  $2\frac{1}{2}$  in length of head: eye small, high up and rather posterior: preorbital bone very long and slender, its length about three times its depth: mouth large, precisely as in *C. latipinnis*, the upper lip pendent, very large, with 5 to 8 series of tubercles: dorsal fin not elongated or especially elevated, its rays 11, the beginning of the dorsal much nearer base of caudal than snout: caudal fin long and strongly forked: anal fin long and high, reaching base of caudal: ventrals not reaching vent: caudal peduncle stout and deep, its least depth more than one-third length of head, its length about two-thirds that of head: scales quite small, about as in *longirostris*, the exposed portion not notably lengthened: chest with well-developed scales; scales 16-100-14: coloration dusky brown, a dusky lateral band, pale below, the dark colors extending low; snout quite dark: size large. . . . .BETROPINNIS, 35.

ii. Body slender and elongate, the caudal peduncle especially long and very slender, the depth  $5\frac{1}{4}$  in the length: head moderate,  $4\frac{3}{4}$  in length, rather slender, with prominent snout and rather contracted, inferior mouth; outline of the mouth triangular, the apex forwards; the lips very thick, greatly developed, lower lip incised to the base, its posterior margin extending backwards to opposite the eye: jaws with a slight cartilaginous pellicle: eye small, high up: preorbital bone broad, scarcely twice as long as deep: scales long and low, posteriorly rounded, their horizontal diameter greater than the ver-

tical, 17-98 to 105-17: fins excessively developed, much more elevated in the males than in the females, the free border of the dorsal, in the males at least, deeply incised: in the males, the height of each of the three vertical fins is greater than the length of the head: dorsal rays 13, its beginning rather nearer snout than base of dorsal: caudal fin especially strong, the rudimentary rays at its base unusually developed: least depth of caudal peduncle less than one-third length of head: coloration rather silvery, the males probably rosy and tuberculate in spring.....LATIPINNIS, 36.

♂ Fontanelle almost obliterated, reduced to a narrow slit: each jaw with a well-developed cartilaginous sheath (as in *Pantosteus*).

j. Body subterete, compressed behind, the depth 5 in length: interorbital space 2 in head: head quite short, broad and rounded above,  $4\frac{3}{4}$  in length: eye small, far back and high up, 6 in head: mouth very large, inferior, beneath the projecting snout: upper lip very full, pendent, with about 5 rows of tubercles upon it: lower lip very full, moderately incised, with about 10 rows, a notch separating the upper lip from the lower, each jaw with a slightly curved cartilaginous sheath on its edge, the two parallel with each other and fitting closely together: fins small: dorsal rays 11; caudal little forked: scales 15-90-11, very much reduced forwards and subject to many irregularities: colors dusky: size small...DISCOBOLUS, 36.

## 24. CATOSTOMUS NIGRICANS *Le Sueur*.

*Hog Sucker. Hog Mullet. Hog Molly. Crawl-a-bottom. Stone Roller. Stone Toter. Stone Luggger. Hammer-head. Mud Sucker.*

a. Subspecies *nigricans*.

1817—*Catostomus nigricans* LE SUEUR, Journ. Ac. Nat. Sc. Phila. 102.

*Catostomus nigrans* (sic) KIRTLAND, Rept. Zool. Ohio, 168, 1838.

*Catostomus nigricans* DEKAY, New York Fauna, part iv, Fishes, 202, 1842.

*Catostomus nigricans* CUVIER & VALENCIENNES, Hist. Nat. des Poiss. xvii, 453, 1844.

*Catostomus nigricans* STORER, Synopsis, 421, 1846.

*Hylomyzon nigricans* AGASSIZ, Am. Journ. Sci. Arts, 2d series, xix, 205, 1855.

*Hylomyzon nigricans* PUTNAM, Bull. Mus. Comp. Zool. 10, 1866.

*Hylomyzon nigricans* COPE, Proc. Ac. Nat. Sc. Phila. 285, 1864.

*Catostomus nigricans* COPE, Journ. Ac. Nat. Sc. Phila. 236, 1868.

*Catostomus nigricans* GÜNTHER, Cat. Fishes Brit. Mus. vii, 17, 1868.

*Catostomus nigricans* COPE, Proc. Am. Philos. Soc. Phila. 468, 1870.

*Hylomyzon nigricans* JORDAN, Fishes of Ind. 221, 1875.

*Hyppentelium nigricans* JORDAN, Bull. Buffalo Soc. Nat. Hist. 95, 1876.

*Hyppentelium nigricans* JORDAN, Mab. Vert. 294, 1876.

*Catostomus nigricans* UHLER & LUGGER, Fishes of Maryland, 138, 1876.

*Hyppentelium nigricans* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 48, 1876.

*Hypentelium nigricans* JORDAN & COPELAND, Check List, 156, 1876.

*Catostomus nigricans* JORDAN, Ann. Lye. Nat. Hist. N. Y. xi, 345, 1877.

*Hypentelium nigricans* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.

*Hypentelium nigricans* JORDAN, Bull. U. S. Nat. Mus. ix, 34, 1877.

*Hypentelium nigricans* JORDAN, Man. Vert. ed. 2d, 319, 1878.

1817—*Catostomus maculosus* LE SUEUR, Journ. Ac. Nat. Sc. Phila. 103.

*Catostomus maculosus* DEKAY, New York Fauna, part iv, Fishes, 203, 1842.

*Catostomus maculosus* CUVIER & VALENCIENNES, Hist. Nat. des Poiss. xvii, 454, 1844.

*Catostomus maculosus* STORER, Synopsis, 422, 1846.

*Catostomus maculosus* UHLER & LUGGER, Fishes of Maryland, 139, 1876.

1817—*Exoglossum macropteryum* RAFINESQUE, Journ. Ac. Nat. Sc. Phila. 420.

*Hypentelium macropteryum* RAFINESQUE, Ich. Ob. 68, 1820.

*Hypentelium macropteryum* KIRTLAND, Rept. Zool. Ohio, 168, 1838.

*Exoglossum macropteryum* CUVIER & VALENCIENNES, xvii, 486, 1844.

*Exoglossum macropteryum* STORER, Synopsis, 428, 1846.

1820—*Catostomus xanthopus* RAFINESQUE, Ich. Ob. 57.

1820—? *Catostomus ? megastomus* RAFINESQUE, Ich. Ob. 59. (Most likely mythical.)

1844—*Catostomus planiceps* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 450, pl. 516.

*Catostomus planiceps* STORER, Synopsis, 426, 1846.

aa. Subspecies *etowanus*.

1877—*Catostomus nigricans* var. *etowanus* JORDAN, Ann. Lye. Nat. Hist. N. Y. xi, 345.

HABITAT.—New York and Maryland to North Carolina; west to the Great Plains. Var. *etowanus* in the Alabama River. Most common in the Central Mississippi Basin; not known from the streams of the South Atlantic States, excepting the Savannah River.

This species is one of the most abundant and widely distributed of our Suckers. It abounds in rapids and shoals, especially in the larger streams, and its singular, almost comical form is familiar to every school-boy in the West. Its powerful pectoral fins render it a swifter fish in the water than any others of its family. Its habit is to rest motionless on the bottom, where its mottled colors render it difficult to distinguish from the stones among which it lies. When disturbed, it darts away very quickly, after the manner of the Etheostomoids. They often go in flocks of eight to ten. I have never yet found this species in really muddy water, and when placed in the aquarium it is one of the very first fishes to feel the influence of impure water. In my experience, it is a fish as peculiar to the clear streams as the species of *Etheostoma* or *Uraniidea* are. Professor Agassiz speaks of it as the Mud Sucker, and has named it *Hylomyzon*, in allusion to its mud-loving habits. It is fortunate that that name has become a synonym, for it is certainly a misnomer.

This Sucker reaches a length of about 18 inches. It is not much valued

as food, but is often caught by boys with a spear or snare. In company with other species of *Catostomus* and *Myxostoma*, it ascends all our Western streams in April for the purpose of depositing its spawn.

The Southern form, which I have designated as var. *etowanus*, is more intensely colored and differs in some minor respects. It frequents, in great abundance, the clear tributaries of the Etawah, Oostanaula, and Coosa Rivers, in company with *Potamocottus meridionalis* (*zopherus*), a species to which the young of the *Catostomus* bears much resemblance as seen in the water.

The synonymy of this species has been well worked out by Professor Agassiz. The variations in age and appearance have given rise to a number of nominal species, most of which have, however, already been disposed of. The oldest specific name, *nigricans*, has been the one most generally employed. The generic name used depends on whether we consider this species generically distinct from the type of *Catostomus* or not. It would seem—if we may so speak—as if Nature had intended *Hypentelium* for a distinct genus, but not being an expert in generic characters, had failed to provide it with any which can stand our tests. The name *Hylomyzon*, being a simple synonym of *Hypentelium*, of course cannot be used. Rafinesque's account is much inferior to that of Professor Agassiz, and the figure given by him is one of the worst ever published, still his typical species is readily identifiable, and his name for it cannot be set aside.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
7644	.....	
8446	Cayuga Lake, New York .....	
8762	.....	
9061	.....	
9069	.....	
12295	Cincinnati, Ohio.....	J. W. Milner.
--	Écorse, Mich.....	J. W. Milner.
15246	Bainbridge, Pa. ....	T. H. Bean.
20066	Black River, Ohio .....	S. F. Baird.
20106	Tennessee .....	Beckwith.
20260	Yellow Creek, Ohio .....	S. F. Baird.
20270	Root River, Wisconsin .....	
—	Etawah River, Georgia (types of var. <i>etowanus</i> ) .....	D. S. Jordan.
—	White River, Indiana .....	D. S. Jordan.
—	Savannah River .....	D. S. Jordan.

25. CATOSTOMUS CLARKI *Baird & Girard.**Clark's Sucker.*1854—*Catostomus clarkii* BAIRD & GIRARD, Proc. Phila. Ac. Nat. Sc. 27.*Catostomus clarkii* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 208, 1855.*Minomus clarkii* GIRARD, Proc. Ac. Nat. Sc. Phila. 173, 1856.*Minomus clarkii* GIRARD, U. S. Mex. Bound. Surv. Ichth. 38, pl. xxii, f. 5-8, 1859.*Catostomus clarkii* JORDAN & COPELAND, Check List, 156, 1876.

HABITAT.—Rio Santa Cruz in Arizona.

Nothing is known of this species except from the figure given by Girard and the descriptions published by Baird and Girard. The original types of the species are not to be found in the Museum, and there are no specimens of recent collection which appear to belong to it. It seems, however, to be a valid species, related to *C. insignis*. Its lips have not been figured, hence I can only infer that it belongs to the group with a narrow upper lip.

26. CATOSTOMUS INSIGNIS *Baird & Girard.**Spotted Sucker.*1854—*Catostomus insignis* BAIRD & GIRARD, Proc. Phila. Ac. Nat. Sc. 28, 1854.*Minomus insignis* GIRARD, Proc. Ac. Nat. Sc. Phila. 173, 1856.*Minomus insignis* GIRARD, U. S. Mex. Bound. Surv. Ichth. 37, pl. xxi, f. 1-4, 1859.*Catostomus insigne* COPE & YARROW, Wheeler's Expl. W. 100th Mer. v, Zool. 676, 1876.*Catostomus insignis* JORDAN & COPELAND, Check List, 156, 1876.

HABITAT.—Tributaries of the Rio Gila.

The original types of this species, from the Rio San Pedro, are now lost. The specimens collected by Dr. Rothrock in Ash Creek, Arizona, and referred to this species by Professor Cope, undoubtedly belong here. The species is a well-marked one, both as to form and coloration. The genus *Minomus*, of which it was made the type, appears, however, to have no tangible existence.

• *Specimens in United States National Museum.*

Number.	Locality.	Collector.
16756	Ash Creek, Arizona .....	Dr. J. T. Rothrock.

## 27. CATOSTOMUS TERES (Mitchill) Le Sueur.

Common Sucker. White Sucker. Brook Sucker. Fine-sealed Sucker.

- 1803—*Le Cyprinus commersonien* LACÉPÈDE, Hist. Nat. des Poiss. v, 502, 508.  
*Catostomus commersonii* JORDAN, Man. Vert. ed. 2d, 320, 1878.
- 18—*Cyprinus catostomus* PECK, Mem. Am. Acad. ii, pt. 2, p. 55, pl. 2, f. 4. (Not of Forster.)
- 1814—*Cyprinus teres* MITCHILL, Lit. and Phil. Trans. New York, i, 458.  
*Catostomus teres* LE SUEUR, Journ. Ac. Nat. Sc. Phila. 103, 1817.  
*Catostomus teres* THOMPSON, Hist. Vt. 134, 1842.  
*Catostomus teres* CUVIER & VALENCIENNES, xii, 468, 1844.  
*Catostomus teres* STORER, Synopsis, 423, 1846.  
*Catostomus teres* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 208, 1855.  
*Catostomus teres* GÜNTHER, Cat. Fishes Brit. Mus. vii, 15, 1868.  
*Catostomus teres* COPE, Proc. Am. Philos. Soc. Phila. 463, 1870.  
*Catostomus teres* JORDAN, Fishes of Ind. 221, 1875.  
*Catostomus teres* JORDAN, Man. Vert. 293, 1876.  
*Catostomus teres* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 48, 1876.  
*Catostomus teres* JORDAN & COPELAND, Check List, 156, 1876.  
*Catostomus teres* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.  
*Catostomus teres* JORDAN & GILBERT, in Klippart's First Report Ohio Fish Commission, 84, pl. xii, f. 18–19, 1877.  
*Catostomus teres* JORDAN, Bull. U. S. Nat. Mus. ix, 37, 1877.
- 1817—*Catostomus communis* LE SUEUR, Journ. Ac. Nat. Sc. Phila. i, 95.  
*Catostomus communis* DEKAY, New York Fauna, part iv, Fishes, 196, 1842.  
*Catostomus communis* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 426, 1844.  
*Catostomus communis* KIRTLAND, Boston Journ. Nat. Hist. v, 265, 1845.  
*Catostomus communis* STORER, Synopsis, 421, 1846.  
*Catostomus communis* COPE, Journ. Ac. Nat. Sc. Phila. 236, 1868.  
*Catostomus communis* UHLER & LUGGER, Fishes of Maryland, 138, 1876.
- 1817—*Catostomus bostoniensis* LE SUEUR, Journ. Ac. Nat. Sc. Phila. 106.  
*Catostomus bostoniensis* STORER, Rep. Ich. Mass. 84, 1838.  
*Catostomus bostoniensis* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 432, 1844.  
*Catostomus bostoniensis* STORER, Synopsis, 423, 1846.  
*Catostomus bostoniensis* PUTNAM, Bull. Mus. Comp. Zool. 10, 1863.  
*Catostomus bostoniensis* GILL, Canadian Nat. p. 19, Aug. 1865.  
*Catostomus bostoniensis* STORER, Hist. Fishes Mass. 290, pl. xxii, f. 3, 1867.  
*Catostomus bostoniensis* THOREAU, Week on Concord and Merrimack, 33, 1868.
- 1820—*Catostomus feroxus* RAFINESQUE, Ich. Oh. 59.
- 1823—*Catostomus hudsonius* RICHARDSON, Franklin's Journal, 717, 1823. (Not of Le Sueur.)  
*Cyprinus (Catostomus) hudsonius* RICHARDSON, Fauna Bor.-Am. Fishes, 112, 1836.  
 (Excl. syn.)
- 1836—*Cyprinus (Catostomus) reticulatus* RICHARDSON, Fauna Bor.-Am. Fishes, 303.

- 1838—*Catostomus gracilis* KIRTLAND, Rept. Zool. Ohio, 168.
- 1838—*Catostomus nigricans* STORER, Rept. Ich. Mass. 86. (Not of Le Sueur.)  
*Catostomus nigricans* THOMPSON, Hist. Vermont, 135, 1842.
- 1842—*Catostomus pallidus* DEKAY, New York Fauna, part iv, Fische, 200.  
*Catostomus pallidus* STORER, Synopsis, 426, 1846.
- 1844—*Catostomus aureolus* CUVIER & VALENCIENNES, Hist. Nat. des Poiss. xvii, 439.  
 (Not of Le Sueur.)  
*Catostomus aureolus* GÜNTHER, Cat. Fishes Brit. Mus. vii, 16, 1865.
- 1850—*Catostomus forsterianus* AGASSIZ, Lake Superior, 358.
- 1855—*Catostomus forsterianus* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 208.  
*Acomus forsterianus* GIRARD, Proc. Ac. Nat. Sc. Phila. 173, 1856.
- 1856—*Catostomus sucklii* GIRARD, Proc. Ac. Nat. Sc. Phila. 175.  
*Catostomus sucklii* GIRARD, U. S. Pac. R. R. Expl. x, pl. li, 226, 1858.  
*Catostomus sucklii* COPE, Hayden's Geol. Surv. Wyoming, 1870, 434, 1872.  
*Catostomus suckleyi* JORDAN & COPELAND, Check List, 156, 1876.
- 1860—? *Catostomus texanus* ABBOTT, Proc. Ac. Nat. Sc. Phila. 473.  
 ? *Catostomus texanus* JORDAN & COPELAND, Check List, 156, 1876.
- 1860—*Catostomus chloropteron* ABBOTT, Proc. Ac. Nat. Sc. Phila. 473.  
*Catostomus chloropteron* COPE, Proc. Ac. Nat. Sc. Phila. 85, 1865.  
*Catostomus chloropterus* JORDAN & COPELAND, Check List, 156, 1876.
- 1876—*Catostomus alticolus* COPE & YARROW, Wheeler's Expl. W. 100th Mer. v, Zool. 677.  
*Catostomus alticolus* JORDAN & COPELAND, Check List, 156, 1876.
- 1876—*Moxostoma trisignatum* (COPE) COPE & YARROW, Wheeler's Expl. W. 100th Mer. v,  
 Zool. 679.  
*Erimyzon trisignatus* JORDAN & COPELAND, Check List, 157, 1876.

HABITAT.—All streams from Labrador to Florida and westward to the Rocky Mountains. Everywhere abundant. The most widely distributed of the *Catostomide*.

This species is the commonest of all the Suckers in nearly every stream east of the Rocky Mountains. In Canada, in New England, in the Great Lakes, in the Mississippi Valley, in South Carolina, in Georgia, in Alabama, it is everywhere the commonest Sucker, and it certainly occurs in Dakota, Nebraska, Kansas, Colorado, and Texas, though how abundantly I am unable to say.

This species is everywhere the one to which the name of "Sucker" primarily belongs, the other species, though often called "Sucker", as a sort of general term, receiving the special names of Red Horse, Buffalo, Mullet, Chub Sucker, etc.

This species is subject to considerable variations in different waters. In shaded brooks, it is dark-colored and rather slender. In open or muddy waters, it becomes pale. In the Great Lakes, it often reaches a considerable size and a proportional stoutness of body. The adult is usually uniformly colored above. Young fishes  $1\frac{1}{2}$  to 3 inches in length are often variegated, and sometimes show three or four lateral dark

blotches, which are sometimes confluent into an irregular dusky band. Such little fishes usually have the lateral line imperfect. On such, the nominal species *Moxostoma trisignatum* was based.

The male fishes in the spring show a more or less distinct pinkish or rosy lateral band. The males and females ascend the small streams in the spring for the purpose of depositing their spawn. The coincidence of their times of migration with that of some of the early settlers of Illinois, who used to come up from New Orleans in the spring, returning in the fall, has given to the natives of that State the slang name of "Suckers", as natives of Michigan were called "Wolverenes"; of Minnesota, "Gophers"; of Wisconsin, "Badgers"; of Indiana, "Hoosiers"; of Ohio, "Buckeyes"; and of Missouri, "Pukes".

I have elsewhere adopted the name "*commersoni*" for this species, inasmuch as there is little doubt that it is the "*Cyprin commersonien*"\* of Lacépède, as has long since been noticed by Valenciennes.

Dr. Günther quotes, in the synonymy of *Catostomus teres*, "*Cyprinus commersonii* Lacépède"; but, on examination of Lacépède's work, I am unable to find that he uses the name *commersoni*, or in fact any classical name whatever for the species, and as priority of date can hardly be claimed for a French name like "*Cyprin commersonien*", I am compelled to fall back on Mitchill's very appropriate name *teres* for the species. The identity of *C. teres* of Mitchill, *C. communis* and *C. bostoniensis* of Le Sueur, *C. reticulatus* of Richardson, *C. gracilis* of Kirtland, and *C. pallidus* of DeKay has been long since shown, and has been generally admitted by late writers. *C. nigricans* of Storer and Thompson, from the Connecticut, is evidently the dusky brook form of this species, and not the true *nigricans* of Le Sueur. It is equally evident that the species called *C. aureolus* by Valenciennes and Günther is the present one and not *Myxostoma aureolum*. Agassiz's *Catostomus forsterianus* is doubtless the common lake form of *C. teres*, as indicated by Dr. Günther. The

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\* The following is Lacépède's description of his "*Le Cyprin Commersonien*":—

"Onze rayons à la dorsale; huit à la nageoire de l'anus; dix à chaque ventrale; huit ou neuf à chaque pectorale; la nageoire du dos et celle de l'anus quadrilatères; l'anal étroite; l'angle de l'extrémité de cette dernière nageoire très aigu; la caudale en croissant; la ligne latérale droite; la machoire supérieure plus avancée que celle d'en bas; les écailles arrondies et très petites.

"Le commersonien, dont nous publions les premiers la description, et que le savant Commerson a observé, présente un double orifice pour chaque narine; sa tête est dénuée de petites écailles; ses ventrales et ses pectorales sont arrondies à leur extrémité; la dorsale s'élève vers le milieu de la longueur totale de la poisson."

types of *C. sucklii* are lost, but *C. teres* occurs in the Upper Missouri region, and Girard's description hints at no specific difference. *Catostomus chloropteron* Abbott is evidently the same. *Catostomus texanus* Abbott, described from a dried specimen, is less clear, but what there is of specific characterization in the description points to *C. teres*. The dorsal carination is frequently observed in stuffed fishes in which some flesh is left in the back to shrink in drying, leaving the back "carinated".

I have examined several of the types of *Catostomus alticolus* Cope. They are all small fishes, not one-fourth grown, and, as usual in young fishes, the head appears proportionally large. I see, however, no reason for considering them different from *Catostomus teres*. *Moxostoma trisignatum* I have already referred to. The absence of the lateral line is due to their youth, not to their belonging to a different genus. The three large lateral spots, "not seen in any other of the order," are found on young specimens of *Catostomus* generally. I have examined the types of "*Moxostoma trisignatum*", and have found specimens of similar size, similarly colored and without lateral line, from Michigan and from other Western States. I would undertake to match them from any stream in the West. The reference of these specimens to *Moxostoma (Erinyzon)* was probably the result of a very hasty examination.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
1592	Carlisle, Pa. ....	S. F. Baird.
6239	Maryland .....	Dr. Kennerly.
6853	Summerville, S. C. ....	
7067	Lake Champlain. ....	S. F. Baird.
7607	Marietta, Ohio. ....	Prof. Andrews.
7677	.....	
7678	.....	
7706	.....	
7707	.....	
7717	.....	
7777	.....	
7781	.....	
8329	Port Huron, Mich. ....	
8409	.....	
8440	.....	
8451	.....	
8489	Racine, Wis .....	
8501	.....	
8573	Toronto, Canada. ....	

## Specimens in United States National Museum—Continued.

Number.	Locality.	Collector.
8664	.....	
8671	.....	
8689	.....	Barry.
8728	Huron River, Michigan.....	S. F. Baird.
8759	.....	
8834	Oswego, N. Y.....	
8870	Alabama.....	
8927	.....	
8984	.....	
9041	Missouri (?).....	Barry.
9054	.....	
9059	.....	
9157	.....	
9170	.....	
9182	Pembina, Red River of the North.....	R. Kennicott.
9195	Aux Plaines River, Illinois.....	R. Kennicott.
9207	Lake Champlain.....	
9393	Écorse, Mich.....	G. Clark.
9404	Abbeville, S. C.....	
9503	Mississippi Valley.....	
9646	.....	
9875	Black River.....	S. F. Baird.
10540	Lake Superior.....	J. W. Milner.
11146	Sandusky, Ohio.....	J. W. Milner.
11147	Sandusky, Ohio.....	J. W. Milner.
11148	Sandusky, Ohio.....	J. W. Milner.
12320	Potomac River.....	J. W. Milner.
12915	Twin Lakes, Colorado ( <i>alticolus</i> ).....	J. T. Rothrock.
12936	South Hadley Falls, Mass.....	J. W. Milner.
12937	South Hadley Falls, Mass.....	J. W. Milner.
12939	South Hadley Falls, Mass.....	J. W. Milner.
12940	South Hadley Falls, Mass.....	J. W. Milner.
15356	Bainbridge, Pa.....	T. H. Bean.
15777	Twin Lakes, Colorado (types of <i>alticolus</i> ).....	J. T. Rothrock.
17099	Arkansas River, Pueblo, Col. (types of <i>trisignatum</i> ).....	C. E. Aiken.
18258	Potomac River.....	G. B. Goode.
18259	Potomac River.....	G. B. Goode.
20010	Yellow Creek, Ohio.....	S. F. Baird.
20057	Brownsville, Tex.....	
20097	Sing Sing, N. Y.....	S. F. Baird.
20194	} Northern Boundary Survey, Dakota.....	Dr. Elliott Coues.
20195		

*Specimens in United States National Museum—Continued.*

Number.	Locality.	Collector.
20241	Piermont, N. Y .....	S. F. Baird.
20238	Madison, Wis.....	S. F. Baird.
20256	.....	
20262	Quebec, Canada.....	S. F. Baird.
20266	Fox River, Wisconsin.....	S. F. Baird.
20267	Sing Sing .....	S. F. Baird.
20268	Root River, Wisconsin.....	S. F. Baird.
20316	.....	
20344	Potomac River .....	Goode & Bean.
20377	Potomac River .....	House.
20382	Platte Valley, Nebraska.....	
20454	Wilkesbarre, Pa.....	L. H. Taylor.
—	Etowah River, Georgia.....	D. S. Jordan.
—	Saluda River, South Carolina.....	D. S. Jordan.
20918	Fort Bridger, Wyoming.....	

28.\* CATOSTOMUS MACROCHILUS *Girard.**Large-lipped Sue er.*1856—*Catostomus macrocheilus* GIRARD, Proc. Ac. Nat. Sc. Phila. 175.*Catostomus macrocheilus* GIRARD, U. S. Pac. R. R. Expl. x, 225, 1858.*Catostomus macrochilus* GÜNTHER, Cat. Fishes Brit. Mus. vii, 20, 1868.*Catostomus macrochilus* JORDAN & COPELAND, Check List, 156, 1876.

HABITAT.—Columbia River.

Only the original type of this species is known. It is an adult specimen, well preserved. Although this species seems closely related to *C. occidentalis*, I am disposed to consider it distinct, as the mouth is notably larger than in any *occidentalis* which I have seen. The examination of a large series of specimens may, however, render it necessary to unite them.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
240	Astoria, Oregon (type <i>macrochilus</i> ) .....	Lieut. Trowbridge.

\* For 28 (b). *Catostomus fecundus* Cope & Yarrow, see Addenda, p. 219.

## 29. CATOSTOMUS OCCIDENTALIS Ayres.

*Western Sucker.*1854—*Catostomus occidentalis* AYRES, Proc. Cal. Ac. Nat. Sc. i, 18.*Catostomus occidentalis* AGASSIZ, Ann. Journ. Sc. Arts, 2d series, xix, 209, 1855.

(Described as a new species.)

*Catostomus occidentalis* GIRARD, Proc. Ac. Nat. Sc. Phila. 174, 1856.*Catostomus occidentalis* GIRARD, U. S. Pac. R. R. Expl. x, 224, 1858.*Catostomus occidentalis* GÜNTHER, Cat. Fishes Brit. Mus. vii, 17, 1868.*Catostomus occidentalis* JORDAN & COPELAND, Check List, 156, 1876. (Name only.)1856—? *Catostomus bernardini* GIRARD, Proc. Ac. Nat. Sc. Phila. 175.? *Catostomus bernardini* GIRARD, U. S. Mex. Bound. Ichth. 40, pl. 23, f. 1-5, 1859.? *Catostomus bernardini* GÜNTHER, Cat. Fishes Brit. Mus. v. 7, 17, 1868.

HABITAT.—Streams west of the Rocky Mountains, probably generally distributed.

This species was described almost simultaneously under the same name by Dr. Ayres and Professor Agassiz. Since then it has been little noticed by ichthyologists, and its distribution has remained uncertain. The few specimens in the National Museum indicate, however, a wide distribution. I have here united *Catostomus bernardini* Girard to *C. occidentalis*. The single specimen made the type of *C. bernardini* is lost, so that we can probably never know exactly for what the author intended the name. The size of the dorsal and the form of the mouth as given in Girard's figure indicate a species of *Catostomus* rather than *Pantosteus*, and as I am unable to distinguish it from *C. occidentalis*, I let it fall into the synonymy. The scales of *C. bernardini* as figured seem, however, smaller than usual in *C. occidentalis*.

*C. occidentalis* is apparently related to *C. teres*, but is distinguished by the form of mouth and by the somewhat smaller scales. The species is "brought to the market in San Francisco, and is said to be quite common in the Sacramento and San Joaquin Rivers."—(GIRARD.)

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
15527	Green River, Wyoming.....	Livingston Stone.
20814	McLeod River, California .....	Livingston Stone.

30. CATOSTOMUS LABIATUS *Ayres.**Thick-lipped Sucker.*1855—*Catostomus labiatus* AYRES, Proc. Cal. Ac. Nat. Sc. i, 32.*Catostomus labiatus* GIRARD, Proc. Ac. Nat. Sc. Phila. 175, 1856.*Catostomus labiatus* GIRARD, U. S. Pac. R. R. Expl. x, 224, 1858.*Catostomus labiatus* JORDAN & COPELAND, Check List, 156, 1876.

HABITAT.—Streams of Oregon (Klamath Lake).

I have seen only the specimen from which Girard's description was taken. Like *macrochilus*, this species appears distinct from *occidentalis*, but the examination of a larger series of specimens is necessary to prove it. At present, it appears to differ from *macrochilus* and *occidentalis* in the smaller size of the dorsal fin.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
239	Klamath Lake, Oregon .....	Dr. John S. Newberry.

31. CATOSTOMUS ARÆOPUS *Jordan*, sp. nov.*Hard-headed Sucker.*1878—*Catostomus aræopus* JORDAN, MSS., Wheeler's Report Surv. W. 100th Mer. (*ined.*).

This species represents *C. discobolus* in the section *Decadactylus*. Its very narrow fontanelle and sheathed lips indicate its close relation to *Pantosteus*. The specific name is from *αραιός*, small, thin; *πήλη*, hole or aperture. The typical specimens were from Kern River, California.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
17107	Kern River, Cal. (type) .....	H. W. Henshaw.
17103	Carson River, Nevada .....	H. W. Henshaw.

32. CATOSTOMUS TAHOENSIS *Gill & Jordan.**Sucker of Lake Tahoe.*1868—*Acomus generosus* COOPER, Cronise's Nat. Wealth Cal. 495. (Not of Girard.)1878—*Catostomus tahoensis* GILL & JORDAN, Bull. U. S. Nat. Mus. xi, p. —.

HABITAT.—Lake Tahoe, Nevada.

The Sucker of Lake Tahoe is closely related to *Catostomus longirostris*, but seems to differ constantly in the shorter head and more contracted

body. It is said to be very abundant in Lake Tahoe. "They are caught in nets and sometimes with the hook, but like all this family are rather poor as food" (*Cooper*). *Acomus generosus* of Girard, with which this species has been identified, is a very different species, belonging to a different genus.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
5240	Lake Tahoe (types <i>C. tahoensis</i> ) .....	J. G. Cooper.
17109	Lake Tahoe .....	H. W. Henshaw.

### 33. CATOSTOMUS ROSTRATUS (*Tilesius*) Jordan.

*Siberian Sucker.*

1813—"Cyprinus rostratus TILESIIUS, Mém. Ac. Sc. St. Pétersbourg, iv, p. 454, tab. 15, figs. 1-2, 1813."

*Cyprinus rostratus* PALLAS, Zoogr. Rosso-Asiat. iii. 308.

*Cyprinus rostratus* GÜNTHER, Cat. Fishes Brit. Mus. xii, 12, 1868. (As doubtful species of *Catostomus*.)

1844—*Catostomus tilesii* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 469, 1844.

HABITAT.—Eastern Siberia.

No writer since Tilesius seems to have observed this fish. It is, however, unquestionably a species of *Catostomus*, allied to and perhaps even identical with *C. longirostris*. The following is Tilesius's description of this species, as quoted by Pallas:—

"Descriptio *Cyprini rostrati* Tungusis ad Covymam fluv., Tschukulschan et Jucagins Onatscha dieti. Tab. XV, Fig. 1-5. (*Der Rüffelkarpfen, Rampkopf*.)

"Magnitudo in adultis pedem superat, sed trium spithamarum longitudinem vix attingit. Caput osseum longum antico rostro descendente truncatum e quo simile quam ob rem Ruthenis.

"Koub dicitur aliis Prodest, quoniam os subtns, ut in (*sic*) Cotto cataphracto vel Agono accipenserino, sed rictus oris vel orificium lunatum non amplum sed angustum labiis crassis pinguibus marginatum, labium anterius fornicatum, ambitu semicirculare ossibus labialibus vel mystaceis ad frænum oris descendentibus arcuatis lateraliter lectum, labium posterius minus, rectum, ab anteriori inclusum amplexum papillis numerosissimis granulatum.

"Oculi laterales a rostro remoti operculo posteriori branchiali approximati ovals, iridibus aureis superne angustioribus, papilla supra centrum posita. Nares ad marginem orbitæ anteriorem duplices in sulco profundo osseo. Operculo branchialia trilamellata, lamella anterior cum ossibus maxillæ superioris conjuncta elliptica angusta ad orbitæ marginem anteriorem ascendens inferius lamellæ secundæ tenerrimæ angustiori orbitam inferiorem formanti imposita, lamina ossea subjacens, operculum

medium formans, subtus plica isthmo juguli adnata, carne tegitur suborbitali. *Lamina posterior* maxima latissima ossea conchæ adinstar fornicata, anterius cum orbitæ margine posteriori juncta. *Membrana branchiostega* triradiata inter operculi laminam anteriorem subtus utrinque approximata coarcta et in isthmo gulæ conjuncta. *Corpus* oblongum erectum microlepidotum, squamis lævibus subtilissime radiato-striatis oblongis, ad caput minoribus versus anum et caudam majoribus imbricatum crassiusculum leviter compressum, ventre-dorsusque convexum. *Linea lateralis* recta versus medium corporis paululum descendens per seriem squamarum postice incisarum expressa versus caudam magis conspicua. *Color* in dorso atro cœruleus nitidus, versus latera subargenteus, subtus albens. *Pinnæ pectorales* quatuordecim radiatæ, radii medii longissimi, *ventrales* decemradiatæ, radia primo osseo acuminato, *dorsalis* decemradiata et duodecimradiata, radio primo cum adminiculo radicali, ultimo brevissimo ad basin usque fisso, omnibus ad apices quadrifidis, dorsalis pinna ventralibus opposita, analis p. septemradiata, radio primo simplici cum adminiculo radicali, reliquis quadrifidis, tertio longissimo septimo brevissimo. *Caudalis pinna* bifurca lacinia inferior paulo major undecimradiata, superior novemradiata tota pinna viginti radiis suffulta extremis lateralibus cum adminiculo radicali connatis. Radii pennarum ad extremitatis quadrifidi et extremi ad radices duplicati vel ex binis truncis connati, quam ab rem primus dorsalis longitudinaliter ad basin sulcatus est, quod etiam in primo analis et caudalibus extremis fere ex tribus compositis cernitur. In dorsali et anali pinna radii valde distant, pectorales ventrales et analis pinnae aureo-rubescens et ad basin prominentes, pectorales adeo tuberosæ, ventralium radices per membranosam laminam triangularem squamatam obteguntur. Anus caudæ propior. Interna non exploravi. Characteribus cæterum generis cyprinacei ore nimirum edentulo, dentibus post branchialibus, membrana branchiostega triradiata utrinque instructus est. A celeberrimo *Merck* plura specimina ex siccata ex Covymæ fluvio allata sunt, quæ nomina Tschukutschan designata sunt. Annotavit simul idem, 'piscem in Lena et Indigirea ejusque collateralis lapidoso Dogdo fluvii copiosum esse sed propter nationis velocitatem captu difficilem esse et non nisi in cœcis fluminum ramis hamo capi, gregatim et velocissime natate, sapidissimum cæterum, excepto vere, cum, ova spargunt nec aristis impeditum piscem esse, attamen ab accolis Covymæ et Indigiræ (qui caput tantem in deliciis habet, reliqua canibus cedunt) non multum aestimari.'—(PALLAS, *Zoographia Rosso-Asiatica*, pp. 308-310.)

### 34. CATOSTOMUS LONGIROSTRIS *Le Sueur*.

*Long-nosed Sucker. Northern Sucker. Red-sided Sucker.*

1773—"Cyprinus catostomus FORSTER, Philos. Trans. lxxiii, 155, tab. 6, 1773."

*Cyprinus catostomus* SCHNEIDER, ed. Bloch, 444, 1802.

1817—*Catostomus longirostrum* LE SUEUR, Journ. Ac. Nat. Sc. Phila. 102.

*Catostomus longirostrum* THOMPSON, Hist. Vt. 135, 1842.

*Catostomus longirostris* DEKAY, New York Fauna, part iv, Fishes, 203, 1842.

*Catostomus longirostrum* CUVIER & VALENCIENNES, xvii, 453, 1844.

*Catostomus longirostrum* STORER, Synopsis, 421, 1846.

*Catostomus longirostrum* JORDAN & COPELAND, Check List, 156, 1876.

*Catostomus longirostris* JORDAN & GILBERT, in Klippart's Rept. 53, 1877.

1817—*Catostomus hudsonius* LE SUEUR, Journ. Ac. Nat. Sc. Phila. 107.

- Catostomus hudsonius* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 459, 1844.
- Catostomus hudsonius* STORER, Synopsis, 419, 1846.
- Catostomus hudsonius* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 208, 1855.
- Catostomus hudsonius* GÜNTHER, Cat. Fishes Brit. Mus. vii, 13, 1868.
- Catostomus hudsonius* JORDAN, Man. Vert. 293, 1876.
- Catostomus hudsonius* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 48, 1876.
- 1823—*Catostomus forsterianus* RICHARDSON, Franklin's Journal, 720.
- Catostomus forsterianus* RICHARDSON, Fauna Bor.-Amer. iii, Fishes, 116, 1836.
- Catostomus forsterianus* DEKAY, New York Fauna, part iv, Fishes, 203, 1842.
- Catostomus forsterianus* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 463, 1844.
- Catostomus forsterianus* STORER, Synopsis, 419, 1846.
- Acomus forsterianus* GIRARD, Proc. Ac. Nat. Sc. Phila. 172, 1856.
- Catostomus forsterianus* PUTNAM, Bull. Mus. Comp. Zool. 10, 1863.
- Catostomus forsterianus* JORDAN & COPELAND, Check List, 156, 1876.
- 1850—*Catostomus aurora* AGASSIZ, Lake Superior, 360, pl. 2, f. 3-4.
- Acomus aurora* GIRARD, Proc. Ac. Nat. Sc. Phila. 173, 1856.
- Catostomus aurora* PUTNAM, Bull. Mus. Comp. Zool. 10, 1863.
- 1856—*Acomus griseus* GIRARD, Proc. Ac. Nat. Sc. Phila. 174.
- Acomus griseus* GIRARD, U. S. Pac. R. R. Expl. x, 222, pl. xlix, 1858.
- Catostomus griseus* GÜNTHER, Cat. Fishes Brit. Mus. vii, 14, 1868.
- Catostomus griseum* COPE, Hayden's Geol. Surv. Wyoming, 1870, 434, 1872.
- Catostomus griseus* JORDAN & COPELAND, Check List, 156, 1876.
- 1856—*Catostomus lactarius* GIRARD, Proc. Ac. Nat. Sc. Phila. 174.
- Acomus lactarius* GIRARD, U. S. Pac. R. R. Expl. x, 223, 1858.
- Catostomus lactarius* JORDAN & COPELAND, Check List, 156, 1876.

HABITAT.—New England to Nebraska and north to Alaska and the Arctic Sea. Extremely abundant in British America and along the northern boundaries of the United States, but not found south of 40° north latitude.

This is another of our numerous species which have an extremely wide range of distribution and a considerable range of variation. It has been longer known than any other of the Suckers. The oldest specific name given was that of *catostomus*, which, however, had to be set aside when the generic name *Catostomus* was proposed for it. The next name in order of time is the very appropriate one of *longirostrum* Le Sueur (more properly spelled *longirostris*), given to some specimens from Vermont. Five pages later, the name *hudsonius* was given as a substitute for *catostomus* of Forster. The slight priority of *longirostrum* over *hudsonius*, however, seems to entitle it to preference, although the latter name has been most frequently used. Later, specimens considered by Dr. Günther to be identical with *hudsonius* received from Richardson the name "*forsterianus*", and, still later, the name *forsterianus* was, without evident reason, transferred from this species to *teres* by Professor Agassiz, who

gave to this species the name of *aurora*, in allusion to the red breeding colors of the male. Western specimens were still later described by Girard as two distinct species, *griseus* and *lactarius*, apparently without comparison with the Eastern forms.

The examination of the large series of specimens noticed below, together with others from the Great Lakes and Upper Mississippi, has convinced me that all belong to one species, variable to some degree, but not more so than is *Catostomus teris* and less so than *Erimyzon sucetta*. Some of the Upper Missouri specimens referable to *C. griseus* Grd. have on an average rather smaller scales (95 in the lateral line instead of 100 to 110); but I am unable to distinguish a tangible variety. The original types of *C. lactarius* Girard are not now to be found, but the description indicates no difference from *C. longirostris*.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
1054	Lake Superior .....	J. W. Milner.
2087	Puget's Sound .....	R. Kennicott.
2563	Platte River, Nebraska .....	Capt. Simpson.
6709	Yonghiogheny River .....	Prof. Andrews.
7047	Lake Winnipeg .....	R. Kennicott.
7640	.....	
7993	Nulato, Youcon River, Alaska .....	W. H. Dall.
8136	.....	
8435	.....	
8437	Essex County, New York .....	
8802	Quebec .....	S. F. Baird.
8905	Great Slave Lake .....	R. Kennicott.
9010	Pole Creek, Nebraska .....	Lient. Wood.
9116	.....	
9175	.....	
9522	Saint Michael's, Alaska .....	Dr. Bannister.
11212	Au Sable River, Michigan .....	J. W. Milner.
11213	Au Sable River, Michigan .....	J. W. Milner.
12210	Au Sable River, Michigan .....	J. W. Milner.
20075	Racine, Wis .....	
20191	Northern Boundary Survey, Dakota .....	Dr. Elliott Coues.
20223	Racine, Wis .....	S. F. Baird.
20235	Lake Superior .....	J. W. Milner.
20257	(Probably original types of <i>griseus</i> ; the old number and locality obliterated.)	Bowman.
20252	Platte River, Nebraska .....	
20689	Great Lakes .....	

35. CATOSTOMUS RETROPINNIS *Jordan*, sp. nov.1878—*Catostomus retropinnis* JORDAN, Bull. Hayden's Geol. Surv. Terr. (*in ed.*).

This fine species combines the mouth of *C. latipinnis* with the form and general characters of *C. longirostris*. The type is No. 21,197, collected by Dr. Elliott Coues in Milk River, Montana. It is a male specimen 16 $\frac{3}{4}$  inches in length. A specimen previously examined from Platte Valley was identified as probably the female of *C. latipinnis*, but the discovery of this large male specimen forbids such a supposition.

*Specimens in the United States National Museum.*

Number.	Locality.	Collector.
20933	Platte Valley .....	Dr. Elliott Coues.
21197	Milk River, Montana (type) .....	

36. CATOSTOMUS LATIPINNIS *Baird & Girard*.

*Great-finned Sucker.*

1853—*Catostomus latipinnis* BAIRD & GIRARD, in Proc. Ac. Nat. Sc. Phila. vi, 338.*Acomus latipinnis* GIRARD, Proc. Ac. Nat. Sc. Phila. 173, 1856.*Acomus latipinnis* GIRARD, U. S. Mex. Bound. Surv. Ichth. 39, pl. xxiv, f. 1-6, 1859.*Catostomus latipinnis* GÜNTHER, Cat. Fishes Brit. Mus. vii, 14, 1868.*Catostomus latipinnis* COPE, Hayden's Geol. Surv. Wyoming, 1870, 434, 1872.*Catostomus latipinnis* JORDAN & COPELAND, Check List, 156, 1876.1856—*Catostomus guzmaniensis* GIRARD, Proc. Ac. Nat. Sc. Phila. 173.*Acomus guzmaniensis* GIRARD, U. S. Mex. Bound. Surv. Ichth. 39, pl. xxiii, f. 6-10, 1859.*Catostomus guzmaniensis* GÜNTHER, Cat. Fishes Brit. Mus. vii, 15, 1868.*Catostomus guzmaniense* COPE & YARROW, Wheeler's Expl. W. 100th Mer. v, Zool. 679, 1876.*Catostomus guzmaniensis* JORDAN & COPELAND, Check List, 156, 1876.

HABITAT.—Arizona and Sonora. Green River, Wyoming (*Cope*). Probably not abundant.

This species is one of the most strongly marked of our Suckers. The male fish may be known at once by the slender form and excessive development of the fins, and probably in the females the fins are more developed than in the males of any of the related species. The squama-

tion also is peculiar, and the form of the mouth is unlike that of any other species. These features are all well shown in Girard's figure of the species in the Ichthyology of the Mexican Boundary.

The distribution of the species has not been well made out. I have seen but one specimen, an adult male from the Gila region, apparently the one from which Girard's figure was made.

The type of *Catostomus guzmaniensis* cannot be found. The figure was made from a young fish, and the distinctions between it and *latipinnis* are such as often distinguish a young fish from an old one. It is better, therefore, to unite the two than to admit an insufficiently characterized nominal species.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
20078	(Type of <i>latipinnis</i> undoubtedly, but the locality, Rio San Pedro, tributary of Rio Gila, and old number, 254?, obliterated.)	J. H. Clark.

### 37. CATOSTOMUS DISCOBOLUS Cope.

*Large-tipped Sucker.*

1872—*Catostomus discobolus* COPE, Hayden's Geol. Surv. Wyo. 1870, 435.

*Catostomus discobolus* COPE & YARROW, Wheeler's Expl. W. 100th Mer. v, Zool. 677, 1876.

*Catostomus discobolus* JORDAN & COPELAND, Check List, 156, 1876.

HABITAT.—Idaho to Arizona.

This interesting species is a *Pantosteus* in all but the technical character of the open fontanelle, and in this respect it is really intermediate, as the fontanelle, in the adult at least, is reduced to a narrow slit. The characters given in the analysis were taken from the Snake River specimen, 20,475, larger and in better condition than most or all of those examined by Professor Cope. Professor Cope's original types came from Green River in Wyoming.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
12914	.....	Newberry.
15783	Zuni, N. Mex.....	Yarrow & Henshaw.
15791	Arizona.....	C. G. Newberry.
20475	Snake River, Idaho.....	F. V. Hayden.

Genus *PANTOSTEUS* Cope.*Minomus* COPE, U. S. Geol. Surv. Wyoming, 1870, 434 (1872). (Not of Girard.)*Pantosteus* COPE, Lieut. Wheeler's Expl. W. 100th Mer. v, 673, 1876.*Catostomus, Acomus et Minomus* sp. GIRARD.Type, *Minomus platyrhynchus* Cope.

Etymology, πᾶν, all; ὀστέον, bone (from the closing of the fontanelle by bone).

Head moderate or rather small, 4 to 5 times in length of body, flattish and rather broad above, anteriorly somewhat pointed; eye rather small, usually behind the middle of the head: suborbital bones narrow, as in *Catostomus*; bones of head rather thick, the two parietal bones firmly united, entirely obliterating the fontanelle.

Mouth rather large, entirely inferior; each jaw with a more or less developed cartilaginous sheath, separable in alcohol, essentially as in *Chondrostoma*, *Aerochilus*, and related genera; upper lip broad, papillose, with a rather broad, free margin, and several series of tubercles; lower lip largely developed, with an extensive free margin deeply incised behind, but less so than in *Catostomus*. Pharyngeal bones and teeth essentially as in *Catostomus*. Isthmus quite broad.

Body generally elongate, subterete, and little compressed.

Scales quite small, from 80 to 105 in the course of the lateral line, and 30 to 35 in a cross-series between dorsal and ventrals, usually more or less reduced in size and crowded forward, as in *Catostomus*; lateral line well developed, straightish.

Fins generally rather small; first ray of dorsal usually about midway of body, its rays few, 9 to 12 in number; ventrals inserted rather under posterior part of dorsal, their rays 10 or 9; anal short and high, with 7 developed rays; caudal rather shallow, emarginate; pectorals well developed: air-bladder with two chambers.

The characters of *Pantosteus* are essentially those of *Catostomus*, except that the fontanelle is obliterated. The usual scale-formula is interme-

diate between that of *Catostomus* proper and that of the subgenus *Decadactylus*.

The genus was first indicated by Professor Cope in 1874, under the name of *Minomus*, he supposing at the time that *Catostomus insignis*, the type of Girard's *Minomus*, was a species with closed fontanelle. On obtaining specimens of *C. insignis*, it became evident that such was not the case, and the new name *Pantosteus* was proposed for the genus. *Pantosteus* runs very close to *Catostomus*, two species referred to the latter genus (*C. discobolus* and *C. arcopus*) being almost intermediate.

*Generic Characterizations.*

MINOMUS Cope, 1872.—“I have proposed to adopt as valid (Proc. Amer. Philos. Soc. 1870, 480) seven genera of this family. I will now add an eighth, which embraces species which combine with the characters of *Catostomus* proper, a complete union of the parietal bones, which obliterates the fontanelle so universal among the suckers. The only other exception is seen in *Cycleptus*, Raf., as I have already mentioned. In all the members of the family where I have examined it, this fontanelle is quite open and of no doubtful proportions, and nowhere reduced to the slit so often seen in *Siluridæ*. In searching for the characters of Girard's so-called genera *Minomus* and *Acomus*, I find that the type of the former, *M. insignis*, B. G., presents the character above mentioned. I therefore adopt his name for the new genus, and add two new species, *M. delphinus* and *M. bardus*. Whether his two other species, *M. plebeius* and *M. clarkii*, belong to it is uncertain as yet, but they have the same physiognomy.”—(COPE, *Hayden's Geol. Surv. Wyoming for 1870*, p. 434, 1872.)

PANTOSTEUS (Cope) Yarrow, 1876.—“Professor Cope, in 1870, purposed to adopt as valid seven genera of this family; but in 1872, he stated his belief that an eighth should be added, which should embrace species combining the characters of *Catostomus* proper, a complete union of the parietal bones, which obliterates the fontanelle, so universal among the suckers; the only other exception being seen in *Cycleptus*, Raf., as he has already observed. In all the members of the family that he has examined in this regard the fontanelle has been found quite open and of no doubtful proportions, and is nowhere reduced to the slit often seen in the *Siluridæ*, unless it be in the *Catostomus discobolus*. In searching for the characters of Girard's so-called genera *Minomus* and *Acomus*, he expressed the view that the type of the former, *M. insignis*, Baird & Girard, presents the character in question. This conclusion was based on a specimen sent to the Academy of Natural Sciences from Washington, bearing that name. Having since examined five specimens of the *M. insignis*, obtained by the geologists of this survey, he finds them to be true *Catostomi* as determined by the presence of the fontanelle. It therefore requires a name, and he proposes for it that of *Pantosteus*. It embraces *P. platyrhynchus*, *P. jarrovi* and *P. virescens* Cope of the present essay and *P. delphinus* and *P. bardus*, Cope, *Hayden's Report*, l. c.”—(YARROW, *Lieut. Wheeler's Expl. W. 100th Mer.* vol. 5, p. 673, 1876.)

PANTOSTEUS Cope & Jordan, 1877.—“Body oblong or elongate, with a short, subquadrate dorsal fin; air bladder in two parts; lateral line well developed; fontanelle obliterated by the union of the parietal bones.”—(JORDAN, *Proc. Ac. Nat. Sc. Phila.* 1877, p. 81.)

ANALYSIS OF SPECIES OF PANTOSTEUS.

\* Scales very small, 100 to 105 in the lateral line; 18 above and 16 below, in a cross-series: body elongate, compressed, the caudal peduncle contracted: head short, wide, 5 in length: muzzle obtuse, little projecting; upper lip wide; lower lip full, emarginate; jaws with well developed cartilaginous sheaths: scales much reduced in size forwards: dorsal rays 10; ventral 9: color olive; lower surface yellow.....VIRESCENS, 35.

\*\* Scales small, 80 to 85 in the course of the lateral line.

† Scales very much reduced and crowded anteriorly: upper lip full, pendent; cartilaginous sheaths on jaws well developed, the commissure transverse and abruptly angulate at the corners of the month.

a. Body extremely elongate, the depth  $5\frac{1}{2}$  to 7 in length: head  $4\frac{3}{8}$  in length, short and wide, with depressed and expanded muzzle, which considerably overhangs the mouth: isthmus very wide: dorsal rays 11; ventral rays 9: scales 15-86-12: belly and lower fins yellowish, probably red in life .....PLATYRHYNCHUS, 39.

aa. Body moderately elongate, the depth  $4\frac{1}{2}$  to 5 in the length: head rather short,  $4\frac{3}{8}$  in length, not specially broadened; muzzle not greatly overhanging the mouth: dorsal rays 9 (rarely 10); ventral rays 10 (rarely 9): scales 11 to 14-83 to 87-13 to 15: light brown above, with dusky spots and clouds; males with the chin and fins red, and a crimson lateral band.....GENEROSUS, 40.

‡ Scales subequal over the body, not much reduced forwards: upper lip rather narrow, not pendent; cartilaginous sheath on jaws obsolete(?).

b. Body comparatively stout, the caudal peduncle short and thick, the back somewhat arched, the depth  $4\frac{1}{2}$  to 5 in length: head short and wide, flattish above,  $4\frac{3}{8}$  to 5 in length: scales 14-84-15: dorsal rays 9 to 11; ventral rays 10: blackish above, with one or two dark lateral shades .....PLEBEIUS, 41.

38. PANTOSTEUS VIRESCENS Cope.

*Green Sucker.*

1876—*Pantosteus vireseens* (COPE) COPE & YARROW, Wheeler's Expl. W. 100th Mer. v, Zool. 675.

*Pantosteus vireseens* JORDAN & COPELAND, Check List, 156, 1876.

HABITAT.—Arkansas River in Colorado.

Only a single specimen of this species is known, collected by Mr. C. E. Aiken at Pueblo, Colo. The small size of its scales indicates its distinctness from the other species of *Pantosteus*. The greenness of coloration of the typical specimen is probably due to its having been kept in a copper tank.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
—	Arkansas River, Pueblo, Colo. (type).....	C. E. Aiken.

39. PANTOSTEUS PLATYRHYNCHUS *Cope*.*Flat-headed Sucker.*1874—*Minomus platyrhynchus* COPE, Proc. Am. Philos. Soc. Phila. 134.*Pantosteus platyrhynchus* COPE & YARROW, Wheeler's Expl. W. 100th Mer. v, Zool. 673, pl. xxix, f. 3, 3 a, 1876.*Pantosteus platyrhynchus* JORDAN & COPELAND, Check List, 156, 1876.*Pantosteus platyrhynchus* JORDAN, Bull. U. S. Nat. Mus. xi, p. —, 1878.

HABITAT.—Utah Lake and tributaries.

The specimens which I have seen of this species are all small and in poor condition. Their remarkable slenderness is doubtless in part due to their flabbiness. The species as noted by Professor Cope much resembles *Catostomus discobolus*. It is also very similar to *Pantosteus generosus*, but at present I consider it distinct.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
12906	Utah Lake .....	Yarrow & Henshaw.
15163	Utah Lake .....	Yarrow & Henshaw.

40. PANTOSTEUS GENEROSUS (*Girard*) *Jordan*.*Yarrow's Sucker.*1856—*Catostomus (Acomus) generosus* GIRARD, Proc. Ac. Nat. Sc. Phila. 174.*Acomus generosus* GIRARD, U. S. Pac. R. R. Expl. x, 221, 1858.*Catostomus generosus* JORDAN & COPELAND, Check List, 156, 1876.1874—*Minomus jarrovi* COPE, Proc. Am. Philos. Soc. Phila. 35.*Pantosteus jarrovi* COPE & YARROW, Wheeler's Expl. W. 100th Mer. v, Zool. 674, pl. xxix, 2, 2 a, 1876.*Pantosteus jarrovi* JORDAN & COPELAND, Check List, 156, 1876.

HABITAT.—Rio Grande, Colorado Basin, and Great Basin of Utah; very abundant.

This species is the most characteristic and most widely diffused of the Suckers of the Great Basin. It was first described by Girard in 1856, under the name of *Catostomus generosus*. Girard's description, unaccompanied by a figure, was so very loose and irrelevant that it has hitherto remained unidentified. I have, however, had the opportunity of examining Girard's original types, and of comparing them with the types of *Pantosteus jarrovi*. They seem to me to belong to the same species, and I am therefore compelled to substitute the name *generosus*

for that of *jarrovi*. If I had not been able to compare *generosus* with *jarrovi*, I should never have suspected their identity.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
256	Cottonwood Creek (types of <i>generosus</i> ) .....	Lieut. Beckwith.
5910	Ojo de Gallo, N. Mex .....	Lieut. Beale.
15802	Zuñi River, New Mexico (types of <i>jarrovi</i> ) .....	H. W. Henshaw.
17080	San Ildefonso, N. Mex.....	Yarrow & Cope.
17095	Mohave Desert, California.....	Dr. O. Loew.
18009	New Mexico .....	H. C. Yarrow.
20102	Pacific Railroad Survey, 38° .....	Lieut. Beckwith.

41. *PANTOSTEUS PLEBEIUS* (*Baird & Girard*) *Jordan*.

*Plain Sucker.*

- 1854—*Catostomus plebeius* BAIRD & GIRARD, Proc. Ac. Nat. Sc. Phila. 28.  
*Catostomus plebeius* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 203, 1855.  
*Minomus plebeius* GIRARD, Proc. Ac. Nat. Sc. Phila. 173, 1856.  
*Minomus plebeius* GIRARD, U. S. Mex. Bound. Surv. Ichth. 38, pl. xxii, f. 1-4, 1859.  
*Catostomus plebeius* GÜNTHER, Cat. Fishes Brit. Mus. vii, 15, 1868.  
*Catostomus plebeius* JORDAN & COPELAND, Check List, 156, 1876.  
*Pantosteus plebeius* JORDAN, Bull. U. S. Nat. Mus. xi, p.—, 1878.
- 1872—*Minomus delphinus* COPE, Hayden's Geol. Surv. Wyoming, 1870, 435, 1872.  
*Pantosteus delphinus* COPE & YARROW, Lieut. Wheeler's Rept. Expl. W. 100th Mer. vol. 5, 673, 1876.  
*Pantosteus dolphinus* JORDAN & COPELAND, Check List, 156, 1876. (Misprint for *delphinus*.)
- 1872—*Minomus bardus* COPE, Hayden's Geol. Surv. Wyoming, 1870, 436.  
*Pantosteus bardus* COPE, Lieut. Wheeler's Expl. W. 100th Mer. vol. 5, p. 673, 1876.  
*Pantosteus bardus* JORDAN & COPELAND, Check List, 156, 1876.

HABITAT.—Basin of the Colorado. Lake Guzman.

The types of *Catostomus plebeius* are not to be found, and no specimens referable to the species are in the National Museum. The types of *Pantosteus delphinus* and *P. bardus* I have been unable to examine. The scale-formula and small dorsal fin of *C. plebeius* indicate that it is a species of *Pantosteus*. Assuming that it is so, I find myself unable to draw from the printed descriptions of *plebeius*, *delphinus*, and *bardus* any sort of specific characters. Until such characters are shown, the burden of proof lies with the proposer of those species, and I shall consider them as identical until they are proved to be distinct. In characters of mouth,

scales, and form of body, *Pantosteus plebeius* seems to resemble *Catostomus insignis* and *C. clarkii*, and to diverge from the type of *discobolus*, *generosus*, and *platyrhynchus*.\*

\* Professor Cope (*in lit.*) dissents from the identification above made, maintaining that *P. delphinus* and *P. bardus* are at least specifically distinct from each other, whatever may be the relation of either to *P. plebeius*. As I have seen none of the three forms in question, I let the above stand as I had written it, and quote the original descriptions of the three nominal species:—

**MINOMUS PLEBEIUS** Grd.—“Body sub-fusiform, compressed. Head elongate, subconical, forming the fifth of the entire length. Mouth of medium size. Eyes large, sub-elliptical, their longitudinal diameter being contained about five times in the length of side of head. Dorsal fin subquadrangular, its anterior margin being equidistant between the tip of the snout and the first rudimentary rays of the upper lobe of the caudal. The latter is slightly concave posteriorly, and the lobes rounded off. The base of the anal is contained nearly three times in its height, and when brought backwards its tip extends to the rudimentary rays at the inferior lobe of the caudal fin. The ventrals are inserted under the posterior third of the dorsal; bent backwards, their tip does not reach as far as the anus. The pectorals are of medium development, subovate, posteriorly acute.

“The scales are of medium size, considerably largest on the peduncle of the tail. Twenty-eight to thirty rows from the base of the ventrals to the dorsal fin. About eighty in the lateral line, which is not discernible as far back as the base of the caudal fin.

“The color as preserved in alcohol, is dark brown on the upper regions, faintly mottled with blackish patches. The sides and belly exhibit traces of orange in some of the specimens, in others it is pale yellowish. The fins are unicolor; the dorsal, caudal, and pectorals, blackish brown; the anals and ventrals yellowish.”—(GIRARD, *Ich. U. S. and Mex. Boundary Surv.* —, p. 38, figs. 1-4, plate xxii.)

**MINOMUS DELPHINUS** Cope.—“The subequal size of the scales of this species would refer it indifferently to the true group *Catostomus* of Girard, or his group *Minomus*, which he did not distinguish clearly. The preceding species would enter his *Acomus*, which is, however, only an undefined group of species, to which, by the way, the type of *Catostomus*, *C. teres*, belongs. This species is especially distinguished from those heretofore described by the shortening of the caudal part of the vertebral column, and the consequent posterior position of the dorsal fin. Add to this a short, wide head, and thick body, and its physiognomy is expressed.

“The dorsal outline is arched, the head flat above, but elevated behind, and much depressed on the muzzle. The muzzle is wide and does not project beyond the upper lip, which is appressed to its lower face and bears four rows of warts; its smooth commissural part is narrow. On the lower lip the tubercles advance nearly to the commissure; this lip is deeply emarginate posteriorly; the eye enters the length of the head five times, two and one-half times measuring the muzzle, and twice the inter-orbital region. Head four and two-thirds times in length to end of caudal basal scales. Scales in thirty longitudinal series, between dorsal and ventral fins; ventrals remark-

Genus CYCLEPTUS *Rafinesque*.

*Cycleptus* RAFINESQUE, Journal de Physique, de Chimie et d'Histoire Naturelle, Paris, 1819, p. 421.

*Rhytidostomus* HECKEL, Fische Syriens, Russegger's Reisen, 1842, p. 1023.

*Catostomus et Sclerognathus* sp. AUCT.

Type, *Cycleptus nigrescens* Rafinesque, = *Catostomus elongatus* Le Sueur.

Etymology, κύκλος, round; λεπτός, small. "The name means small, round mouth" (*Rafinesque*).

Head very small, short and slender, its length contained 6 to 7 times in that of the body, its upper surface rounded; eye quite small, nearly median, not very high up, its length 6 to 8 in that of the side of the head; suborbital bones rather small and quite narrow; fontanelle entirely obliterated by the union of the parietal bones.

Mouth small, entirely inferior, overlapped by the projecting snout, the upper lip thick, pendent, covered with 3 to 5 rows of tubercles, the outer quite large, the inner small; lower lip moderate, formed some-

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ably short, extending little more than half way to vent, originating under posterior third of dorsal. Pectorals well separated. Isthmus wide.

"Color above blackish, with a strong inferior marginal shade on the lower part of the sides, and the lighter tint above; a brown spot just above axilla, is cut off from it by a band of the yellow color which covers the belly and head below.

"The only species concerning which any doubt can arise in the nomenclature of this one is *C. bernardini* of Girard. That writer states that the latter possesses 15 D. radii; this, with the ascription of a slender form and other peculiarities, will always separate them. Three species in Professor Hayden's collection without locality. This should be probably a tributary of Green River."—(COPE, *Hayden's Geol. Surv. Terr.* 1872, p. 436.)

MINOMUS BARDUS Cope.—"This species is distinguished by its very short head, and marked coloration, resembling in that respect the *C. guzmaniensis* of Girard; with this species, it has, however, nothing else in common.

"Head wide, muzzle not projecting beyond upper lip; latter not pendent, with narrow, smooth commissure and three or four rows of tubercles. Lower lip deeply incised, tubercular to near inner edge. Eye 5.25 times in length of head, twice in interorbital width. Head five times to end of basal caudal scales. Form stout: body cylindrical anteriorly. Dorsal fin nearer end of muzzle than end of caudal scales. Scales of body subequal, in thirty longitudinal rows between dorsal and ventral fins, latter originating beneath hinder border of dorsal, not quite reaching vent. Pectorals well separated; isthmus wide, narrower than in *M. delphinus*. Color blackish above, a broad olive band from upper part of opercular border along upper half of caudal peduncle, and a broad black band below, narrowing to a line along the middle of the peduncle; below, yellowish, a band of the same cutting off a blackish area above the axilla, as in the last species."—(COPE, *Hayden's Geol. Surv. Terr.* 1872, p. 436.)

what as in *Catostomus*, but less full, incised behind; jaws without cartilaginous sheath; muciferous system not greatly developed; opercular apparatus not greatly developed, the operculum smooth and narrow. Isthmus moderate; gill-rakers moderately long, soft; pharyngeal bones strong, the teeth stout, increasing in size downwards, rather wide apart.

Body elongate, moderately compressed, not much elevated, the caudal peduncle long, the greatest depth contained 4 to 6 times in length.

Scales moderate, about equal over the body, not closely imbricated, with wide exposed surfaces, the number in the lateral line from 55 to 60, and about 17 in a transverse series from dorsal to ventrals; edges of scales serrate; lateral line well developed, nearly straight.

Fins rather large; dorsal fin beginning in front of ventrals and ending just before anal, of about 30 rays, strongly falcate in front, the first and second developed rays in length more than half the length of the base of the fin, the rays rapidly shortened to about the eighth, the length of the remaining rays being nearly uniform and all short; caudal fin large, widely forked, the lobes about equal; anal fin quite small, low, of 7 or 8 developed rays, scaly at base; ventrals moderate, with 10 rays; pectorals elongate, somewhat falcate.

Sexual peculiarities somewhat marked; the males in spring with black pigment; the head then covered with small tubercles.

Air-bladder with two chambers, the anterior short, the posterior elongate.

But a single species of this singular genus is as yet known. It is found in the waters of the Mississippi Valley, and, although not a rare fish, it is by no means as generally abundant as are many others of its family.

#### *Generic Characterizations.*

CYCLEPTUS Rafinesque, 1819.—“Cycleptus, (abdominal). Différent du genre *Catostomus*. Deux nageoires dorsales, bouche petite, ronde, au bout du museau; lèvres circulaires. Famille Cyprinidia? *C. nigrescens*, noirâtre; ventre blanchâtre, bouche retroussée; queue fourchée. Parvient à deux pieds de long; très bon à manger, rare dans l'Ohio et le Missouri.”—(RAFINESQUE, *Journ. de Phys. etc.* 1819, p. 421.)

CYCLEPTUS Rafinesque, 1820.—“Difference from the foregoing genus [*Catostomus*]—two dorsal fins, mouth round and terminal.”—(RAFINESQUE, *Ich. Oh.* p. 6.)

RHYTIDOSTOMUS Heckel, 1842.—“Dentes pectiniformes 60–60. Pinna dorsalis basi elongata; radio tertio vel quarto longissimo. In reliquis cum genere *Catostomo* congruit.”—(HECKEL, *Fische Syrius*, p. 33, or *Russeger's Reisen*, p. 1023.—Species referred to the genus, *Cyprinus catostomus* Forster and *Catostomus elongatus* Le Sueur.)

CYCLEPTUS Agassiz, 1855.—“As in many other instances, Rafinesque has named, but neither defined nor characterised the genus to which I now call attention. He has not

himself even seen the fish upon which the genus is founded, and refers to another genus a species which cannot be separated from this. Moreover, the characteristics of the genus, as given by Rafinesque, are not true to nature. Yet, notwithstanding these objections, I do not feel at liberty to reject his generic name, since it is possible to identify the fish he meant by the vernacular name under which it is known in the West. There is another reason why Rafinesque's description of our western fishes ought to be carefully considered and every possible effort made to identify his genera and species, the fact that he was the first to investigate the fishes of the Ohio and its tributaries upon a large scale, and that notwithstanding the looseness with which he performed the task and the lamentable inaccuracies of his too short descriptions, his works bear almost upon every page the imprint of his keen perception of the natural affinities of species, and their intimate relations to one another; so much so, that even where he has failed to assign his genera any characters by which they may be recognized, yet, when the species upon which they were founded can be identified, we usually find that there are good reasons for considering them as forming distinct genera.

"The trouble with Rafinesque is, that he too often introduced in his works species which he had not always seen himself, and which he referred almost at random among his genera, thus defacing his well characterised groups, or that he went so far as to found genera upon species which he had never seen, overlooking perhaps that he had already described such types under other names.

"The genus *Cycleptus* affords a striking example of all these mistakes combined together. In his remarkable paper upon the genus *Catostomus*, Lesueur describes and figures one species from the Ohio River, under the name of *C. elongatus*, peculiar for its elongated cylindrical body, and for its long dorsal fin beginning half way between the pectorals and ventrals, and extending as far back as the insertion of the anal. The species Rafinesque introduces in his subgenus *Decaetylus* among the genuine *Catostomi*, without perceiving that it belongs to his own genus *Cycleptus*. This mistake arises undoubtedly from his belief that in *Cycleptus* there are two dorsals, which indeed he mentions as characteristics of this genus; but this statement is erroneous: the rays of the dorsal are, in fact, enclosed in a continuous membrane, the anterior rays only being much longer than those of the middle and posterior portion of the fin; occasionally these long rays split, and accidentally separate from the following ones, when they seem to form two dorsals.

"The character of this genus, so far as the dorsal is concerned, consists in reality not in its division, but in its great extension along the back, and the elongation of its anterior rays. The anal is very long in proportion to the size of the fish, and inserted far back, so that the length of the abdominal cavity is greater than in the genera *Carpiodes*, *Ichthyobus*, and *Babalichthys*, with which *Cycleptus* is closely allied by the peculiar form of its dorsal. Again, Rafinesque remarks that the mouth is terminal, round and small. This requires also to be qualified. The mouth appears terminal and round only when the jaws are protruded to their utmost extent; when closed, it is rather crescent-shaped and entirely retracted under the projecting, pointed snout; the lips are covered with numerous projecting papillæ and spread horizontally,—these are moreover, continuous around the angles of the mouth, so that the upper and lower lips are hardly separated by a small fold, and the lower lip is slightly emarginate in the middle, while in other genera of this tribe it is actually bilobed.

"The pharyngeal bones are strong, their anterior surface being flattened and the greatest diameter being the transverse one, as in *Bubalichthys*, and not laterally compressed and thin as in *Carpiodes* and *Ichthyobus*.

"The symphysis is short and its peduncle flat and square, separated from the curved arch by a deep semicircular emargination. The teeth are also stronger and stouter than in *Carpiodes* and *Ichthyobus*, as is also the case in *Bubalichthys*, and they are gradually increasing in size, and relative thickness from the upper part of the arch to the symphysis, but they are much fewer and farther apart than in the latter genus. Their inner edge is transverse, rather blunt, though the middle ridge is somewhat projecting; the lower teeth are so shaped that their inner angle is hardly higher than the outer, while in the middle and upper teeth it is gradually more projecting, and from the middle of the arch upwards forms a prominent point arched outwards.

"The scales are considerably longer than high, with a rather prominent posterior margin; numerous radiating furrows upon the anterior and posterior fields, some across the lateral fields; the concentric ridges of the posterior field are not only broader than those of the other fields, but instead of running parallel to the margin of the scales they are curved in concentric gothic arches between each two radiating furrows. Heckel mentions this genus under the name of *Rhytidostomus*, but Rafinesque's name *Cycleptus* has the priority. Properly it ought to be called *Leptoicyelus*, according to its etymology, (see my Nomenclator Zoologicus; Index Universalis, p. 109,) but under this form nobody would recognise it as Rafinesque's name. I shall therefore not urge the change."—(AGASSIZ, *Am. Journ. Sci. Arts*, 1855, p. 197.)

CYCLEPTUS Cope & Jordan, 1877.—"Body much elongated, subcylindrical forwards: dorsal elongate, falciform, of 30 or more rays; fontanelle obliterated by the union of the parietal bones; mouth small, inferior, with papillose lips."—(JORDAN, *Proc. Ac. Nat. Sc. Phila.* 1877, p. 81.)

## ANALYSIS OF SPECIES OF CYCLEPTUS.

\* Depth 4 to 5 in length: head 6 to  $6\frac{1}{2}$ : eye small, 6 to 7 in length of head: longest dorsal rays a little longer than head: pectorals rather longer than head: dorsal rays 30; anal 7 or 8: scales 9-56-7: coloration very dark, the males almost black; size large; length of adult  $1\frac{1}{2}$  to  $2\frac{1}{2}$  feet ..... ELONGATUS, 42.

42. CYCLEPTUS ELONGATUS (*Le Sueur*) Agassiz.

*Black Horse. Gourd-seed Sucker. Missouri Sucker. Suckerel.*

1817—*Catostomus elongatus* LE SUEUR, *Journ. Ac. Nat. Sc. Phila.* 103.

*Catostomus elongatus* RAFINESQUE, *Ich. Oh.* 60, 1820.

*Catostomus elongatus* KIRTLAND, *Rept. Zool. Ohio*, 168, 1833.

*Catostomus elongatus* DEKAY, *New York Fauna*, part iv, *Fishes*, 203, 1842.

*Catostomus elongatus* CUVIER & VALENCIENNES, *Hist. Nat. des Poiss.* xvii, 455, 1844.

*Catostomus elongatus* KIRTLAND, *Boston Journ. Nat. Hist.* v, 267, 1845.

*Catostomus elongatus* STORER, *Synopsis*, 422, 1846.

*Cycleptus elongatus* AGASSIZ, *Am. Journ. Sc. Arts*, 2d series, xix, 197, 1855.

*Sclerognathus elongatus* GÜNTHER, *Cat. Fishes Brit. Mus.* vii, 23, 1863.

*Cycleptus elongatus* JORDAN, Fishes of Ind. 222, 1875.

*Cycleptus elongatus* JORDAN, Bull. Buffalo Soc. Nat. Hist. 95, 1876. (Name only.)

*Cycleptus elongatus* JORDAN, Man. Vert. 298, 1876.

*Cycleptus elongatus* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 50, 1876.

*Cycleptus elongatus* JORDAN & COPELAND, Check List, 158, 1876. (Name only.)

*Cycleptus elongatus* JORDAN & GILBERT, in Klippart's Rept. 53, 1876. (Name only.)

*Cycleptus elongatus* JORDAN, Bull. U. S. Nat. Mus. ix, 33, 1877.

*Cycleptus elongatus* JORDAN, Man. Vert. ed. 2d, 1878.

1818—*Cycleptus nigrescens* RAFINESQUE, Journal de Physique, 421.

*Cycleptus nigrescens* RAFINESQUE, Ich. Oh. 61, 1820.

HABITAT.—Mississippi Valley, in all the larger streams.

This species is found in some abundance in the larger streams. At the Falls of the Ohio, it is taken in nets, and meets a ready sale. It is, however, much less abundant than the Buffalo fishes are. From the general use of the name "Missouri Sucker", its abundance in the State of Missouri may be inferred; but, as to the facts in the case, I am not informed. This fish is as sharply distinguished from the other Suckers in its appearance as in its anatomy. The dusky colors and the small size of the head attract attention at once.

But one species is yet known. That being the case, the synonymy of the species needs no discussion, its oldest name being the one in common use.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
107	.....	
8673	.....	
10790	Cincinnati, Ohio .....	J. W. Milner.
12278	..... do .....	Do.

### Genus CARPIODES *Rafinesque.*

*Carpiodes* RAFINESQUE, Ich. Oh. 56, 1820. (As subgenus of *Catostomus*.)

*Sclerognathus* VALENCIENNES, Hist. Nat. des Poissons, xvii, 472, 1844.

Type, *Catostomus cyprinus* Le Sueur.

Etymology, Latin *carpio*, a carp; *i. e.*, carp-like.

Head comparatively short and deep, sometimes conic, sometimes blunt, its length ranging from  $3\frac{1}{2}$  to 5 in that of the body, its upper surface always rounded; eye moderate, median or anterior in position; suborbital bones well developed, their depth more than half that of

the fleshy portion of the cheek below; fontanelle always present, well developed.

Mouth always small, horizontal and inferior, the mandible less than one-third the length of the head, the lips thin, the upper protractile, narrow, the lower quite narrow,  $\Lambda$ -shaped, or rather  $\Gamma$ -shaped, behind; both lips feebly plicate or nearly smooth, the plicæ often more or less broken up; jaws without cartilaginous sheath; muciferous system moderately developed; opercular apparatus well developed, the sub-opercle broad, the operculum in the adult more or less rugose; isthmus moderate; pharyngeal bones remarkably thin and laterally compressed, with a shallow furrow along the anterior margin on the inside, and another more central one on the outline of the enlarged surfaces; teeth very small, compressed, nearly equally thin along the whole inner edge of the bone, forming a fine comb-like crest of minute serratures; their cutting edge rises above the inner margin into a prominent point. Gillrakers of anterior arch slender and stiff above, becoming reduced downwards.

Body ovate or oblong, the dorsal outline more or less arched, the ventral outline more nearly straight, the depth from half to one-third the length, the sides compressed; the back notably so, forming a sort of carina; caudal peduncle short and deep; scales large, about equal over the body, their posterior margins slightly serrate; lateral line well developed, nearly straight, with 34 to 41 scales, 12 to 15 scales in a cross-row from dorsal to ventrals; dorsal fin beginning near the middle of the body, somewhat in advance of ventrals, falcate, its anterior rays very much elevated and usually filamentous, their height ranging from  $\frac{1}{2}$  to  $1\frac{1}{3}$  the length of the base of the fin, the number of developed rays ranging from 23 to 30; caudal fin well forked, the lobes equal; anal fin comparatively long and low, emarginate (in males?), its number of developed rays usually 8; ventrals shortish, with usually 10 rays; pectorals short.

Sexual peculiarities little marked; in some species, at least, the males in spring have the snout minutely tuberculate.

Coloration always plain; pale olivaceous above, white below, but hardly silvery, the fins all partaking of the color of the region to which they belong.

Air-bladder with two chambers.

Size medium or rather large.

This genus was first recognized and defined by Professor Agassiz in

1855. Since then it has been generally received by authors under the same name and with the same limits. It was first briefly outlined by Rainesque in 1820 under the name of *Carpiodes*, then afterwards by Valenciennes defined more fully under the name of *Sclerognathus*. Both *Carpiodes* and *Sclerognathus* having the same typical species (*Catostomus cyprinus* Le Sueur), the older and preferable name, *Carpiodes*, is the one to be adopted.

The recognition of species in this genus is a matter of extreme difficulty, from their great resemblance to each other in color, size, form, and general appearance. Our knowledge of the species thus far has been almost entirely due to the labors of Professor Cope (A Partial Synopsis of the Fishes of North Carolina", Proc. Am. Philos. Soc. Phila. 1870). I have myself examined specimens agreeing with each of Professor Cope's descriptions, and, with two exception (*Carpiodes selene* and *Carpiodes grayi*), I am disposed to admit all his species. It is true, however, that in every large collection of *Carpiodes* there are specimens disagreeing more or less from the typical forms of each species, and which should, in consistency, be described as distinct species, or else the species which they appear to connect should be united. I have not, however, examined a sufficiently full series of *Carpiodes* to be prepared to accept either of these alternatives. I have, therefore, taken Professor Cope's analysis of the species, and added to it such additional features as I have been able to observe, and I give the whole as our best knowledge at present on the subject, leaving for future study the consideration of the degree of relationship existing between *cyprinus*, *velifer*, and *thompsoni*. The other four species, *carpio*, *bison*, *cutisanserinus*, and *difformis*, seem to be manifestly distinct, unless *difformis* be a monstrous form of *cutisanserinus*.

Species of this genus are found in all the fresh waters of the United States east of the Rocky Mountains. They seldom ascend the small streams, and are taken by means of nets from the larger rivers and lakes. From their resemblance in form to the European Carp (*Cyprinus carpio*), they are popularly known as "Carp". This resemblance has suggested the name of the genus and of two of its species. As food-fishes they are rather indifferent, the flesh being rather coarse and flavorless and full of small bones. The geographical distribution of the species has been little studied. *C. cyprinus* is the common species east of the Alleghanies, and, if "*C. damalis*" and "*C. tumidus*" be the same, in the Upper Missouri region and the Rio Grande also. *C. thompsoni* is the

common Carp of the Great Lakes. *C. carpio* is the most abundant species in the Ohio River, where *C. velifer* and *C. cutisanserinus* also occur in immense numbers.

I am convinced that neither the number of scales nor the number of fin-rays can be relied on to distinguish species in this genus, the entire range of variation being probably found in every species. The height of the anterior rays of the dorsal, although subject to considerable variation with age and wear, seems to be sufficiently constant to divide the species into two groups.

*Generic Characterizations.*

CARPIODES Rafinesque, 1820.—“Body oblong, somewhat compressed; head compressed, nine abdominal rays, dorsal fin commonly elongate, tail equally forked.”—(RAFINESQUE, *Ich. Oh.* p. 56.)

SCLEROGNATHUS Storer, 1846.—“Snout slightly advanced beyond the mouth; the extremity of the mouth is supported, as in the *Catostomi*, by the intermaxillary, which is furnished in front with a well developed, projecting, cartilaginous ethmoid. The upright branch is long, and of a styloid form, while the horizontal is shortened, and is a mere keel, the inferior edge of which serves merely to support the superior angle of the mouth. The remainder of the maxillary arch is formed by a fibrous ligament covered by a thin, undilated lip, reduced to a thin and fleshy protuberance. The upper jaw is a wide, very solid bony piece, under which the upper lip is partly drawn; this bone is concealed by the first two suborbitals, being wider and no less advanced than those of the *Catostomi*. As to its lips, it is a *Leuciscus*; but the osteology of its mouth resembles that of the *Catostomi*. The dorsal is long, like that of the Carps. The head is naked, marked by lines of mucous pores. Pharyngeal teeth comb-like, finer and more equal than those of the *Catostomi*. The air-bladder is divided into two large lobes; the anterior is large and rounded, with a slight depression at its superior face; the second conical, twice as long as the first and followed by two small lobes; the second communicates with the œsophagus by an air-pipe.”—(STORER, *Mem. Am. Ac. Arts and Sc.* 1846, p. 427; essentially a translation from Valenciennes's account.)

CARPIODES Agassiz, 1855.—“The body is very high and strongly compressed, the narrow ridge on the back forming the outline in front of the dorsal is very much arched, and regularly continuous downwards with the rather steep profile of the head.

“The head is short, its height and length differ but little. The snout is short and blunt. The small mouth is entirely inferior, and surrounded by narrow thin lips, which are more or less transversely folded. The lower jaw is short and broad. The pharyngeal bones of *Carpiodes* are remarkably thin, compressed laterally, with a shallow furrow along the anterior margin on the side, and another more central one on the outline of the arched surfaces; the teeth are very small, compressed, equally thin along the whole inner edge of the bone, forming a fine comb-like crest of minute serratures; their cutting edge rises above the inner margin into a prominent point.

“The anterior lobe of the long dorsal is slender, its third and fourth rays being prolonged beyond the following ones into long filaments. The lower fins are all pointed,

rather small, and hence different from one another. The ventral ridge of the body is flat. The scales have many narrow, radiating furrows upon the anterior field, and are more deeply marked, in a straight line, across the lateral fields, or limiting the lateral and posterior fields, hardly any upon the anterior field, the waving of the broader concentric ridges producing only a radiated appearance upon that field. Tube of the lateral line straight and simple, arising in advance of the centre of radiation, which is seated in the centre of form of the scales."—(AGASSIZ, *Am. Journ. Sc. Arts*, 1855, p. 189.)

CARPIODES Günther, 1863.—"Distinguished from *Sclerognathus* (*i. e.* *Bubalichthys* and *Ichthyobus*) by its very thin, compressed pharyngeal bones, which are armed with a comb-like series of nearly equally minute compressed teeth."—(GÜNTHER, *Cat. Fishes Brit. Mus.* vii, p. 24.)

CARPIODES Cope & Jordan, 1877.—"Body oblong oval, compressed; dorsal elongate, elevated in front, of 20 or more rays; fontanelle present; pharyngeal bones narrow, with the teeth relatively thin and weak; mouth small, inferior, protractile downwards."—(JORDAN, *Proc. Ac. Nat. Sc. Phila.* 1877, p. 82.)

## ANALYSIS OF SPECIES OF CARPIODES.

\* Dorsal fin with the anterior rays very much elevated and attenuated, equalling or more usually exceeding the length of the base of the fin.

† Muzzle very abruptly obtuse, almost vertically truncate in front.

a. Muzzle exceedingly blunt, so that the anterior edge of the mandible is in line with the anterior rim of the orbit, and the maxillary reaches to the anterior edge of the pupil: anterior suborbital deeper than long: head  $4\frac{1}{4}$  in length: eye quite large,  $3\frac{1}{2}$  to 4 in head: body arched, the depth somewhat less than half the length: first ray of dorsal nearer muzzle than base of caudal: scales 6-35-4: D. 24, A. 8, V. 9.....DIFFORMIS, 43.

aa. Muzzle notably blunt, but less so than in the preceding: anterior edge of the mandible in advance of the orbit, and the maxillary just reaching the line of the lower rim of the orbit: anterior suborbital bone deeper than long (longer than deep, "*selene*"): head 4 times in length: eye smallish,  $4\frac{1}{2}$  in head: body arched, the depth about  $2\frac{1}{2}$  in length: anterior rays of dorsal about midway between snout and base of caudal: scales 7-37-5: D. 26, A. 8, V. 10.....CUTISANSERINUS, 44.

‡ Muzzle conic, projecting, obtusely pointed: end of the mandible reaching to opposite nostrils: anterior suborbital as deep as long: head  $3\frac{3}{4}$  in length: eye moderate, 4 to  $4\frac{1}{2}$  in length of head: body arched above, the depth  $2\frac{1}{4}$  to  $2\frac{1}{2}$  in length: first ray of dorsal nearer muzzle than base of caudal: scales 7-37-5: D. 26 or 27 ("*22*", Cope).....VELIFER, 45.

\*\* Dorsal fin with the anterior rays more or less shortened, their length one-half to two-thirds that of the base of the fin: muzzle more or less conic and projecting.

b. Head long, contained about  $3\frac{1}{2}$  times in length to base of caudal: muzzle elongate-conic, so that the eye is nearly median, the middle of the length of the head falling in front of its posterior margin: body not much arched; depth 3 in length: anterior rays of dorsal pretty high, not much shorter than the base of the fin, not thickened at base: lips well developed: eye large,  $4\frac{1}{2}$  in head: scales 7-40-5: D. 27, A. 7, V. 10.....BISON, 46.

- bb. Head intermediate, its length contained about 4 times ( $3\frac{3}{4}$  to  $4\frac{1}{3}$ ) in that of body: anterior rays of dorsal not thickened at base.
- c. Body stout, short, the back much arched, the depth  $2\frac{1}{2}$  in length: head 4 to  $4\frac{1}{2}$  in length, the muzzle moderately pointed: dorsal rays considerably elevated, two-thirds as long as base of fin: eye small,  $5\frac{1}{2}$  in head: tip of lower jaw much in advance of nostrils; maxillary reaching line of orbit: anterior suborbital large, deep, roundish: origin of dorsal about midway of body: scales rather closely imbricated, 8-39 to 41-6: D. 27, A. 7, V. 10.

THOMPSONI, 47.

- cc. Body elongate, not much elevated, the depth  $2\frac{3}{4}$  in length: head  $3\frac{3}{4}$  to 4, the muzzle prominent but rather bluntish: front scarcely concave above eyes, the profile forming a somewhat uniform curve: eye small, nearly 6 in head: anterior rays of dorsal moderately elevated, nearly three-fourths the length of the fin, the first ray nearly midway between snout and base of caudal: scales 6-37-5: D. 24 to 27, A. 8, V. 10 ..... CYPRINUS, 48.

- bbb. Head comparatively short, its length contained  $4\frac{1}{2}$  to 5 times in the length of the body: body more fusiform than in the others, compressed, but not much arched, the depth  $2\frac{3}{8}$  to 3 times in the length: anterior rays of dorsal short, notably thickened and osseous at base, the first ray nearer the end of the muzzle than the base of the caudal fin: eye small, anterior,  $4\frac{1}{2}$  in head: muzzle short, but projecting much beyond mouth: size largest of the genus.

CARPIO, 49.

## 43. CARPIODES DIFFORMIS Cope.

*Deformed Carp Sucker.*1870—*Carpiodes difformis* COPE, Proc. Am. Philos. Soc. Phila. 480.*Carpiodes difformis* JORDAN, Man. Vert. 297, 1876.*Carpioões difformis* JORDAN & COPELAND, Check List, 158, 1876.*Carpiodes difformis* JORDAN, Proc. Ac. Nat. Sc. Phila. 72, 1877.*Carpiodes difformis* JORDAN & GILBERT, in Klippart's First Report Ohio Fish Commission, 86, pl. xiii, f. 21, 1877.*Carpiodes difformis* JORDAN, Bull. U. S. Nat. Mus. 9, 50, 1877.*Carpiodes difformis* JORDAN, Man. Vert. ed. 2d, 321, 1878.

HABITAT.—Ohio Valley; less common than the other species.

The only specimen which I have seen of this species was from the Wabash River, in which stream Professor Cope's original types were collected. No specimens are in the United States National Museum, which, indeed, at present contains very few of the Carp Suckers or Buffalo-fish.

## 44. CARPIODES CUTISANSERINUS Cope.

*Long-finned Carp Sucker. Quillback.*1870—*Carpiodes cutisanserinus* COPE, Proc. Am. Philos. Soc. Phila. 481.*Carpiodes cutisanserinus* JORDAN & COPELAND, Check List, 158, 1876.

*Carpiodes cutisanserinus* JORDAN, Bull. U. S. Nat. Mus. 9, 50, 1877.

*Carpiodes cutisanserinus* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.

*Carpiodes cutisanserinus* JORDAN, Man. Vert. ed. 2d, 321, 1878.

1870—*Carpiodes selene* COPE, Proc. Am. Philos. Soc. Phila. 481.

*Carpiodes selene* JORDAN & COPELAND, Check List, 158, 1876.

*Carpiodes selene* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.

*Carpiodes selene* JORDAN, Man. Vert. ed. 2d, 321, 1878.

1876—*Ichthyobus difformis* NELSON, Bull. No. 1, U. S. Nat. Mus. 49.

HABITAT.—Mississippi Valley; generally abundant.

This species is closely related to *C. velifer*, but differs in the abruptly truncate snout, that of *velifer* being conic. I am unable to recognize *C. selene* as a distinct species at present, the form of the anterior sub-orbital being the only distinguishing feature of much importance, and that probably not a constant one. *C. cutisanserinus* is as abundant in the Ohio as *C. velifer*, and I have seen many specimens from the Illinois River.

Specimens in United States National Museum.

Number.	Locality.	Collector.
20032	Cumberland River.....	A. Winchell.
20033	.....do.....	Do.

#### 45. CARPIODES VELIFER (*Rafinesque*) Agassiz.

*Carp Sucker. Skimback. Quillback. Sailor. Sailing Sucker. Spear-fish.*

1820—?? *Catostomus anisopterus* RAFINESQUE, Ich. Oh. 45. (Description at second hand and unrecognizable.)

1820—*Catostomus velifer* RAFINESQUE, Ich. Oh. 56.

*Catostomus velifer* KIRTLAND, Rep. Zool. Ohio, 168, 1838.

*Carpiodes velifer* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 191, 1855.

*Carpiodes velifer* COPE, Proc. Am. Philos. Soc. Phila. 482, 1870.

*Carpiodes velifer* JORDAN, Fishes of Ind. 222, 1875.

*Carpiodes velifer* JORDAN, Bull. Buffalo Soc. Nat. Hist. 95, 1876.

*Carpiodes velifer* JORDAN, Man. Vert. 297, 1876.

*Carpiodes velifer* JORDAN & Copeland, Check List, 158, 1876.

*Ichthyobus velifer* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49, 1876.

*Carpiodes velifer* JORDAN & GILBERT, in Klippart's First Report Ohio Fish Commission, 87, 1877.

*Carpiodes velifer* JORDAN, Bull. U. S. Nat. Mus. ix, 34, 1877.

*Carpiodes velifer* JORDAN, Man. Vert. ed. 2d, 321, 1878.

1846—*Sclerognathus cyprinus* KIRTLAND, Bost. Journ. Nat. Hist. vol. v, 275. (In part; not of C. & V.)

HABITAT.—Western streams and lakes (Cayuga Lake, New York, to Mississippi River).

This species is quite abundant in the Ohio River, and I have seen specimens not evidently distinguishable, from Lake Erie and from other waters tributary to the Great Lakes. Indiscriminately with *C. cutis-anserinus*, it is known to the fishermen as Quillback, Skimback, etc., the lower-finned species being called rather "Carp". Most of the synonymy above quoted includes several species, the true *velifer* being first distinguished by Professor Cope. Rafinesque's *anisopterus* I bring into the synonymy of this species, simply to refer to it somewhere. It is really unidentifiable. Kirtland's *Sclerognathus cyprinus* refers most to this species, but his figure represents no known fish. The head is too small, and the form, etc., incorrect.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
20277	Cayuga Lake, New York.....	

There are also several other specimens in the collection, but without locality.

#### 46. CARPIODES BISON Agassiz.

*Long-headed Carp Sucker.*

1854—*Carpiodes bison* AGASSIZ, Am. Journ. Sci. Arts, 356.

*Carpiodes bison* AGASSIZ, Am. Journ. Sci. Arts, 190, 1855.

*Carpiodes bison* COPE, Proc. Am. Philos. Soc. Phila. 483, 1870.

*Carpiodes bison* JORDAN, Man. Vert. 297, 1876.

*Carpiodes bison* JORDAN & COPELAND, Check List, 158, 1876.

*Ichthyobus bison* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49, 1876.

*Carpiodes bison* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.

*Carpiodes bison* JORDAN, Bull. U. S. Nat. Mus. ix, 50, 1877.

*Carpiodes bison* JORDAN, Man. Vert. ed. 2d, 322, 1878.

HABITAT.—Mississippi Valley (Osage River, *Agassiz*; Mississippi River, Wabash River, Tennessee River, *Cope*).

What the fish is to which Professor Agassiz gave the name "*bison*" cannot be ascertained from the published descriptions. Professor Cope has described the present species under that name, and we accept the

name *bison* on his authority. This species is not generally common in so far as my experience goes. I have, however, seen one or two from the Ohio River. I found no specimens in the National Museum.

#### 47. CARPIODES THOMPSONI *Agassiz.*

*Lake Carp.*

1842—*Catostomus cyprinus* THOMPSON, Hist. Vt. 133.

1855—*Carpiodes thompsoni* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 191.

*Carpiodes thompsoni* COPE, Proc. Ac. Nat. Sc. Phila. 285, 1864.

*Carpiodes thompsonii* COPE, Proc. Am. Philos. Soc. Phila. 483, 1870.

*Carpiodes thompsoni* JORDAN, Man. Vert. 297, 1876.

*Ichthyobus thompsoni* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49, 1876.

*Carpiodes thompsoni* JORDAN & COPELAND, Check List, 158, 1876.

*Carpiodes thompsonii* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.

*Carpiodes thompsoni* JORDAN, Man. Vert. ed. 2d, 322, 1878.

HABITAT.—Great Lake region; abundant.

This species occurs in more or less abundance throughout the Great Lake region. It is the shortest and most arched of all the species. Its dorsal fin is about intermediate between that of *velifer* and that of *carpio*. I have examined very many specimens of this species, and I find little variation among them. This fish reaches a length of something over a foot, and is sold by the Lake fishermen as "Carp".

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
11040	Sandusky, Ohio.....	J. W. Milner.
11127	.....do.....	Do.
11128	.....do.....	Do.
11130	.....do.....	Do.
11131	.....do.....	Do.
11132	.....do.....	Do.

#### 48. CARPIODES CYPRINUS (*Le Sueur*) *Agassiz.*

*Eastern Carp Sucker. Nebraska Carp Sucker. Rio Grande Carp.*

1817—*Catostomus cyprinus* LE SUEUR, Journ. Ac. Nat. Sc. Phila. i, 91.

*Labco cyprinus* DEKAY, New York Fauna, part iv, Fishes, 194, 1842.

*Sclerognathus cyprinus* CUVIER & VALENCIENNES, Hist. Nat. des Poissons, xvii, 474, 1844.

*Sclerognathus cyprinus* STORER, Synopsis, 427, 1846.

*Carpiodes cyprinus* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 191, 1855.

*Carpiodes cyprinus* GÜNTHER, Cat. Fishes Brit. Mus. vii, 24, 1868.

*Carpiodes cyprinus* COPE, Proc. Am. Philos. Soc. Phila. 484, 1870.

*Carpiodes cyprinus* JORDAN, Fishes of Ind. 202, 1875.

*Carpiodes cyprinus* JORDAN, Man. Vert. 297, 1876.

*Carpiodes cyprinus* UHLER & LUGGER, Fishes of Maryland, 140, 1876.

*Carpiodes cyprinus* JORDAN & COPELAND, Check List, 158, 1876.

*Carpiodes cyprinus* JORDAN, Man. Vert. ed. 2d, 323, 1878.

1854—*Carpiodes vacca* AGASSIZ, Am. Journ. Sci. Arts, 356.

1854—*Carpiodes tumidus* BAIRD & GIRARD, Proc. Phila. Ac. Nat. Sc. 23.

*Ictiobus tumidus* GIRARD, U. S. Mex. Bound. Surv. Ich. 34, pl. xxx, f. 1-4, 1859.

*Ichthyobus tumidus* JORDAN & COPELAND, Check List, 158, 1876.

1856—*Carpiodes damalis* GIRARD, Proc. Ac. Nat. Sc. Phila. 170.

*Carpiodes damalis* GIRARD, U. S. Pac. R. R. Expl. x, 218, pl. xlvi, f. 1-4, 1858.

*Carpiodes damalis* COPE, Proc. Ac. Nat. Sc. Phila. 85, 1865.

*Carpiodes damalis* JORDAN & COPELAND, Check List, 155, 1876.

1870—*Carpiodes grayi* COPE, Proc. Am. Philos. Soc. Phila. 482, 1870.

*Carpiodes grayi* JORDAN & COPELAND, Check List, 158, 1876.

*Carpiodes grayi* COPE & YARROW, Wheeler's Expl. W. 100th Mer. v, Zool. 681, 1876.

HABITAT.—New England to Alabama; thence to Mexico and north to the Upper Missouri.

I have elsewhere already united the nominal species *grayi* and *tumidus*, for the following reasons:—Girard's "*Ictiobus tumidus*" is certainly a *Carpiodes*, as is plainly shown by the published figure, the mouth being represented as small and inferior, beneath the projecting snout. I have numerous young specimens of a *Carpiodes* from the Rio Grande, at Brownsville, Texas, the original locality of *Ictiobus tumidus*. But my specimens do not disagree in any important respect from *Carpiodes grayi*, from the same river, nor am I able, on examination of authentic specimens of the latter species, to point out any differences between them and my Brownsville specimens. Therefore, if *tumidus* and *grayi* are really different, the differences have escaped my notice. It is of course possible that my Brownsville specimens, although from the original locality of *tumidus*, may not be that species; but, as the types of *tumidus* have been lost, I do not see how the question can ever be settled.

I am furthermore unable to separate *tumidus* as thus characterized from *damalis* Grd., and the close relationship existing between *damalis* and *cyprinus* has already been noticed by Professor Cope. As I now believe that *cyprinus*, *tumidus*, *damalis*, and *grayi* were all based on members of a single widely diffused species, I unite them in the above synonymy.

This species is the common Carp Sucker of Pennsylvania and the

Middle States. I have no specimens referable to this species from the Great Lakes, nor from the Mississippi or the Ohio. If *cyprinus*, *tumidus*, and *damalis* are identical, however, one of two things must be true. Either *C. cyprinus* really inhabits the whole Mississippi Valley, but has been overlooked or confounded with others, or else we have a very curious anomaly in the distribution of the species, it being an inhabitant of waters of two widely separated areas, having little in common. The former supposition seems the most probable, and I accordingly look for specimens of *C. cyprinus* in the Mississippi Valley.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
—	Round Lake, Montgomery, Alabama .....	Kumlien & Bean.
179	Fort Pierre, Nebr. (types of <i>C. damalis</i> ).....	Dr. Evans.
3550	Republican River .....	Wood & Hammond.
13012	Rio Grande, New Mexico ( <i>grayi</i> ) .....	Dr. O. Loew.
15891	Nebraska .....	
20109	"U. S. Mex. Boundary Survey" (types of <i>tumidus</i> ?).	
—	Brownsville, Tex.....	

#### 49. CARPIODES CARPIO (*Rafinesque*) *Jordan*.

*Big Carp Sucker. Olive Carp Sucker.*

1820—*Catostomus carpio* RAFINESQUE, Ich. Ob. 56.

*Carpiodes carpio* JORDAN, Bull. Buffalo Soc. Nat. Hist. 95, 1876.

*Carpiodes carpio* JORDAN, Man. Vert. 297, 1876.

*Ichthyobus carpio* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49, 1876.

*Carpiodes carpio* JORDAN & COPELAND, Check List, 158, 1876.

*Carpiodes carpio* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.

*Carpiodes carpio* JORDAN, Proc. Ac. Nat. Sc. Phila. 72, 1877.

*Carpiodes carpio* JORDAN, Bull. U. S. Nat. Mus. ix, 34, 1877.

*Carpiodes carpio* JORDAN, Man. Vert. ed. 2d, 322, 1878.

1870—*Carpiodes nummifer* COPE, Proc. Am. Philos. Soc. Phila. 484.

HABITAT.—Mississippi Valley. Abundant in the Ohio River.

This is the most abundant species of its genus in the Ohio River and its tributaries. It is the largest species, the most elongate, and has the lowest fin-rays and the smallest head. The peculiar enlargement of the anterior rays of the dorsal I have found to be an excellent diagnostic character. This species has been well described by Professor Cope under the name of *C. nummifer*. There can, however, be but little

doubt that Rafinesque had the same fish in mind as his *C. carpio*, and I have accordingly adopted the latter name.

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
12291	Ohio River, Cincinnati .....	J. W. Milner.
12292	.....do .....	Do.

### Genus BUBALICHTHYS *Agassiz.*

*Bubalichthys* AGASSIZ, Am. Journ. Sci. Arts, 1855, 192.

*Sclerognathus* GÜNTHER, Cat. Fishes Brit. Mus. vii, p. 22, 1868.

*Catostomus* et *Carpiodes* sp. of authors.

Type, *Carpiodes urus* Agassiz.

Etymology, βούβαλος, buffalo; ἰχθῦς, fish.

Head moderate or rather large, deep and thick, its superior outline rapidly rising, its length about 4 in that of the body: eye moderate, median or rather anterior in position; suborbital bones comparatively narrow; fontanelle always present and widely open.

Mouth moderate or small, more or less inferior, the mandible short, little oblique, or typically quite horizontal, the mandible less than one-third the length of the head, the premaxillaries in the closed mouth below the level of the lower part of the orbit; lips rather thin, thicker than in *Ichthyobus*, the upper protractile, narrow, plicate, the plicæ sometimes broken up into granules; lower lip comparatively full (for a Buffalo-fish), faintly plicate, the plicæ broken up into granules, the lower lip having the general  $\Pi$ -shaped form seen in *Carpiodes*; jaws without cartilaginous sheath; muciferous system well developed; opercular apparatus well developed, but less so than in *Ichthyobus*, the operculum strongly rugose; isthmus moderate; pharyngeal bones triangular, with large teeth, which increase in size from above downwards; teeth compressed, their grinding edge blunt, slightly arched in the middle, and provided with a little cusp along the inner margin, which is hardly detached from the crown, and does not rise above the surface: gill-rakers of anterior arch slender and stiff above, growing shorter downwards.

Body ovate or oblong, the dorsal outline more or less arched, the sides of the body compressed, the ventral outline curved also, but to a less degree: scales very large, about equal over the body, their posterior

outlines somewhat serrate; lateral line well developed, nearly straight, with 35 to 42 scales, 12 to 14 in a cross-series from ventrals to dorsal; dorsal fin beginning near the middle of the body, somewhat in advance of the ventrals, its anterior rays elevated, their height about equal to half the base of the fin, the number of rays in the dorsal fin ranging from 25 to 32; caudal fin well forked, the lobes about equal, not falcate; anal fin comparatively long and rather low, of 8 or 9 developed rays; ventrals moderate, 10-rayed; pectorals rather short: sexual peculiarities, if any, unknown: coloration dull dark brown, nearly plain, not silvery; fins olivaceous or more or less dusky.

Air-bladder with two chambers.

Size quite large.

In general appearance, the species of *Bubalichthys* bear a considerable resemblance to those of *Carpiodes*. The form is, however, coarser than that of any *Carpiodes*, the dorsal fin is lower, and the coloration is darker and duller. The species reach a larger size than do those of *Carpiodes*, but whether larger or not than the species of *Ichthyobus* I am unable to say. In external appearance, *Bubalichthys* is intermediate between *Carpiodes* and *Ichthyobus*, the one species, *bubalus*, resembling *Carpiodes* most, the other, *urus*, being most like *Ichthyobus*.

Our knowledge of the species of this genus is very incomplete. Many species were named and indicated by Professor Agassiz, but with such fragmentary descriptions that not a single one of them is certainly known by any one. I have, however, been able to identify in specimens from Quincy, Ill., the fishes termed by him *B. bubalus* and *B. niger*, the small-mouthed and the large-mouthed Buffalo. Assuming these two well-separated species as a basis, I have compared with them numerous Buffalo-fishes from various localities, and in all cases I have found them identical with either the one or the other. I have therefore adopted the hypothesis, possible, and perhaps probable, that all of the nominal species of Professor Agassiz were based on the one or the other of these two forms. As to this, I may say that the sole basis of some of these nominal species was the difference in locality. From what we know of the range of other species of *Catostomidae*, there is nothing antecedently improbable in the same fish being found in the Wabash and Mobile Rivers, or in the Tennessee and Osage. *Myxostoma macrolepidotum*, *Erimyzon oblongus*, *Minytrema melanops*, *Catostomus teres*, and others are known to occur in all four of those streams. The questions of locality may, I think, be safely eliminated from the discussion. The

descriptions published by Professor Agassiz are almost worthless for the distinction of species. It has accordingly seemed best to me, as a temporary arrangement, at least until *more than two* species are shown to occur in our waters, or until some one is able to show from examination of Professor Agassiz's types what he really had in mind, to distribute his nominal species in the synonymy of the two which we know. I have accordingly considered each of Agassiz's species and made it identical with either the small-mouthed or the large-mouthed species, as the description seemed to indicate. A third species, from Central America, which I suppose belongs to this genus, is added from Dr. Günther's description.

*Generic Characterizations.*

BUBALICHTHYS Agassiz, 1855.—“At the time I vindicated the propriety of restoring some of the genera established by Rafinesque among Cyprinoids, I did not suspect that the genus *Carpiodes*, as I then represented it, still contained two distinct types, though I had noticed that some of the species had the anterior margin of their dorsal greatly prolonged, whilst in others it hardly rises above the middle and posterior of that fin. Having since examined the pharyngeals of all the species of this tribe which I have been able to secure from different parts of the country, I find that those with a high dorsal which constitute the genus *Carpiodes*, have, in addition, very thin flat pharyngeals with extremely minute teeth, whilst those with a low dorsal have triangular pharyngeals with larger teeth, increasing gradually in size and thickness, from the upper margin of the bones towards the symphysis. The difference in form of these bones arises from the circumstance that the slight ridge upon the outer surface of the arch in *Carpiodes* is transformed in this second type into a prominent edge, dividing the outer surface of the arch into a posterior and anterior plane, meeting under an acute angle. This structural homology is satisfactorily traced by the difference of the external appearance of these two planes, the posterior one being full as the posterior half of the flat outer surface of the arch in *Carpiodes*, whilst the anterior plane is coarsely porous, indeed studded with deep pits analogous to the porous character of the anterior half of the outer surface of that bone in *Carpiodes*. The teeth themselves are compressed; their grinding edge is rather blunt, slightly raised in the middle, and provided with a little cusp along the inner margin, which is hardly detached from the crown, and does not rise above its surface, as in *Carpiodes*, *Ichthyobus* and *Cycleptus*.

“In this genus the bulk of the body is not placed so far forwards as in *Carpiodes*, the greatest height being between head and tail. The upper outline of the body is less strongly arched in advance of the dorsal; the head is longer than high, and the snout not more prominent than the mouth. The mouth opens obliquely downwards and forwards, the lower jaw being nearly as long as the upper. The lips are small and granulated. The anterior rays of the dorsal are not separately prolonged beyond the rest of the fin, though its anterior margin is higher than its middle and posterior portion. The lower fins are as in *Carpiodes*.

“The scales have many narrow radiating furrows upon the anterior field, none across the lateral fields, and few upon the posterior fields, converging to the centre of radia-

tion, to which the tubes of the lateral line extend also. For this new genus I propose the name of *Bubalichthys*, intending to recall the name of Buffalo fish, commonly applied to this species. To this genus belong the species I have described as *Carpiodes urus* from the Tennessee River, *C. taurus* from Mobile River, and *C. vitulus* from the Wabash, and also the *Catostomus niger* of Rafinesque and *Catostomus bubalus* of Dr. Kirtland from the Ohio, but not *C. bubalus* Rafinesque, which is the type of the genus *Ichthyobus* described in the following paragraph. I have another new species from the Osage River, sent me by Mr. George Stolley. This shows this type to be widely distributed in our western waters, but thus far it has not been found in the Atlantic states. I have some doubts respecting the nomenclature of these species which are rather difficult to solve. It will be seen upon reference to Rafinesque's *Ichthyologia Obiensis*, p. 55 and 56, that he mentions two species of his subgenus *Ichthyobus*, one of which he calls *C. bubalus*, and the other *C. niger*; the second he has not seen himself, but describes it on the authority of Mr. Audubon as 'entirely similar to the common Buffalo fish,' his *C. bubalus*, but 'larger, weighing upwards of fifty pounds.' Dr. Kirtland, on the other hand, describes the *C. bubalus* as the largest species found in the western waters, and adds that the young is nearly elliptical in its outline and is often sold in the market as a distinct species under the name of Buffalo Perch. If there was only one species of Buffalo in those waters the case would be very simple, and the *Catostomus bubalus* and *niger* of Rafinesque, and *C. bubalus* of Dr. Kirtland, should simply be considered as synonymous, but Dr. Rauch of Burlington has sent me fine specimens of this Buffalo Perch, to which the remark of Dr. Kirtland, 'elliptical in its outline,' perfectly applies, and I find that it not only differs specifically but even generically from the broader, high backed, common Buffalo, and being the smaller species, I take it to be Rafinesque's *C. bubalus*, the type of his genus *Ichthyobus*, which is more fully characterised below, whilst the larger species, Rafinesque's *C. niger*, can be no other than Dr. Kirtland's *C. bubalus*, 'the largest species of the western waters.' It seems therefore hardly avoidable to retain the name of *C. niger* or rather *Bubalichthys niger* for the common Buffalo, though Rafinesque, who first named the fish, never saw it, or if he saw it mistook it for his own *bubalus*, and though Dr. Kirtland, who correctly describes and figures it, names it *C. bubalus*, for such is the natural result to which the history of the successive steps in our investigation of these fishes lead. But our difficulties here are not yet at an end. Among the splendid collections I received from Dr. Rauch, I found two perfectly distinct species of *Bubalichthys*, one with a large mouth, and the other with a small mouth, and one of *Ichthyobus*, living together in the Mississippi River, in the neighborhood of Burlington, Iowa; and the next question, probably never to be solved, will be, if they all three occur also in the Ohio, whether Rafinesque's *C. niger* was the big mouthed or the small mouthed *Bubalichthys*. Judging from the figure given by Dr. Kirtland in the *Boston Journal of Natural History*, vol. v, pl. fig. 2, I believe his *C. bubalus* to be the small mouthed species. I myself have, however, seen only one specimen of the big mouthed species from the Ohio, and that in rather an indifferent state of preservation; for which I am indebted to Prof. Baird, and none of the small mouthed species. Should, however, all three, as is possible, occur in the Ohio as well as the Mississippi, to avoid introducing new names, I will call the big mouthed species *B. niger*, preserving for it Rafinesque's specific name,—the small

mouthed, *B. bubalus*, retaining for it the name which Dr. Kirtland has given it, even though the species of *Ichthyobus* must bear the same specific name, being that originally applied by Rafinesque. It may be that either my *B. vitulus* or my *B. urus* is identical with Dr. Kirtland's *C. bubalus*, but until I can obtain original specimens of this species, this point must remain undecided, as it is impossible for mere descriptions to institute a sufficiently minute comparison. The specimens from Osage River I shall call *B. bonasus*.

"Compared with one another, these species differ as follows: *B. niger*, (the big-mouthed Buffalo) differs from *B. bubalus* (the small-mouthed Buffalo) by its larger mouth, opening more forwards; its more elongated body, the first rays of the dorsal rising immediately above the base of the ventrals, and its anterior lobe being broader, and the anal fin not emarginated; *B. bonasus* differs from *B. bubalus* and from *B. niger* in having the mouth larger than the first and smaller than the second, and from *B. bubalus* by its less emarginated dorsal, which renders its larger lobe broader, anal fin not emarginated, opercle larger. A farther comparison with the Southern species could only be satisfactory, if accompanied by accurate figures."—(AGASSIZ, *Am. Journ. Sc. Arts*, 1855, p. 192.)

SCLEROGNATHUS Günther, 1863.—"Scales of moderate or rather large size. Lateral line running along the middle of the tail. Dorsal fin much elongate, with about 30 or more rays, none of which are spinous. Anal fin short. Mouth small, inferior (*Bubalichthys*) or subterminal (*Sclerognathus*), with the lips more or less thickened. Barbels none. Gill-rakers long, stiff in the upper two-thirds of the first branchial arch, modified into low membranaceous transverse folds in the lower third. Pseudobranchiæ. Pharyngeal bones sickle-shaped, armed with a comb-like series of numerous, compressed teeth, increasing in size downwards."—(GÜNTHER, *Cat. Fishes Brit. Mus.* vii, 22, 1863.)

BUBALICHTHYS Cope & Jordan, 1877.—"Body oblong oval, compressed; dorsal elongate, elevated in front, of 20 or more rays; fontanelle present; pharyngeal bones strong, the teeth comparatively coarse and large, increasing in size downwards; mouth inferior."—(JORDAN, *Proc. Ac. Nat. Sc. Phila.* 1877, p. 82.)

## ANALYSIS OF SPECIES OF BUBALICHTHYS.

\* Body considerably elevated and compressed above; the dorsal region subcarinate; belly thicker; depth  $2\frac{1}{2}$  to  $2\frac{3}{4}$  in length; axis of body above the ventrals below the lateral line and nearly twice as far from the back as from the belly: head moderate, triangular in outline when viewed from the side, 4 in length: eye equal to snout, 4 to 5 in length of head, much larger than in *B. urus*: mouth quite small, notably smaller and more inferior than in *B. urus*: mandible about equal to eye: dorsal fin elevated in front and rapidly declined, the highest ray reaching much beyond the middle of the fin, the seventh ray about half the length of the third or longest; anal rays rapidly shortened behind, the middle rays much shorter than the first long ones: scales 8-39-6; dorsal, 29; anal, 10; ventrals, 10: coloration paler, the lower fins slightly dusky.....BUBALUS, 50.

\*\* Body much less elevated and less compressed than in the preceding, the back not at all carinated; axis of body above ventrals about at the lateral line, and but very little farther from the dorsal outline than from the ventral; depth 3 to  $3\frac{1}{4}$  in length: head very stout, strongly transversely convex, thicker, larger, and less pointed

than in the next, about 4 in length: eye about equal to snout,  $5\frac{1}{2}$  in head, much smaller than in *B. bubalus*: mouth large, considerably oblique, opening well forwards: mandible longer than eye: dorsal fin lower and less rapidly depressed than in the next, the longest ray scarcely half the length of the base of the fin; anal fin rounded, its rays not rapidly shortened, the middle ones not much shorter than the longest: colors very dark; fins all black: scales 8-41-7; dorsal, 30; anal, 10.....URUS, 51.

\*\*\* Mouth small, inferior, slightly corrugated: depth  $3\frac{1}{2}$  to  $3\frac{1}{4}$  in length; head 4 to  $4\frac{1}{2}$ , not much longer than high: eye rather small, one-fifth of the length of the head and  $\frac{2}{3}$  that of the snout: suborbitals narrow. Anterior rays not much produced, shorter than the head; caudal forked. Origin of ventral vertically below the fourth dorsal ray. Pectoral fin not extending to ventrals. There are five longitudinal series of scales between the lateral line and the root of the ventral. Coloration uniform. Scales 7-33-7; dorsal 29; anal 10.....MERIDIONALIS, 52.

### 50. BUBALICHTHYS BUBALUS *Agassiz.*

*Buffalo-fish. Small-mouthed Buffalo. High-backed Buffalo.*

- 1838—*Catostomus bubalus* KIRTLAND, Rept. Zool. Ohio, 168. (Not of Rafinesque.)  
*Catostomus bubalus* KIRTLAND, Boston Journ. Nat. Hist. v, 266, 1845.  
*Catostomus bubalus* STORER, Synopsis, 424, 1846.  
*Bubalichthys bubalus* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 195, 1855.  
*Bubalichthys bubalus* JORDAN, Fishes of Ind., 222, 1875.  
*Bubalichthys bubalus* JORDAN & COPELAND, Check List, 158, 1876.  
*Bubalichthys bubalus* JORDAN, Proc. Ac. Nat. Sc. Phila. 74, 1877.  
*Bubalichthys bubalus* JORDAN & GILBERT, in Klippart's Rept. 53, 1877.
- 1854—?? *Carpiodes taurus* AGASSIZ, Am. Journ. Sci. Arts, 335. (Not identifiable.)  
 ?? *Bubalichthys taurus* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 193, 1855.  
 ?? *Bubalichthys taurus* JORDAN & COPELAND, Check List, 158, 1876.
- 1854—?? *Carpiodes vitulus* AGASSIZ, Am. Journ. Sci. Arts, 356. (Not identifiable.)  
 ?? *Bubalichthys vitulus* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 193, 1855.  
 ?? *Bubalichthys vitulus* JORDAN & COPELAND, Check List, 158, 1876.  
 ?? *Bubalichthys vitulus* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.
- 1868—*Sclerognathus urus* GÜNTHER, Cat. Fishes Brit. Mus. vii, 22.
- 1876—*Ithyobus cyaneellus* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 49.  
*Ithyobus cyaneellus* JORDAN & COPELAND, Check List, 158, 1876.  
*Ithyobus cyaneellus* JORDAN, Proc. Ac. Nat. Sc. Phila. 73, 1877.  
*Ithyobus cyaneellus* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.  
*Ithyobus cyaneellus* JORDAN, Man. Vert. ed. 2d, 323, 1878.
- 1877—*Bubalichthys altus* NELSON, MSS.  
*Bubalichthys altus* JORDAN, Proc. Ac. Nat. Sc. Phila. 73, 1877.  
*Bubalichthys altus* JORDAN, Man. Vert. ed. 2d, 324, 1878.
- 1877—*Bubalichthys bubalinus* JORDAN, Bull. U. S. Nat. Mus. ix, 50.  
*Bubalichthys bubalinus* JORDAN, Man. Vert. ed. 2d, 325, 1878.

HABITAT.—Mississippi Valley; abundant in all the larger streams.

This is probably the most generally distributed of the various species known popularly as Buffalo-fish. The question as to its proper nomenclature is even more complicated than that of the next species. It may be that this is the true *bubalus* of Rafinesque, as supposed by Dr. Kirtland. But as that species was the type of the genus *Ictiobus*, the identification of Rafinesque's species with the present one would lead to changes in nomenclature far from desirable. The name *Ichthyobus* would then belong to *Bubalichthys* and the genus *Ichthyobus* would receive a new name. As this can never be proven, it is best to consider Agassiz's identification as correct and that of Dr. Kirtland wrong. The first mention of this species was that of Dr. Kirtland as *Catostomus bubalus*. The name *bubalus*, however, was given through an erroneous identification, and must be passed over. Next come Agassiz's names *taurus* and *vitulus*, both possibly belonging here, but just as likely belonging to *urus*. Both of them, from the exasperating insufficiency and irrelevance of the descriptions, are practically unidentifiable. Next is Agassiz's *bubalus*, noticed below. The next name in order is that of *Ichthyobus cyaneus* Nelson, which was based on this species, as I have ascertained by examination of his type. This is the first tenable name *certainly* belonging to this species, unless we adopt the name *bubalus*. Next comes Nelson's *altus*. A specimen answering Nelson's description in all respects, and as evidently belonging to the species now under consideration, is at present before me. It is a fine *adult* example. Lastly comes my own *bubalinus*, intended merely as a substitute for the name "*bubalus*", not then considered tenable as the specific name of this species, having been given to it originally by an error in identification. The adoption of the name *bubalus* by Agassiz after the knowledge of this error may, however, be considered as a proposal of a new name. The original descriptions of *taurus*, *vitulus*, *cyaneus*, and *altus* are here subjoined.

*Carpiodes taurus* Agassiz, Am. Journ. Sci. Arts, 1855, p. 355.—“From Mobile River, Alabama. The form of the body is intermediate between that of *C. Cyprinus* and *C. Urus*. The gill-cover has the same form as in *C. Urus*, but it is larger and more strongly arched behind. The hind margin of the scales is waving, owing to a somewhat prominent middle angle. The anterior rays of the dorsal equal in length two-thirds of that of the base of the fin. Anal not lunate behind. The ventrals do not reach to the anal opening. Caudal not so deeply furcate as in *C. Cyprinus*.”

*Carpiodes vitulus* Agassiz, Am. Journ. Sc. Arts, 1855, p. 356.—“From the Wabash River, Indiana. This seems to be a smaller species than the preceding ones. The form of the body resembles that of *C. Taurus*, but the eyes are smaller; the opercle is more broadly rounded behind; the subopercle has its posterior and free border regularly arched above and below, and not emarginate as in *C. Taurus*. The direction of the numerous water-tubes on the head and cheeks also differ. The upper and lower border of the scales are nearly straight. The dorsal does not extend quite so far forward. I am indebted to Col. Richard Owen of New Harmony for this species.”

*Ichthyobus cyanellus* Nelson, Bull. Ills. Mus. Nat. Hist. i, 1877, p. 49.—“Blue Buffalo. A number of specimens of this species are in the state collection, from the Illinois river, and in Prof. Jordan’s collection, from the Mississippi at St. Louis. The following is the description, taken from several specimens, measuring from 8 to  $9\frac{1}{4}$  inches in length:—

“Head about  $3\frac{1}{3}$  in length. Depth  $2\frac{1}{3}$  to 5-6. Eye  $4\frac{1}{3}$  to  $5\frac{1}{2}$  in head. Dorsal I, 30. Anal I, 8. Ventrals 10. Lat. 1. 38. Longitudinal rows 7-5 to 7-6. Body compressed, high. Anteriorly broad, compressed behind. Longest ray reaching 18th ray. Pectorals shorter than ventrals, both shorter than head. Anal scarcely reaching caudal; head very short, high and thick; its thickness  $\frac{3}{4}$  length, depth  $1\frac{1}{2}$  in length. Mouth quite small, oblique, and overlapped by a slightly projecting snout. Mandible short, 4 in head. Opercle becoming wrinkled with age. Head small, short and thick; muzzle obtuse, conic, not twice the length of eye. Anterior ray of dorsal, in type from Illinois river, slightly nearer snout than base of caudal. In specimens from St. Louis the dorsal is about equidistant. Color above, light steel blue in adults, becoming lighter below. Young lighter with distinct stripes along the rows of scales. Although the species is described from specimens but nine inches long, when full grown it undoubtedly reaches similar dimensions to its congeners.”

*Bubalichthys altus* Nelson, MSS.; Proc. Acad. Nat. Sc. Phila. 1877, 74.—“This specimen is very deep and much compressed. The back is much arched and the profile descends steeply in front to end of snout, not forming an angle with it as in many species of *Ichthyobus*.

“Depth of body,  $2\frac{1}{2}$  in length; head, 4 in length; greatest thickness of body,  $1\frac{2}{3}$  in length of head; depth of head,  $1\frac{1}{2}$  in its length; width,  $1\frac{1}{2}$  in length. Eye,  $5\frac{1}{2}$  in head,  $2\frac{1}{2}$  in interorbital space, which is but little rounded.

“Lateral line perfectly straight from upper edge of opercle to caudal.

“Scales, 8–35–5. Dorsal I. 25; A. I. 9.

“Color in spirits, dull yellowish olive; fins dusky.

“Type specimen 12 inches long, in Ills. State Museum, from Cairo, Illinois.”

### 51. BUBALICHTHYS URUS *Agassiz*.

*Big-mouthed Buffalo. Black Buffalo. Mougrel Buffalo.*

1818—?? *Ambodon niger* RAFINESQUE, Journal de Physique Phila. 421. (Entirely unrecognizable.)

?? *Catostomus niger* RAFINESQUE, Ichth. Oh. 56, 1820. (Unrecognizable; more likely *Cycleptus elongatus*.)

*Bubalichthys niger* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 195, 1855.

*Bubalichthys niger* JORDAN, Fishes of Ind. 222, 1875.

*Bubalichthys niger* JORDAN, Bull. Buffalo Soc. Nat. Hist. 95, 1876.

*Bubalichthys niger* JORDAN, Man. Vert. 298, 1876.

*Bubalichthys niger* NELSON, Bull. No. 1, Ills. Mus. Nat. Hist. 50, 1876.

*Bubalichthys niger* JORDAN & COPELAND, Check List, 158, 1876.

*Bubalichthys niger* JORDAN, Proc. Ac. Nat. Sc. Phila. 75, 1877.

*Bubalichthys niger* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.

*Bubalichthys niger* JORDAN, Bull. U. S. Nat. Mus. ix, 34, 1877.

*Bubalichthys niger* JORDAN, Man. Vert. ed. 2d, 323.

1854—*Carpiodes urus* AGASSIZ, Am. Journ. Sc. Arts, 355.

*Bubalichthys urus* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 193, 1855.

*Bubalichthys urus* PUTNAM, Bull. Mus. Comp. Zool. 10, 1863.

*Bubalichthys urus* JORDAN, Fishes of Ind. 222, 1875.

*Bubalichthys urus* JORDAN & COPELAND, Check List, 158, 1876.

1855—*Bubalichthys bonasus* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 195.

*Bubalichthys bonasus* JORDAN & COPELAND, Check List, 158, 1876.

HABITAT.—Mississippi Valley, in the larger streams.

This is an abundant species in the Mississippi and its larger tributaries. It is very distinct from the preceding, almost intermediate between *Bubalichthys bubalus* and *Ichthyobus bubalus*. It may indeed be necessary to unite these two genera on account of this species.

The question of the name which should be borne by this species is a very difficult one. Inasmuch as Rafinesque's *C. niger* was known to him only through the accounts of Mr. Audubon, a gentleman known to have played several practical jokes on the too credulous naturalist, and to have led him thereby to describe and name several impossible animals, and inasmuch as no real description whatever is given by Rafinesque, it seems to me that the name *niger* can be used only on the authority of Agassiz, and not on that of Rafinesque. That being the case, the name

*urus* of Agassiz, which unquestionably belongs to this species, has a year's priority over *niger*, and is really the first tenable name applied to any species of *Bubalichthys*. The original account given by Rafinesque of his *Catostomus niger* and that by Professor Agassiz of his *Bubalichthys urus* I here append. Agassiz's descriptions of *B. niger* and *B. bonasus* have been previously given under the head of the genus.

*Catostomus (Ictiobus) niger* Raf. Ich. Oh. p. 56.—“Entirely black; lateral line straight; I have not seen this fish. Mr. Audubon describes it as a peculiar species found in the Mississippi and the lower part of the Ohio, being entirely similar to the common Buffalo-fish, but larger, weighing upwards of fifty pounds, and living in separate schools.”

*Carpiodes urus* Agassiz, Am. Journ. Sci. Arts, 1854, p. 355.—“From the Tennessee River. It grows very large, weighing occasionally from 30 to 40 pounds. The body in this species is not so high as in *C. cyprinus*, nor is it so compressed above; the scales are also not so high, but more angular behind, and the anterior portion of the dorsal is not so elongated. The gill-cover is larger, and the distance from the hind border of the eye to the inferior angle of the subopercle near the base of the pectorals and the distance from the same point to the superior and posterior angle of the opercle, are nearly equal. In *C. cyprinus* the distances differ by nearly one third. The subopercle is not triangular, but its hind border is nearly regularly arched from the upper angle to the posterior angle of the interopercle. The anal has its posterior margin full and not lunate; the caudal is not so deeply furcate as in *C. cyprinus*. The ventrals do not reach the anal. All fins are of a dark color. I am indebted to Dr. Newman for this species.”

I found no specimens of *Bubalichthys urus* in the collections of the United States National Museum.

## 52. BUBALICHTHYS MERIDIONALIS (Günther) Jordan.

*Central American Buffalo.*

1868—*Scelrognathus meridionalis* GÜNTHER, Trans. Zool. Soc. p. —.

*Scelrognathus meridionalis* GÜNTHER, Cat. Fishes Brit. Mus. vii, 23, 1868.

HABITAT.—Rio Usumacinta, Guatemala.

I know nothing of this species except from Günther's description. From its remote locality, it is probably distinct, but the description shows no especial difference from *B. bubalus*, unless it be that the body is slenderer. The following is Dr. Günther's account:—

“D. 29-30. A. 10; lat. l. 38, l. transv.  $7\frac{1}{2}$ - $7\frac{1}{2}$ . Mouth small, inferior,

slightly corrugated. The height of the body is contained thrice and one third or thrice and one fourth in the total length (without caudal), the length of the head four times or four times and a half; head not much longer than high. Eye rather small, one fifth of the length of the head and two thirds of that of the snout; suborbitals narrow. The anterior dorsal rays are not much produced, being shorter than the head. Caudal fin forked. The origin of the ventral fin is vertically below the fourth dorsal ray. Pectoral fin not extending to the ventral. There are five longitudinal series of scales between the lateral line and the root of the ventral. Coloration uniform. Pharyngeal teeth very numerous and small, increasing somewhat in size downwards.

“Rio Usumacinta (Guatemala).”

### Genus ICHTHYOBUS *Rafinesque*.

*Ambلودον* RAFINESQUE, Journal de Physique, de Chymie et d'Histoire Naturelle, Paris, 421, 1819. (Part.)

*Ictiobus* RAFINESQUE, Ich. Ob. 1820, p. 55. (As subgenus of *Catostomus*.)

*Ichthyobus* AGASSIZ, Am. Journ. Sci. Arts, 1855, p. 195.

Type, *Ambلودον bubalus* Rafinesque.

Etymology,  $\iota\chi\theta\upsilon\varsigma$ , fish;  $\beta\omicron\upsilon\varsigma$ , bull or buffalo; *i. e.*, buffalo-fish.

Head very large and strong, wide and deep, its length  $3\frac{1}{2}$  to  $3\frac{3}{4}$  in that of the body, its upper surface broad and depressed; eye moderate, wholly anterior in position, the middle of the head being entirely behind it; suborbital bones proportionately narrow; fontanelle large, well open; opercular apparatus largely developed, the suboperculum broad, the operculum broad, strongly furrowed.

Mouth very large for a Sucker, terminal, protractile forwards, the middle of the premaxillaries rather above the line of the middle of the eye, the posterior edge of the maxillary extending about to the line of the nostrils; mandible very strong, oblique, placed at an angle of 45 degrees or more when the mouth is closed, its posterior end extending to beyond opposite the front of the eye, its length a little less than one-third that of the head. Lips very little developed, the upper narrow and smooth, scarcely appreciable, the lower narrow, rather full on the sides, but reduced to a narrow rim in front, entirely destitute both of papillæ and plicæ; jaws without cartilaginous sheath; muciferous system of head well developed; isthmus narrow; pharyngeal bones in form intermediate between those of *Curpiodes* and those of *Bubalichthys*, the outer surface of the arch standing outwards, and presenting a porous

outer margin. The peduncle of the symphysis is much longer proportionally, and more pointed than in *Carpiodes* and *Bubalichthys*. The teeth are very numerous, small, thin and compressed in *Carpiodes*, but the lower ones are gradually larger than the upper ones. Their inner edge is slanting outwards, and not uniformly arched as in *Bubalichthys*, or truncate as in *Cycleptus*, the innermost margin rising somewhat in the shape of a projecting cusp. Gill-rakers of anterior arch long and slender above, becoming shorter downwards.

Body heavy, robust, not especially arched above nor greatly compressed, the form somewhat elliptical, the depth  $2\frac{1}{2}$  to  $3\frac{1}{2}$  in the length of the body.

Scales large, thick, nearly equal over the body, their posterior edges somewhat serrate, the lateral line well developed, but not as distinct as in *Carpiodes*, slightly decurved anteriorly, the number of scales in its course 36 to 42; 13 to 15 in a transverse series from dorsal to ventrals.

Dorsal fin with an elongate basis, its number of rays 25 to 30, the anterior rays somewhat elevated, their length about half that of the base of the fin; caudal not much forked; anal fin not much elevated, its rays about 9 in number; pectorals and ventrals moderate, the latter with about 10 rays.

Sexual peculiarities, if any, unknown. Coloration dark, not silvery, above dusky olive; lower fins more or less black.

Air-bladder with two chambers.

Size very large.

The claim of this group to generic rank has been questioned by Professor Cope and others. The differences in the pharyngeal teeth are perhaps hardly sufficient to distinguish it from *Carpiodes*, but at present I am inclined to think that the great development of the mandible, which forms a large and terminal mouth, amply sufficient for generic distinction. The relations of the group to *Bubalichthys* are doubtless, in reality, closer. *Ichthyobus* bears much the same relation to *Bubalichthys* that *Chasmistes* does to *Catostomus*, and, so far as the mouth is concerned, but in a greater degree, that *Erimyzon* bears to *Minytrema* and *Placopharynx* to *Myxostoma*. The head of *Ichthyobus* is much larger and stouter, and the whole body more robust and less compressed than in *Carpiodes*. I know from autopsy but a single species of *Ichthyobus*. It has, however, been described under several different names. So far as is known, the genus is confined to the valley of the Mississippi, no species having been recorded from the Great Lakes, or from any streams

east of the Alleghanies. No members of the suborders *Cycleptinæ* and *Bubalichthyinæ* are known from the United States west of the basin of the Rio Grande.

The typical species was first described under the name of *Amblodon*. The genus *Amblodon* of Rafinesque, 1819, is based on the same species as his *Ictiobus* of 1820. The name *Amblodon*, however, was given in allusion to the pharyngeal teeth of *Haploidonotus grunniens*, popularly supposed to be the teeth of the Buffalo-fish, the presence of which teeth was supposed to distinguish *Amblodon* from *Catostomus*. This error was afterwards discovered by Rafinesque, and the name *Amblodon* transferred to the Sciaenoid fish. As *Amblodon* of Rafinesque included the present genera *Haploidonotus* and *Ichthyobus*, erroneously confounded, and as on the discovery of this error its author restricted the name to *Haploidonotus*, I think that we are justified in retaining *Ichthyobus* instead of *Amblodon* for the genus of Catostomoids.

*Generic Characterizations.*

AMBLODON Rafinesque, 1819.—“16. AMBLODON. (*Abdominal*.) Différent du genre *Catostomus*. Machoire inférieure pavée de dents osseuses serrées arrondies, à couronne plate, inégales.—Les poissons de ce genre, qui abondent dans l’Ohio, le Missouri et le Mississippi, sont distinguées par le nom vulgaire de Buffalo-Fish (Poisson bouffle) et les François de la Louisiane les nomment Picoueau. Il y en a plusieurs espèces qui parviennent souvent à une très grosse taille. Les deux suivants habitent dans l’Ohio. 1. *A. bubalus*. Brun olivâtre pâle dessous, joues blanchâtres. D. 28, A. 12, P. 16, A. 9, C. 24. *L’A. niger* est entièrement noir; tous deux ont la ligne latérale droite, queue bilobée, tête tronquée, etc. Ils sont très-bons à manger.”—(RAFINESQUE, *Journal de Physique*, etc. p. 421.)

ICTIOBUS Rafinesque, 1820.—“Body nearly cylindrical. Dorsal fin elongated, abdominal fins with nine rays, tail bilobed, commonly equal.”—(RAFINESQUE, *Ichthyologia Ohiensis*, p. 55.)

ICHTHYOBUS Agassiz, 1855.—“In the form and position of the fins, as well as in the general outline of the body, this genus is very nearly related to *Bubalichthys*, but in the structure of the parts of the head, it is quite dissimilar. The mouth opens directly forwards, and is large and round. The lips are small, smooth and thin; the upper one is not thicker than the intermaxillary itself, and tapers to a narrow edge. At the symphysis of the lower jaw, which is larger than in any other genus of this group, the lower lip is hardly more than a thin membrane connecting its small lateral lobes.

“The eye is small, and the opercular pieces very large.

“The scales have many narrow radiating furrows upon the anterior field; none across the lateral fields, few upon the margin of the posterior field and these not extending to the centre of radiation. Tubes of the lateral line straight and simple, arising nearly in the middle of the posterior field.

“Pharyngeal bones are neither flat as in *Carpionides* nor triangular as in *Bubalichthys*,

but present an intermediate form; the outer surface of the arch standing outwards and presenting a porous outer margin. The peduncle of the symphysis is much longer proportionally and more pointed than in *Carpiodes* and *Bubalichthys*. The teeth are very numerous, small, thin and compressed as in *Carpiodes*, but the lower ones are gradually larger than the upper ones. Their inner edge is slanting outwards, and not uniformly arched as in *Bubalichthys* or truncate as in *Cycleptus*, the innermost margin rising somewhat in the shape of a projecting cusp."—(AGASSIZ, *Am. Journ. Sc. Arts*, 1855, p. 196.)

ICHTHYOBUS Cope & Jordan, 1877.—"Body oblong oval, compressed; dorsal elevated in front, of 20 or more rays; fontanelle present; pharyngeal bones narrow, with the teeth relatively thin and weak; mouth large, subterminal, protractile forwards."—(JORDAN, *Proc. Ac. Nat. Sc. Phila.* 1877, p. 82.)

## ANALYSIS OF SPECIES OF ICHTHYOBUS.

\* Body robust, moderately compressed, the outline somewhat elliptical, but the back rather more curved than the belly; depth  $2\frac{1}{2}$  to  $3\frac{1}{2}$  in length: head very large and thick,  $3\frac{1}{2}$  in length of body: opercular apparatus very strong, the operculum itself forming nearly half the length of the head: scales very large: developed rays of the dorsal 27 to 29; anal rays 9; ventrals 10: scales 7–37 to 41–6: coloration dull brownish-olive, not silvery; fins dusky: size very large, reaches a length of nearly three feet and a weight of 20 to 30 pounds..... BUBALUS, 53.

53. ICHTHYOBUS BUBALUS (*Rafinesque*) *Agassiz*.

*Red-mouth Buffalo Fish. Large-mouthed Buffalo.*

1818—*Ambiodon bubalus* RAFINESQUE, *Journal de Physique*, 421.

*Catostomus bubalus* RAFINESQUE, *Am. Month. Mag. and Crit. Rev.* 354, 1818.

*Catostomus bubalus* RAFINESQUE, *Ich. Ob.* 55, 1820.

*Ichthyobus bubalus* AGASSIZ, *Am. Journ. Sc. Arts*, 2d series, xix, 196, 1855.

*Ichthyobus bubalus* JORDAN, *Fishes of Ind.* 222, 1875.

*Ichthyobus bubalus* JORDAN, *Bull. Buffalo Soc. Nat. Hist.* 95, 1876.

*Ichthyobus bubalus* JORDAN, *Man. Vert.* 298, 1876.

*Ichthyobus bubalus* NELSON, *Bull. No. 1, Ills. Mus. Nat. Hist.* 49, 1876.

*Ichthyobus bubalus* JORDAN & COPELAND, *Check List*, 158, 1876.

*Ichthyobus bubalus* JORDAN & GILBERT, in *Klippart's Rept.* 53, 1876.

*Ichthyobus bubalus* JORDAN, *Proc. Ac. Nat. Sc. Phila.* 72, 1877.

*Ichthyobus bubalus* JORDAN, *Bull. U. S. Nat. Mus.* ix, 34, 1877.

*Ichthyobus bubalus* JORDAN, *Man. Vert.* ed. 2d, 322.

1844—*Sclerognathus cyprinella* CUVIER & VALENCIENNES, *Hist. Nat. des Poissons*, xvii, 477, pl. 518.

*Sclerognathus cyprinella* STORER, *Synopsis*, 428, 1846.

*Ichthyobus cyprinella* AGASSIZ, *Am. Journ. Sci. Arts*, 196, 1855.

*Sclerognathus cyprinella* GÜNTHER, *Cat. Fishes, Brit. Mus.* vii, 24, 1868.

*Ichthyobus cyprinella* JORDAN, *Man. Vert.* 298, 1876.

*Ichthyobus cyprinella* JORDAN & COPELAND, *Check List*, 158, 1876.

1855—*Ichthyobus rauchii* AGASSIZ, *Am. Journ. Sc. Arts*, 2d series, xix, 196.

*Ichthyobus rauchii* PUTNAM, Bull. Mus. Comp. Zool. 10, 1863.

*Ichthyobus rauchii* JORDAN & COPELAND, Check List, 158, 1876.

*Ichthyobus rauchii* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.

*Ichthyobus rauchii* JORDAN, Man. Vert. ed. 2d, 323, 1878.

1855—*Ichthyobus stolleyi* AGASSIZ, Am. Journ. Sc. Arts, 2d series, xix, 196.

*Ichthyobus stolleyi* JORDAN & COPELAND, Check List, 158, 1876.

1877—*Ichthyobus ischyryus* NELSON, MSS.—JORDAN, Proc. Ac. Nat. Sc. Phila. 72.

*Ichthyobus ischyryus* JORDAN & COPELAND, Check List, 158, 1876.

*Ichthyobus ischyryus* JORDAN & GILBERT, in Klippart's Rept. 53, 1876.

*Ichthyobus ischyryus* JORDAN, Man. Vert. ed. 2d, 323, 1878.

HABITAT.—Mississippi Valley ; generally abundant in the larger streams.

AN examination of a large series of wide-mouthed Buffalo fishes from the Ohio, Wabash, Illinois, and Mississippi Rivers has convinced me, contrary to my previous impressions, that all belong to a single species. It is not absolutely certain what Rafinesque's *Catostomus bubalus* was. It is perhaps as likely to have been a species of *Bubalichthys*, as supposed by Dr. Kirtland, as an *Ichthyobus*. I however follow Professor Agassiz in identifying it with the present species, which is, at the Falls of the Ohio, where Rafinesque's collections were made, probably the most abundant of the Buffalo-fishes. Neither Rafinesque nor Professor Agassiz has, however, recognizably described the species. In my Manual of Vertebrates, in 1876, I gave a short account of *Ichthyobus bubalus*, drawn from two large specimens taken in Wabash River at Lafayette. Besides these, I have numerous smaller specimens, obtained in the Mississippi at Saint Louis. As these differed in the greater compression of the body and higher fins, I have identified them as belonging to *Ichthyobus rauchii* Agassiz, an identification which I still think correct. In 1877, Mr. Nelson described an *Ichthyobus ischyryus*, from Mackinaw Creek, a tributary of the Illinois River, near Peoria. His typical specimen was very stout and deep, and at the time I thought with him that it was probably distinct from *I. bubalus*. Lately I have been enabled to re-examine the type of *I. ischyryus* in the State Museum of Illinois, and to compare it with a numerous series from the same locality. I found it possible to establish an unbroken series among them, connecting the nominal species which I had termed *bubalus*, *rauchii*, and *ischyryus*, the differences separating them being, in my opinion, due either to differences of age or to individual peculiarities. As no description of any importance has been published of *I. stolleyi*, I include it as a synonym of *I. bubalus*. I know nothing whatever concerning it. *Ichthyobus cyaneolus* Nelson, as below stated, is a species of

*Bubalichthys*. The description of *Sclerognathus cyprinella* Valenciennes refers principally to the generic features of these fishes. It agrees fully with *I. bubalus*, except in the number of scales above the lateral line, a difference doubtless due to a difference in the place or the manner of making the count. As no specific characters are known, and as the *Ichthyobus bubalus* doubtless abounds in the Lower as in the Upper Mississippi, I refer *I. cyprinella* to the synonymy of *I. bubalus*, the original type having probably been a young specimen of that species. This species is perhaps the largest of the *Catostomidae*, reaching a weight of 20 to 30 pounds and a length of more than two feet. The young ("ischyrus") are sold in the Illinois markets under the name of Red-mouth Buffalo, the adult being called simply Buffalo. A species which I suppose to be the present one I have seen taken in immense numbers, by means of seines, in the Mississippi River at Burlington, Iowa. The flesh is good, although not first-rate. It is rather coarse, and is full of small bones.

For purposes of comparison I here add the original descriptions of *S. cyprinella*, *I. rauchii*, *I. stolleyi*, and *I. ischyrus* :—

SCLEROGNATHUS CYPRINELLA Valenciennes.—"Rien ce me semble, ne justifie mieux la séparation des sclérognaibes du genre des Catostomes que l'espèce dont je vais donner ici la description. Avec une bouche, formée comme celle du *Sclerognathus cyprinus*, nous voyons l'ouverture portée au bout du museau, la lèvre inférieure plus longue que la supérieure, et par conséquent il n'y a plus de possibilité d'employer la bouche pour sucer.

"Ce poisson a le corps assez semblable au précédent [*Sclerognathus cyprinus*]; sa hauteur est trois fois et un tiers dans sa longueur totale; la longueur de la tête y est comprise quatre fois et demie; l'œil est petit, et sur le haut de la joue, le diamètre est contenu cinq fois et un tiers dans la tête, et deux diamètres et demi, donnant la mesure de l'intervalle entre les deux yeux; le dessus du crâne, couvert comme à l'ordinaire, d'une peau nue est moins convexe; les deux lignes de pores sont tracées à leur place ordinaire, et sont sinuées, comme celles de l'espèce précédente; l'opercule est strié et bombé et est plus grand, ce qui rend le sous-opercule plus petit que dans l'autre sclérognaibe. L'on sent les intermaxillaires à l'extrémité supérieure du museau, soutenant un lèvre très mince. L'inférieure est moins épaisse, et le nombre des papilles est moins faible. La dorsale a la même forme que celle de l'autre espèce; mais l'anale est plus pointue; la caudale est échancrée et large.

"D. 33. A. 12, etc.

"Les écailles sont beaucoup plus petites; j'en compte quarante et une le long des côtés; dix au dessus, et sept au dessous de la ligne latérale, qui est étroite et mince.

"La couleur est un doré verdâtre, avec les nageoires plus foncées.

"Notre individu est long de sept poncees; il vient du Lac Pontchartrain."—(VALENCIENNES, *Hist. Nat. des Poiss.* xvii, pp. 477-479.)

ICHTHYOBUS RAUCHII Agassiz.—"Dorsal much higher than in *I. bubalus*, all other fins much larger, and the scales much higher than long; from Burlington, Iowa."

ICHTHYOBUS STOLLEYI Agassiz.—“Body higher than in *Ichthyobus rauchii*, profile steeper, and hence snout blunter, opercular bones larger; fins proportionally of the same size. From Osage River, Missouri.”

ICHTHYOBUS ISCHYRUS Nelson.—“This is a very stout and heavily built species: depth  $2\frac{1}{2}$  in length; head extremely broad between the eyes and but slightly convex; its length  $3\frac{1}{2}$  times in length of body; snout short and rounded, opercular apparatus large; depth of head  $1\frac{1}{2}$  in its length; width of head  $1\frac{1}{2}$ ; eye  $6\frac{2}{8}$  in head,  $1\frac{2}{8}$  in snout, 4 in interorbital space; caudal peduncle a little deeper than long; scales 7-37-7, nearly uniform, a little crowded anteriorly, finely punctate; fins all small; dorsal I, 27; anal I, 8, bluish olive above; yellowish below; fins blackish.”

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
20774	Illinois River at Peoria (very large; typical of <i>bubalus</i> ) ....	S. A. Forbes.

## Genus MYXOCYPRINUS Gill.

*Myxocyprinus* GILL, Johnson's Cyclopædia, p. 1574, 1878.

*Carpiodes et Sclerognathus* sp. BLEEKER, GÜNTHER.

Type, *Carpiodes asiaticus* Bleeker.

Etymology, *μυζαω*, to suck; *κῦπρινος*, a carp.

This genus is known to me only from Dr. Bleeker's description of its typical species. Whether it differs from its relatives, *Ichthyobus*, *Bubalichthys*, etc., in any other character than the obvious one of the great increase in the number of its dorsal rays and the smaller scales, I do not know. In any event, however, its right to independent generic rank is unquestionable.

### *Generic Characterizations.*

MYXOCYPRINUS Gill, 1878.—“*Myxocyprinus* is a name proposed for the *Carpiodes asiaticus* of Bleeker, which is distinguished by the multiradiate dorsal and anal fins (e. g. D. 52; A. 13).”—(GILL, *Johnson's Cyclopædia, Appendix*, p. 1574.)

### 54. MYXOCYPRINUS ASIATICUS (*Bleeker*) Jordan.

1864—*Carpiodes asiaticus* BLEEKER, Nederl. Tydschr. Dierk. ii, 19.

*Sclerognathus asiaticus* GÜNTHER, Cat. Fishes Brit. Mus. vii, 23, 1868.

HABITAT.—China.

My only knowledge of this species is from Dr. Bleeker's original description, which I here subjoin:—

“CARPIODES ASIATICUS Blkr.—Carpiod. corpore oblongo compresso, altitudine  $2\frac{1}{2}$  fere in ejus longitudine absque,  $3\frac{1}{2}$  circiter in longitudine corporis cum pinna caudali,

dorse valde elevato maxime compresso; latitudine corporis  $2\frac{1}{2}$  circiter in ejus altitudine; capite obtuso 5 fere in longitudine corporis absque 6 circiter in longitudine corporis cum pinna cauduli; oculis in media capitis longitudine sitis, diametro 5 circiter in longitudine capitis, diametris  $2\frac{3}{8}$  circiter distantibus; linea rostro-dorsali vertice et fronte declivi rectiuscula, rostro valde convexa; naribus orbitæ approximatis, posterioribus valvula claudendis; rostro obtuso truncatiusculo valde carnoso ante rictum prominente; labiis valde carnosus papillatis, inferiore lobis parum productis; osse suborbitali anteriore sat longo ante orbitam sito, scaphæformi, duplo circiter longiore quam alto apice acuto antrosum spectante; osse suborbitali 2<sup>o</sup> oblique tetragono æque alto circiter ac longo; ossibus suborbitalibus ceteris gracilibus oculi diametro quadruplo circiter humilioribus; operculo duplo circiter altiore quam lato marginibus posteriore et inferiore convexo; osse scapulari valde brevi et obtuso; ossibus pharyngealibus compressis sat validis altioribus quam latis, dentibus 30 ad 50 compressis corona vulgo unituberculatis; squamis dimidio libero et dimidio basali subradiatim striatis, 50 in linea laterali, 24 in serie transversali absque ventralibus intimis quarum 12 lineam lateralem inter et initium pinne dorsalis; squamæ linea laterali postice medio emarginatis; linea lateralis singulis squamis tubulo simplice marginem squamarum liberum attingente notata; pinnis dorsali et anali basis vagina squamosa inclusa, dorsali basi non multo plus que 2 in longitudine totius corporis, longe ante pinnas ventrales incipiente, antice valde elevata corpore vix humiliore, acuta, valde emarginata, medio et postice corpore quadruplo circiter humiliore radio postico radio anali postico subopposito; pinnis pectoralibus rotundales capite longioribus, ventrales non attingentibus; ventralibus acute rotundatis pectoralibus non multo brevioribus, analem non attingentibus; anali corpore minus duplo humiliore, duplo altiore quam basi longa, acutiuscule rotundata non emarginata; caudali profunde emarginata lobis acutis  $4\frac{3}{8}$  circiter in longitudine corporis; colore corpore fuscescente-olivaceo, pinnis fusco vel fusco-violaceo.

“B. 3. D. 4-49. P. 1-17. V. 2-11. A. 3-11 vel 4-10. C. 1-16-1 et lat. brev.

“Hab. China.

“Longitudo speciminis descripti 508'''.

“Rem. La présence de *Catostomini* dans les eaux de l'Asie orientale est un fait assez curieux. Tilesius déjà en avait fait connaître un représentant, vivant dans le Covyra, dans le Léna, l'Indigirea et le Dogdo, espèce qu'il nomma *Cyprinus rostratus*, que M. Valenciennes rebaptisa *Catostomus Tilesii* et qui paraît être un *Acomus*. Mais cette espèce était jusqu'ici la seule du groupe qu'on savait habiter l'Asie. L'espèce actuelle prouve l'existence dans les fleuves de l'Asie orientale d'une seconde espèce du groupe et elle appartient manifestement au genre dont la *Carpiodes cyprinus* est le type. Mais elle est remarquable parmi tous les poissons de la division des *Ichthyobi* (*Carpiodes* Raf., *Cycleptus* Raf., *Ichthyobus* Raf., et *Bubalichthys* Ag.) par son dos très-élevé et anguleux et par sa très-longue dorsale à plus de 50 rayons. C'est un espèce éminemment distincte qu'on ne pourrait confondre avec aucune des espèces américaines.”—(BLEEKER, *Notices sur Quelques Genres et Espèces des Cyprinoides de Chine*, <*Nederlandsch Tijdschrift voor de Dierkunde*, 1864, ii, pp. 19-21.)

## A D D E N D A .

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### 23. CHASMISTES LIORUS *Jordan, sp. nov.*

*Big-mouthed Sucker of Utah Lake.*

1878—*Chasmistes fecundus* JORDAN, Bull. Hayden's Geol. Surv. Terr. iv, No. 2, 417. (Not *Catostomus fecundus* Cope & Yarrow.)

*Chasmistes fecundus* JORDAN, p. 150 of the present work.

Since pages 149–151 of the present work were in press, I have carefully recompared Cope and Yarrow's description and figure of their *Catostomus fecundus*, and my notes on their typical specimens, with the specimens on which the genus *Chasmistes* was based, and I have come to the conclusion, hinted at in the text, that the *Chasmistes* is a species distinct from *C. fecundus*, and thus far undescribed. The specific name *liorus* (λεῖτος, smooth; ὄρος, border) is therefore proposed for it, in allusion to the smooth lips.

### 28 (b). CATOSTOMUS FECUNDUS *Cope & Yarrow.*

*Sucker of Utah Lake.*

1876—*Catostomus fecundus* COPE & YARROW, Zool. Lient. Wheeler's Expl. W. 100th Mer. 678, plate xxxii, figs. 1, 1 a.

*Catostomus fecundus* JORDAN & COPELAND, Check List, 156, 1-76. (Name only. Not *Catostomus fecundus* Jordan, Bull. U. S. Nat. Mus. xi; nor *Chasmistes fecundus* Jordan, Bull. Hayden's Geol. Surv. Terr. iv, No. 2, 417.)

HABITAT.—Utah Lake.

As stated above, I at first identified *Chasmistes liorus* from Utah Lake with this species from the same waters, the two being very similar as to scales and fins, and the form of the mouth and snout in the figure of *C. fecundus* suggesting, though not resembling, the form of those parts in *Chasmistes*. The finding of one of the typical specimens of *Catostomus fecundus* in the National Museum has shown me that it is a true *Catostomus*, and not a *Chasmistes*. I did not ascertain the lip characters of the species while at the Museum, the mouth-parts being in poor condition, and I therefore am not now able to place it in the ana-

lytical key to the species of the genus. If the upper lip is narrow, with few rows of tubercles, it will not be easy to separate *fecundus* from *teres*. If the lip is broad, with many series of tubercles, it will be approximated to *C. occidentalis*, differing, however, in the larger scales (about 60 in the lateral line, instead of 72). I therefore quote the original description, and leave the relations of the species to be finally settled at some future time:—

“It is a true *Catostomus* having the parietal fontanelle well marked and widely open. The head enters in entire length 5 times, the diameter of the orbit 6 times in greatest length of side of head. The insertion of the dorsal fin anteriorly is nearer to the end of the muzzle than insertion of caudal; the ventrals originating below middle of dorsal. The width of the dorsal to ventral enters the entire length to insertion of caudal 6 times.

“Radii: D. 12–13. A. 1–8. P. 7. V. 11. Scales are in 20 longitudinal rows from the insertion of the first dorsal to pectoral, and in 60 transverse rows from branchiæ to insertion of caudal: they are elongate and octagonal, smaller on dorsal region, and larger on ventral. Body elongated, subfusiform. It differs from *C. (Acomus) generosus*, Gir., in many particulars, as may be seen from the following comparisons.

“Girard’s species has no fontanelle; is shorter and narrower; the diameter of orbit enters greatest length of side of head 5 times instead of 6. The anterior insertion of dorsal fin is equidistant between the end of the snout and the insertion of the caudal, while in *C. fecundus*, it is nearer the end of the snout than insertion of caudal. The ventrals in *C. generosus* originate under the posterior third of the dorsal; in *C. fecundus* under the middle third of the dorsal. The radii in *C. generosus* are: D. 10, A. 2, 7, P. 16, V. 10, C. 27; in *C. fecundus*: D. 12–13, A. 1, 8, P. 17, V. 11.

“This species is abundant in Utah Lake, and is called ‘Sucker’ by the settlers. They run well up the rivers to spawn in June; feed on the bottom and eat spawn of better fish; spawning beds on gravel; bite at hook sometimes; are extremely numerous, and are considered a nuisance by the fishermen, but they meet with a ready sale in winter, at an average price of 2½ cents a pound.”—(COPE & YARROW, *l. c.*)

*Specimens in United States National Museum.*

Number.	Locality.	Collector.
12894	Utah Lake. ....	Yarrow & Henshaw.
--	do .....	Do.

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**LACÉPÈDE (Bernard Germain Étienne de la Ville-sur-Ilion, Comte de).** Histoire Naturelle des Poissons par le Citoyen La Cépède, membre de l'Institut national, et Professeur du Muséum de histoire naturelle. Tome premier à cinquième. À Paris, chez Plassan, imprimeur libraire, Rue du Cimetière André-des-Arcs, No. 10. L'an VI de la République, — 1798 [— L'an XI de la République, i. e. 1803].

[Descriptions of Le Cyprin catostome, *Cyprinus catostomus* Forster, Le Cyprin commersonien, and Le Cyprin sucet, *Cyprinus suetta* Lacépède.]

**BLOCH (Mark Elieser) and SCHNEIDER (Johann Gottlob).** M. E. Blochii Doctoris Medicinæ Berolinensis, et societatis literariis multis adscripti, Systema Ichthyologiæ iconibus CX illustratum.—Post obitum auctoris opus inchoatum absolvit, correxit, interpolavit Jo. Gottlob Schneider, Saxo-Berolini, sumtibus Auctoris impressum et bibliopolio Sanderiano commissum, 1801.

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**TILESIIUS (—).** "Piscinum Camtschatceicorum descriptiones et icones. <Mém. Ac. Sc. St. Pétersb. I and III, 1810–1811."

[Description and figure of *Cyprinus rostratus*, sp. nov., from Eastern Siberia.]

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[Description of *Cyprinus rostratus* quoted from Tilesius.]

**MITCHILL (Samuel Latham).** The Fishes of New York Described and Arranged. <Transactions of the Literary and Philosophical Society, New York, 1814.

[*Cyprinus teres* and *Cyprinus oblongus*, sp. nov.]

**LE SUEUR (Charles A.)** A new genus of Fishes, of the Order Abdominales, proposed, under the name of *Catostomus*; and the characters of this genus, with those of its species, indicated. By C. A. Le Sueur. Read September 16, 1817. <Journal of the Academy of Natural Sciences of Philadelphia, vol. i, 1817, pp. 88–96 and 102–111.

[Describes *Catostomus*, gen. nov., and the following new species, most of which are figured:—*C. cyprinus*, *C. gibbosus*, *C. tuberculatus*, *C. macrolepidotus*, *C. aurcolus*, *C. communis*, *C. longirostrum*, *C. nigricans*, *C. maculosus*, *C. elongatus*, *C. vittatus*, *C. duquesnii*, *C. bostoniensis*, and *C. hudsonius*. *C. teres* (Mitch.), *C. oblongus* (Mitch.), and *C. suetta* (Lac.) are also described. This paper is an excellent one, and compares favorably with most that has since been written on this group.]

**RAFINESQUE (Constantine Samuel).** Discoveries in Natural History made during a Journey through the Western Region of the United States by Constantine Samuel Rafinesque Esq. Addressed to Samuel L. Mitchill, President, and other members of the Lyceum of Natural History in a letter dated at Louisville, Falls of the Ohio, 20th July 1818. < American Monthly Magazine and Critical Review, New York, September, 1818.

[Description of *Catostomus bubalus* and *Catostomus erythrurus*, sp. nov., and notice of the discovery of the "Carp" "*Catostomus macropterus*" and the "Sucker" *Catostomus duquesnei*.]

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[Description of *Exoglossum (Hypentelium) macropterus*; subgenus and species new.]

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**LACÉPÈDE (Bernard Germain Étienne).** Histoire Natrelle des Poissons, par M. le Comte Lacépède, suite et complément des Œuvres de Buffon. Tome cinquième, avec vingt-trois nouvelles planches en taille-douce. Paris, Rapet, Rue Saint-André-des-Ares, No. 10, Éditeur du Temple de la Gloire ou les Fastes Militaires de la France, ouvrage in-folio, avec figures, 1819.

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[Originally printed in the Western Review and Miscellaneous Magazine, Lexington, Kentucky, 1819-20. It contains descriptions of the genera and species of *Catostomi* found in the Ohio River, they being referred to three genera, *Catostomus*, *Cycleptus*, and *Hypentelium*, the genus *Catostomus* being divided into five new subgenera, *Moxostoma*, *Ictiobus*, *Carpiodes*, *Terctulus*, *Eurystomus*, and *Decactylus*.

The following is the arrangement of the species described:—

Genus <i>CATOSTOMUS</i> .		<i>melanotus</i> , sp. nov.
Subgenus <i>Moxostoma</i> .		<i>fasciolaris</i> , sp. nov.
<i>anisurus</i> , sp. nov.		<i>erythrurus</i> .
<i>anisopterus</i> , sp. nov.		<i>flexuosus</i> , sp. nov.
Subgenus <i>Ictiobus</i> .	Subgenus <i>Eurystomus</i> .	<i>megastomus</i> , sp. nov.
<i>bubalus</i> .	Subgenus <i>Decactylus</i> .	<i>duquesni</i> .
<i>Liger</i> .		
Subgenus <i>Carpiodes</i> .	Genus <i>CYCLEPTUS</i> .	<i>nigrescens</i> .
<i>carpio</i> , sp. nov.	Genus <i>HYPENTELIUM</i> .	<i>macropterus</i> .]
<i>velifer</i> , sp. nov.		
<i>xanthopus</i> , sp. nov.		
Subgenus <i>Terctulus</i> .		
<i>melanops</i> , sp. nov.		

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[Descriptions of *Catostomus gibbosus*, *C. tuberculatus*, *C. nigricans*, and *C. bostoniensis*.]

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**AGASSIZ (Louis).** Notice of a collection of Fishes from the southern bend of the Tennessee River, in the State of Alabama; by L. Agassiz. <American Journal of Science and Arts, second series, xviii, 1854, pp. 297-308, 353-365.

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— Description of a new species of *Catostomus*. By Wm. O. Ayres, M. D. Feb. 26, 1855. <Proceedings of the California Academy of Sciences, vol. i, pp. 31-32, 1855; 2d ed., pp. 30-32, 1873.

[*Catostomus labiatus*, sp. nov.]

**AGASSIZ (Louis).** Synopsis of the Ichthyological Fauna of the Pacific Slope of North America, chiefly from the collections made by the U. S. Expl. Exped., under the command of Capt. C. Wilkes, with recent Additions and Comparisons with Eastern types; by L. Agassiz. <American Journal of Science and Arts, 2d series, vol. xix, 1855, pp. 186-231.

[Characterizes very fully the genera, viz:—*Carpiodes* Raf.; *Bubalichthys* Ag., gen. nov.; *Ichthyobus* Raf.; *Cycleptus* Raf.; *Moxostoma* Raf.; *Ptychostomus* Ag., gen. nov.; *Hylomyzon* Ag., gen. nov.; and *Catostomus* Le Sueur. The species of each genus are noticed, and the following new species are very briefly and in most cases unsatisfactorily described:—*Carpiodes thompsoni*, *Bubalichthys bonasus*, *Ichthyobus rauchii*, *Ichthyobus stolleyi*, *Moxostoma tenue*, and *Catostomus occidentalis*.]

**GIRARD (Charles).** Researches upon the Cyprinoid Fishes inhabiting the fresh waters of the United States of America, west of the Mississippi Valley, from specimens in the Museum of the Smithsonian Institution. By Charles Girard, M. D. <Proceedings of the Academy of Natural Sciences of Philadelphia, 1856, pp. 165-213.

[Twenty-six species enumerated—most of them briefly described. Two new genera are proposed, *Minomus* and *Acomus*, and the following new species are characterized:—*Carpiodes damalis*, *Moxostoma claviformis*, *Moxostoma kennerlyi*, *Moxostoma victoriae*, *Moxostoma campbelli*, *Ptychostomus albidus*, *Ptychostomus haydeni*, *Acomus guzmaniensis*, *Acomus generosus*, *Acomus griseus*, *Acomus lactarius*, *Catostomus macrochilus*, *Catostomus sucklii*, and *Catostomus bernardini*. These descriptions are mostly short and insufficient.]

— General Report upon the Zoology of the Several Pacific Railroad Routes. = Reports of Explorations and Surveys to Ascertain the most practicable and Economical Route for a Railroad from the Mississippi River to the Pacific Ocean, made under the direction of the Secretary of War, in 1853-6, according to Acts of

**GIRARD (Charles)**—Continued.

Congress of March 3, 1853, May 31, 1854, and August 5, 1854. Volume X. Washington, A. O. P. Nicholson, Printer, 1859. (Part 4, Fishes, by Dr. Charles Girard.)

[Descriptions of *Carpoides damalis*, *Moxostoma claviformis*, *Ptychostomus haydeni*, *Acomus generosus*, *Acomus griseus*, *Acomus lactarius*, *Catostomus occidentalis*, *Catostomus labiatus*, *Catostomus macrocheilus*, and *Catostomus suekllii*; all of the species except *Acomus generosus*, *C. occidentalis*, *C. labiatus*, and *C. macrocheilus* being accompanied by figures.]

— United States and Mexican Boundary Survey, under the order of Lieut. Col. W. H. Emory, Major First Cavalry and United States Commissioner.—Ichthyology of the Boundary, by Charles Girard, M. D. < United States and Mexican Boundary Survey, vol. ii, part i, 1859.

[Descriptions and figures of *Ictiobus tumidus*, *Moxostoma kennerlyi*, *Moxostoma victoriae*, *Moxostoma campbelli*, *Ptychostomus congestus*, *Ptychostomus albidus*, *Minomus insignis*, *Minomus plebeius*, *Minomus clarki*, *Acomus latipinnis*, *Acomus guzmaniensis*, and *Catostomus bernardini*.]

**BLEEKER (Pieter van)**. "Conspectus systematis Cyprinorum. < *Naturl. Tijdschr. Nederl. Ind.* XXI, 1860."

[Systematic arrangement of the genera.]

**ABBOTT (Charles Conrad)**. Descriptions of Four New Species of North American Cyprinidae, by Charles C. Abbott. < Proceedings of the Academy of Natural Sciences of Philadelphia, 1860, pp. 473-474.

[Describes *Catostomus texanus* and *Catostomus chloropteron*.]

**GILL (Theodore Nicholas)**. On the classification of the EVENTOGNATHI or CYPRINI, a suborder of TELEOCEPHALI, by Theodore Gill. < Proceedings of the Academy of Natural Sciences of Philadelphia, 1861, pp. 6-9.

[Characterizes the suborder *Eventognathi*, equivalent to "the true Cyprinoids of Agassiz, without teeth in the jaws, and with large falciform lower pharyngeal bones". This suborder is divided into four families,—*Homalopteroidae*, *Cobitoideae*, *Cyprinoideae*, and *Catostomoidae*; the latter family being in turn divided into three subfamilies,—*Catostominae*, *Cycleptinae*, and *Bubalichthyinae*.]

**PUTNAM (Frederick Ward)**. List of the Fishes sent by the Museum to different Institutions, in exchange for other Specimens, with Annotations. By F. W. Putnam. = Bulletin of the Museum of Comparative Zoology, Cambridge, Massachusetts, U. S. A., 1863, (No. 1).

[Contains names of 10 species, with references to descriptions by Professor Agassiz.]

**COPE (Edward Drinker)**. Partial Catalogue of the Cold-blooded Vertebrata of Michigan. Part 1. By Prof. E. D. Cope.

[Notes on several species.]

**GILL (Theodore Nicholas)**. Synopsis of the Fishes of the Gulf of St. Lawrence and the Bay of Fundy. By Prof. Theodore Gill, M. A. < Canadian Naturalist, August, 1865, (pp. 1-24 in reprint).

[Records *Catostomus bostoniensis* and *Moxostoma oblongum*.]

**BLEEKER (Pieter van)**. Notices sur Quelques Genres et Espèces des Cyprinoïdes de Chine par P. Bleeker. < *Nederlandsch Tijdschrift voor de Dierkunde*, uitgegeven door het Koninklijk Zoologisch Genootschap, *Natura Artis Magistra*, te Amsterdam, onder Redactie van P. Bleeker, H. Schlegel en G. F. Westerman, tweede jaargang, 1865.

[Description of *Carpoides asiaticus*, sp. nov.]

**THOREAU (Henry David)**. A Week on the Concord and Merrimack Rivers, by Henry D. Thoreau, author of "Walden," etc. New and revised edition. Boston: Ticknor and Fields. 1868.

[Contains an account of the habits of *Catostomus bostoniensis* and *C. tuberculatus*.]

**GÜNTHER (Albert).** Catalogue of the Physostomi, containing the families Heteropygii, Cyprinidae, Gonorhynchidae, Hyodontidae, Osteoglossidae, Clupeidae, Chirocentridae, Alepocephalidae, Notopteridae, Halosauridae, in the collection of the British Museum, by Dr. Albert Günther. London: Printed by order of the trustees. 1868. = Catalogue of the Fishes of the British Museum by Albert Günther, M. A., M. D., Ph. D., F. R. S., F. Z. S., etc., etc. Volume seventh.

[Contains descriptions of twenty-four species, besides twenty-one doubtful species merely enumerated, arranged in four genera, *Catostomus*, *Moxostoma*, *Sclerognathus*, and *Carpiodes*.]

**COPE (Edward Drinker).** On the Distribution of Fresh Water Fishes in the Alleghany Region of South-Western Virginia. By E. D. Cope, A. M. < Journal of the Academy of Natural Sciences of Philadelphia, new series, vol. vi, part iii, January, 1869, pp. 207-247.

[Description and figure of *Teretulus cervinus*, sp. nov., with notes on *T. duquesnei*, *Catostomus nigricans*, and *C. communis*.]

**GÜNTHER (Albert).** An Account of the Fishes of the States of Central America based on Collections made by Capt. J. M. Dow, F. Godman, Esq., and O. Salvin, Esq. By Albert Günther, M. A., M. D., Ph. D., F. R. S., F. Z. S. < Transactions of the Zoological Society of London, vol. vi, 1869, pp. 377-494.

[Description of *Bubalichthys meridionalis*, sp. nov.]

**COPE (Edward Drinker).** Partial Synopsis of the Fishes of the Fresh Waters of North Carolina, by Edw. D. Cope, A. M. < Proceedings of the American Philosophical Society of Philadelphia, 1870, pp. 448-495.

[Descriptions of *Placopharynx carinatus* (gen. et sp. nov.), *Ptychostomus papillosus* (sp. nov.), *P. velatus* (sp. nov.), *P. collapsus* (sp. nov.), *P. pidiensis* (sp. nov.), *P. coregonus* (sp. nov.), *P. albus* (sp. nov.), *P. thalassinus* (sp. nov.), *P. robustus* (sp. nov.), *P. erythrurus*, *P. lachrymalis* (sp. nov.), *P. macrolepidotus*, *P. duquesnei*, *P. carpio*, *P. oneida*, *P. aureolus*, *P. suevii*, *P. crassilabris* (sp. nov.), *P. breviceps* (sp. nov.), *P. conus* (sp. nov.), *P. cervinus*, *Carpiodes difformis* (sp. nov.), *C. eutisanserinus* (sp. nov.), *C. selene* (sp. nov.), *C. velifer*, *C. grayi* (sp. nov.), *C. thompsoni*, *C. bison*, *C. cyprinus*, and *C. nummifer* (sp. nov.), with notes on other species, and a very useful analysis of the species of *Ptychostomus* and *Carpiodes*.]

— Report on the Reptiles and Fishes obtained by the Naturalists of the Expedition, by E. D. Cope, A. M. < Preliminary Report of the United States Geological Survey of Wyoming, and contiguous territories, (being a second annual report of progress,) conducted under the authority of the Secretary of the Interior by F. V. Hayden, United States Geologist. Washington: Government Printing Office. 1872.

[*Catostomus discobolus*, *Minomus delphinus*, *Minomus bardus*, and *Ptychostomus bucco*, sp. nov.]

— On the Plagopterinæ and the Ichthyology of Utah. By Edward D. Cope, A. M. Read before the American Philosophical Society, March 20th, 1874. < Proceedings of the American Philosophical Society of Philadelphia, vol. 14, pp. 129-139, 1874.

[*Minomus platyrhynchus* and *Minomus jarrovi* described as new species.]

**JORDAN (David Starr).** Synopsis of the Genera of Fishes to be looked for in Indiana, by Prof. David S. Jordan, M. D. < Sixth Annual Report of the Geological Survey of Indiana, made during the year 1874, by E. T. Cox, State Geologist; assisted by Prof. John Collett, Prof. W. W. Borden, and Dr. G. M. Levette. Indianapolis. Sentinel Company, Printers. 1875. pp. 197-228.

[Nine genera characterized and one or two species mentioned under each.]

— Concerning the Fishes of the Ichthyologia Ohienensis, by David S. Jordan, M. S., M. D. < Proceedings of the Buffalo Society of Natural History, 1876, pp. 91-97.

[Contains identifications of the species described by Rafinesque; a new genus, *Erimyzon*, being proposed for *Cyprinus oblongus* Mitchell.]

**JORDAN (David Starr).** Manual of the Vertebrates of the Northern United States, including the district east of the Mississippi River, and north of North Carolina and Tennessee, exclusive of marine species. By David Starr Jordan, M. S., M. D., Professor of Natural History in N. W. C. University and in Indiana State Medical College. Chicago: Jansen, McClurg & Company. 1876.

[Twenty-three species briefly described, and referred to nine genera.]

**NELSON (Edward W.)** A Partial Catalogue of the Fishes of Illinois, by E. W. Nelson. < Bulletin of the Illinois Museum of Natural History, i, 1876.

[Notes on 21 species; *Ichthyobus cyanellus* described as a new species, and the genus *Carpiodes* united to *Ichthyobus*.]

**UHLER (P. R.) and LUGGER (Otto).** List of Fishes of Maryland, by P. R. Uhler and Otto Luggger. < Report of the Commissioners of Fisheries of Maryland, pp. 67-176, (1876).

[Seven species described.]

**COPE (Edward Drinker) and YARROW (Henry C.)** Report upon the collections of Fishes made in portions of Nevada, Utah, California, Colorado, New Mexico and Arizona during the years 1871, 1872, 1873 and 1874, by Prof. E. D. Cope and Dr. H. C. Yarrow. = Chapter VI. < Report upon Geographical and Geological Explorations and Surveys West of the One Hundredth Meridian, in charge of First Lieut. Geo. M. Wheeler, Corps of Engineers, U. S. Army, under the direction of Brig. Gen. A. A. Humphreys, Chief of Engineers, U. S. Army, published by authority of Hon. Wm. W. Belknap, Secretary of War, in accordance with acts of Congress of June 23, 1874, and February 15, 1875. In six volumes. Accompanied by one topographical and one geological atlas. Vol. V.—Zoology. Washington: Government Printing Office. 1875. (Issued in 1876.)

[Contains descriptions of *Pantosteus* (gen. nov.), *Pantosteus platyrhynchus*, *Pantosteus jarrovi*, *Pantosteus virescens* (sp. nov.), *Catostomus insigne*, *Catostomus alticolum*, *Catostomus discobolum*, *Catostomus fecundum* (sp. nov.), *Catostomus guzmanianse*, *Moxostoma trisignatum* (sp. nov.), *Ptychostomus congestus*, and *Carpiodes grayi*, with figures of most of the species.]

**JORDAN (David Starr) and COPELAND (Herbert Edson).** Check List of the Fishes of the Fresh Waters of North America, by David S. Jordan, M. S., M. D., and Herbert E. Copeland, M. S. < Bulletin of the Buffalo Society of Natural History, ii, 1876, pp. 133-164.

[Eighty-three nominal species enumerated, referred to ten genera, viz:—*Catostomus*, *Pantosteus*, *Hypentelium*, *Erimyzon*, *Teretulus*, *Placopharynx*, *Carpiodes*, *Ichthyobus*, *Bubalichthys*, and *Cycloptus*.]

**JORDAN (David Starr).** On the Fishes of Northern Indiana. < Proceedings of the Academy of Natural Sciences of Philadelphia, 1877.

[Notes on several species; *Ichthyobus ischyurus* and *Bubalichthys altus* described as new species, from MSS. left with the author by Mr. Nelson; an analysis of the genera of *Catostomidae* is given, nine of them being "accepted by Prof. Cope and the writer".]

— A Partial Synopsis of the Fishes of Upper Georgia, by David S. Jordan, M. D. < Annals of the New York Lyceum of Natural History, 1876. (Published in 1877.)

[Notes on numerous species, *Myxostoma curyops* being described as new.]

**KLIPPART (John H.)** First Annual Report of the Ohio State Fish Commission to the Governor of the State of Ohio, for the years 1875 and 1876. Columbus: Nevius & Myers, State Printers. 1877.

[Descriptions of *Catostomus teres*, *Teretulus oblongus*, *Placopharynx ca-inatus*, *Carpiodes difformis*, and *Carpiodes velifer*, with woodcuts of all but *P. carinatus* and *C. velifer*. The descriptions are by Charles H. Gilbert, mostly arranged from MSS. notes of D. S. Jordan; the notes on habits, etc., by Mr. J. H. Klippart.]

**JORDAN (David Starr) and BRAYTON (Alembert Winthrop).** On *Lagochila*, a new genus of Catostomoid fishes. <Proceedings of the Academy of Natural Sciences of Philadelphia, 1877, pp. 280-283.

[Description and figure of *Lagochila lacra* (gen. et sp. nov.), with an analysis of the genera of *Catostomidae* admitted, viz:—*Lagochila*, *Placopharynx*, *Myxostoma Erimyzon*, *Hypentelium*, *Catostomus*, *Pantosteus*, *Cycleptus*, *Carpiodes*, *Ichthyobus*, *Bubalichthys*, and *Myxocyprinus*.]

**HALLOCK (Charles).** The Sportsman's Gazetteer and General Guide. The Game Animals, Birds and Fishes of North America: their Habits and Various Methods of Capture. Copious Instructions in Shooting, Fishing, Taxidermy, Woodcraft, etc. Together with a Directory to the Principal Game Resorts of the Country: illustrated with maps. By Charles Hallock, Editor of "Forest and Stream", Author of the "Fishing Tourist", "Camp Life in Florida", etc. New York: Forest and Stream Publishing Company. 1877.

[Contains descriptions and notices of numerous species; the Red Horse, *M. macrolepidotum*, being on p. 338 inadvertently called "*Catostomus cepedianum*".]

**JORDAN (David Starr).** Contributions to North American Ichthyology, based primarily on the Collections of the United States National Museum. I. Review of Rafinesque's Memoirs on North American Fishes, by David S. Jordan. Washington: Government Printing Office. 1877. = Bulletin of the United States National Museum, No. 9. pp. 53.

[Contains identifications of the various nominal species described by Rafinesque.]

— Contributions to North American Ichthyology, based primarily on the Collections of the United States National Museum. II. A.—Notes on *Cottidae*, *Etheostomatidae*, *Percidae*, *Centrarchidae*, *Aphododeridae*, *Dorysonatidae*, and *Cyprinidae*, with revisions of the genera and descriptions of new or little known species. B.—Synopsis of the *Siluridae* of the fresh waters of North America. By David S. Jordan. Washington: Government Printing Office. 1877. = Bulletin of the United States National Museum, No. 10. pp. 116.

[Description of *Myxostoma pacilura*, sp. nov.]

**GILL (Theodore Nicholas).** Johnson's New Universal Cyclopædia; a scientific and popular treasury of useful knowledge. Illustrated with maps, plans and engravings. Editors in chief, Frederick A. P. Barnard, S. T. D., LL. D., L. H. D., M. N. A. S., President of Columbia College, New York; Arnold Gnyot, Ph. D., LL. D., M. N. A. S., Professor of Geology and Physical Geography, College of New Jersey. Associate Editors—[29 persons, among them Theodore Gill, A. M., M. D., Ph. D., M. N. A. S., Late Senior Assistant Librarian of the Library of Congress]. With numerous contributions from writers of distinguished eminence in every department of letters and science in the United States and in Europe. Complete in four volumes, including appendix. Volume IV, S—Appendix. (Testimonials at the end of the volume.) Alvin J. Johnson & Son, 11 Great Jones Street, New York. MDCCCLXXVIII.

[Contains a description of the family *Catostomidae*, a list of the genera, and a diagnosis of *Myxocyprinus*, gen. nov.]

**JORDAN (David Starr).** Manual of the Vertebrates of the Northern United States, including the district East of the Mississippi River, and North of North Carolina and Tennessee, exclusive of Marine Species, by David Starr Jordan, Ph. D., M. D., Professor of Natural History in Butler University. Second Edition Revised and Enlarged. Chicago: Jansen, McClurg & Company. 1878.

[Descriptions of forty species, referred to eleven genera:—*Lagochila*, *Placopharynx*, *Myxostoma*, *Minytrema* (gen. nov.), *Erimyzon*, *Hypentelium*, *Catostomus*, *Cycleptus*, *Carpiodes*, *Ichthyobus*, and *Bubalichthys*. In the Addenda, the name *Quassilabia* is suggested as a substitute for *Lagochila*.]

**JORDAN (David Starr).** A Catalogue of the Fishes of the Fresh Waters of North America. By David S. Jordan, M. D. < Bulletin IV, Hayden's Geological Survey of the Territories, No. 2, pp. 407-442. Washington, May 3, 1878.

[Fifty-one species enumerated; arranged in thirteen genera, viz:—*Bubalichthys*, *Ichthyobus*, *Carpiodes*, *Cycleptus*, *Pantosteus*, *Catostomus*, *Chasmistes* (gen. nov.), *Erimyzon*, *Minytrema*, *Myxostoma*, *Placopharynx*, and *Quassilabia*.]

— Notes on a Collection of Fishes from the Rio Grande, at Brownsville, Texas. By David S. Jordan, M. D. < Bulletin Hayden's United States Geological and Geographical Survey, vol. iv, No. 2. Washington, May 3, 1878.

[Synonymy and note on *Carpiodes tumidus*.]

— A Catalogue of the Fishes of Illinois, by Prof. David S. Jordan. < Illinois State Laboratory of Natural History. The Natural History of Illinois. Bulletin No. 2. Bloomington, Ill., June, 1878.

[Twenty-three species enumerated, with notes; these are arranged in nine genera.]

**FORBES (S. A.)** The Food of Illinois Fishes by S. A. Forbes. < Bulletin of the Illinois State Laboratory of Natural History, No. 2, 1878.

[Valuable notes on the food of *Catostomidæ*.]

**JORDAN (David Starr).** Notes on a Collection of Fishes from the Rio Grande, at Brownsville, Texas, continued. By D. S. Jordan M. D. < Hayden's Bulletin of the Geological and Geographical Survey of the Territories, vol. iv, No. 3. Washington, July 23, 1878.

[Remarks on the probable identity of *Carpiodes grayi* and *Ietiobus tumidus* with *Carpiodes cyprinus*.]

— Catalogue of the Fishes of Indiana, in Article Pisciculture (by Alexander Heron). < Twenty-seventh Annual Report of the Indiana State Board of Agriculture, 1877. Volume XIX. Indianapolis. 1878.

[Twenty-two species enumerated, referred to ten genera.]

**JORDAN (David Starr) and BRAYTON (Alembert Winthrop).** On the Distribution of the Fishes in the Alleghany Region of South Carolina, Georgia and Tennessee, with Descriptions of New or Little Known Species. By David S. Jordan and Alembert W. Brayton. < Bulletin of the United States National Museum, No. 12. Washington, Government Printing Office, 1878.

[Notes on numerous species.]

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