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

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PREFACE.

The purpose of this paper is to present a series of identifications of the species of fresh-water fishes described by Rafinesque in his "Ichthyologia Ohiensis" and elsewhere, made as a result of nearly three years of "field-work" in the region fished in by Rafinesque. In most cases, fresh specimens have been carefully compared with Rafinesque's accounts, and in the more difficult groups, as the *Cyprinidæ*, *Catostomidæ*, and *Centrarchidæ*, I have taken a full series of the species known to occur in this region and compared Rafinesque's description with each specimen in turn, until one was reached which showed no serious discrepancy.

It is evident that many of Rafinesque's descriptions were drawn up from memory, and that his measurements were made by the eye, without the restraint of a tape-line. He indeed somewhere states that his collections were made in the summer and accounts written up for publication during the winter. As a result of this, the descriptions are often inexact, although usually striking. The numerous misprints in his work are also, in some cases, a source of confusion.

By making due allowance for these facts, and keeping in mind the proposition, unjustly controverted by some writers, that Rafinesque was not altogether a knave nor a fool, I have succeeded in identifying more or less satisfactorily, nearly all of his species, and in restoring to a number of his names their rightful priority.

The species still remaining unidentified are of two sorts: First, species really existing but not distinctively described, as *Luxilus interruptus*, *Rutilus compressus*, etc., in which no really tangible characters are given; and, second, those like *Aplocentrus calliops* and *Pogostoma leucops*, described at second hand from "drawings by Mr. Audubon", presenting, a grouping of characters applicable to no known fish.

It is not my purpose here to enter into any discussion of the merits of Rafinesque's work. That the Ichthyologia has been, and still is, a stumbling-block, is generally admitted. This is partly owing to errors of observation on the part of the author, partly to the admixture of statements derived from memory, imagination, or hearsay with statements of fact, and, finally, in no slight degree to the fact that Rafinesque's

accounts were taken from living fishes, and hence were not to be readily interpreted by workers in the closet with preserved specimens.

In order to do justice to Rafinesque's work, it is necessary, in the words of Girard (Proc. Ac. Nat. Sc. Phil. 1856, 167), "that one should go to the very ground trodden by Rafinesque himself, his book in hand, during all seasons of the year, aye, even for years in succession, to enable us to discriminate between what Rafinesque really observed and what is imaginary".

Rafinesque's work has been well summed up by Professor Agassiz:

"Nothing is more to be regretted for the progress of natural history in this country than that Rafinesque did not put up somewhere a collection of all the genera and species he had established, with well-authenticated labels, or that his contemporaries did not follow in his steps, or at least preserve the tradition of his doings, instead of decrying him and appealing to foreign authority against him. Tracing his course as a naturalist during his residence in this country, it is plain that he alarmed those with whom he had intercourse, by his innovations, and that they preferred to lean upon the authority of the great naturalists of the age, then residing in Europe, who, however, knew little of the special natural history of this country, than to trust a somewhat hasty man who was living among them, and who had collected a vast amount of information from all parts of the States, upon a variety of objects then entirely new to science. From what I can learn of Rafinesque, I am satisfied that he was a better man than he appeared. His misfortune was his prurient desire for novelties and his rashness in publishing them, and yet both in Europe and America he has anticipated most of his contemporaries in the discovery of new genera and species in those departments of science which he has cultivated most perseveringly, and it is but justice to restore them to him, whenever it can be done". (Am. Journ. Sc. Arts, 1854, p. 354.)

In regard to the descriptions of fishes made by Rafinesque from "drawings by Mr. Audubon", I am informed by Dr. Kirtland, on the excellent authority of Dr. Bachman, that several of the monsters described by Rafinesque (such as *Aplocentrus*, *Pogostoma*, *Eurystomus*, etc.) were drawn by Audubon with a view to a practical joke on the too credulous ichthyologist. That being the case, it is but justice to Rafinesque's memory to let those names drop from our systematic lists without prejudice to him.

The work known as the "Ichthyologia Ohiensis" was originally published as a serial in the "Western Review and Miscellaneous Magazine", Lexington, Ky., from December, 1819, to November, 1820. This fact of publication by parts should be kept in mind, as, in one case at least (that of *Aplesion*), it may affect our nomenclature.

The following are the dates of publication, for which I am indebted to Professor Gill:

Vol.	No.	Date.	W. R. & M. M.	I. O.
			Page.	*Page.*
I.	I.	December, 1819	305–313	1–13
	II.	January, 1820	361–377	13–29
	III.	February (?), 1820	?–57	?–37
II.	IV.	April, 1820	169–177	37–45
	V.	May, 1820	?–243	45–53
	VI.	June, 1820	299–307	53–60
	VII.	July, 1820	355–363	61–69
III.	VIII.	October, 1820	165–173	69–77
	IX.	November, 1820	244–252	77–84

Quite a number of genera and species of American fresh-water fishes were described by Rafinesque in other publications previous to the appearance of the Ichthyologia. I give a list of all these known to me, with identifications. I exclude all names merely catalogued without explanation, as having no claims upon our attention. In some cases, a species was catalogued under one name and finally described under some other.

I have next inserted a complete catalogue of Rafinesquian genera, arranged in chronological order, with their equivalents in the nomenclature which I at present adopt.

The body of this paper consists of a list of the genera, subgenera, and species of the Ichthyologia, arranged in the sequence adopted by Rafinesque, with the names, English, Latin, and French, as he gave them, the misprints corrected by him in the "Errata" being here rectified. The page in the Ichthyologia in which each description occurs is added for the benefit of compilers of synonymy. Next comes my identification, with a partial synonymy of the species, the name which I adopt being printed in capitals. In a subsequent paper on the fishes of the Ohio Basin, the synonymy will be given in full, for which reason I have preferred not to insert it here.

In all cases where the recognition of Rafinesque's genera or species will render necessary a change in the current nomenclature, I have added Rafinesque's description as a foot-note, that the reader may see the grounds on which the identification is based. In such cases, I have usually italicized the salient points.

Finally, a list of the species now found in the valley of the Ohio, which do not appear to have been known to Rafinesque, completes the memoir.

This paper was originally prepared for the press in the spring of 1876. Most of the changes in nomenclature here discussed have been adopted by the author in different papers on fishes, and they have generally received the sanction of American workers in ichthyology. The manuscript of the paper has been since retouched, some untenable positions have been abandoned, and some further changes suggested by Professors Cope and Gill have been introduced.

I.—LIST OF RAFINESQUIAN GENERA AND SUBGENERA, WITH THEIR EQUIVALENTS IN THE ADOPTED NOMENCLATURE.

I give here a catalogue in chronological order of the generic and subgeneric names proposed by Rafinesque for our fresh-water fishes, with the type of each where any type is either designated or in any definite way implied, with its equivalence in the nomenclature which the writer at present adopts. The reasons for the use or non-use of these names will appear farther on. Those names originally proposed for subgenera are designated by a star (*).

Rafinesquian genera.	Type species.	Modern genera.
	1818.	
Notropis	atherinoides.	Nototropis (=*Minnilus* =*Alburnellus*).
Glossodon	harengoides.	Hyodon.
Litholepis	adamantinus.	Litholepis (*Atractosteus*).
Dinoctus	truncatus.	Acipenser L.
Pogostoma	leucops.	A myth!
Pomoxis	annularis.	Pomoxys.
Noturus	flavus.	Noturus.
Sarchirus	vittatus.	Lepidosteus.
Exoglossum	lesurianum.	Exoglossum.
Maxillingua*	lesurianum.	Exoglossum.
Hypentelium*	macropterum.	Hypentelium (*Hylomyzon* Ag.).
	1819.	
Aplodinotus	grunniens.	Haploidonotus.
Etheostoma	flabellaris.	Etheostoma (*Catonotus*).
Leucops	leucops.	A myth!
Aplocentrus	calliops.	A myth!
Calliurus	punctulatus.	Micropterus.
Lepomis	auritus L.	Lepiopomus.
Pomotis*	auritus L.	Lepiopomus.

Rafinesquian genera.	Type species.	Modern genera.
Apomotis *	cyanellus.	Apomotis.
Notemigonus	auratus.	Notemigonus (*Stilbe*).
Amphiodon	"alveoides" (alosoides).	Hyodon.
Amblodon	bubalus (teeth of *grunniens*).	Ichthyobus and Haploidonotus.
Cycleptus	nigrescens.	Cycleptus.
Pylodictis	limosus.	Pelodichthys (*Hopladelus*).

1820.

Stizostedion *	salmonea.	Stizostethium
Lepibema *	chrysops.	Roccus Mitchill, 1817.
Pomacampsis *	nigropunctata.	Stizostethium.
Icthelis	auritus L.	Lepiopomus.
Telipomis *	———	Apomotis (*Bryttus* C. & V.).
Aplites *	pallida.	Micropterus Lac.
Nemocampsis *	flexuolaris.	Micropterus Lac.
Dioplites *	salmonea.	Micropterus Lac.
Ambloplites *	ictheloides.	Ambloplites.
Aplesion *	calliura.	Micropterus Lacép.
Diplesion *	blennioides.	Diplesium (*Hyostoma* Ag., 1854).
Pomolobus	chrysochloris.	Pomolobus.
Dorosoma	notata.	Dorysoma (*Chatoëssus* Cuv. & Val., 1829).
Clodalus *	clodalus (Le S.)	Hyodon Le S.
Minnilus	———	Nototrepis.
Alburnus	alburnus L. (European).	Alburnus (Heckel emend., 1843).
Phoxinus	phoxinus L. (European).	Phoxinus (Agassiz emend., 184–).
Dobula	dobula L. (European).	? Squalius Bonaparte, 1841.
Hemiplus (181–).	—— (European ?).	———.
Luxilus	chrysocephalus.	Luxilus (*Hypsilepis* Baird, 1854).

Rafinesquian genera.	Type species.	Modern genera.
Chrosomus	erythrogaster.	Chrosomus.
Semotilus	dorsalis.	Semotilus.
Rutilus	rutilus L. (European).	Leuciscus Klein, 17—.
Plargyrus	rutilus L.	Leuciscus.
Pimephales	promelas.	Pimephales.
Moxostoma *	anisurus.	Myxostoma (*Ptychostomus*).
Ictiobus *	bubalus.	Ichthyobus.
Carpiodes *	———	Carpiodes.
Teretulus *	———	Myxostoma.
Eurystomus *	megastomus.	? A myth.
Decactylus *	———	Catostomus, etc.
Cycleptus	nigrescens.	Cycleptus.
Ictalurus *	———	Ichthælurus.
Elliops *	maculatus.	Ichthælurus.
Ameiurus *	———	Amiurus.
Ilictis *	limosus.	Pelodichthys.
Leptops *	viscosus.	Pelodichthys.
Opladelus *	nebulosus.	Pelodichthys.
Picorellus *	vittatus.	Esox.
Cylindrosteus *	platostomus.	Lepidosteus.
Atractosteus *	ferox.	Litholepis, 1818.
Sturio *	———	Acipenser L.
Sterletus *	serotinus.	Acipenser L.
Dinectus	truncatus.	Acipenser L.
Pegedictis	ictalops.	Etheostoma (*Catonotus*).
Proceros	maculatus.	A myth.

II.—LIST OF SPECIES DESCRIBED PRIOR TO THE ICHTHYOLOGIA OHIENSIS.

I give here a list of the papers known to me in which descriptions by Rafinesque, prior to those in the Ichthyologia, occur, with the names of the species so described, the page on which the descriptions occur, and my identification of the species.

*I. "Précis des Découvertes Somiologiques", 1814:

Sparus mocasinus ..... 19=Eupomotis aureus (Walb.) G. & J.
Centropomus albus .... 19=Morone americana (Gmel.) Gill.
Centropomus luteus .... 19=Perca americana Schranck.

II. Dissertation on Water Snakes, Sea Snakes and Sea Serpents. <American Monthly Magazine and Critical Review, September, 1817:

Anguilla gigas ..... 434=A myth.

III. First Decade of new North American Fishes. <American Monthly Magazine and Critical Review, December, 1817:

Anguilla chrisypa..... 120=Anguilla vulgaris Fleming.
Salmo pallidus ..... 120=Salmo namaycush Bloch.
Bodianus rupestris.... 120=Ambloplites rupestris (Raf.) Gill.
Bodianus achigan..... 120=Micropterus salmoides (Lac.) Gill.
Cyprinus bullaris..... 120=Leucosomus bullaris (Raf.) Jor. (*Semotilus argenteus* Auct.)
Cyprinus hemiplus.... 121=Notemigonus americanus (L.) Jor.
Cyprinus vittatus..... 121=Rhinichthys atronasus (Mit.) Ag.
Cyprinus megalops.... 121=Luxilus cornutus (Mit.) Jor.
Cyprinus melanurus... 121=Luxilus cornutus (Mit.) Jor.

IV. Description of two new Genera of North American Fishes, Opsanus and Notropis. <American Monthly Magazine, January, 1818:

Notropis atherinoides.. 204=Nototropis sp. (*Minnilus* Raf.=*Alburnellus* Grd.).

V. Second Decade of new North American Fishes. <American Monthly Magazine, January, 1818:

Perca mucronata..... 204=Morone americana (Gmel.) Gill.
Perca notata..... 205=Perca americana Schranck (=*Perca flavescens* Auct.)
Petromyzon leucopterus 205=Ammocœtes nigricans (Le S.) Gill.
Sparus erythrops..... 205 (Erroneous and unidentifiable.)

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*I have been unable to obtain this paper. Professor Gill informs me that two or three other American species are described in it, among them *Perca americana* Schranck.

VI. 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, September, 1818. *(Twenty-six species recorded, the following described at some length:)

Glossodon harengoides. 354=Hyodon tergisus Le Sueur.
Glossodon heterurus... 354=Hyodon tergisus Le Sueur.
Perca salmonea..... 354=Stizostethium salmoneum Raf.
Sciæna caprodes..... 354=Percina caprodes (Raf.) Grd.
Silurus punctatus..... 354=Ichthælurus punctatus (Raf.) Jor.
Silurus olivaris..... 354=Pelodichthys olivaris (Raf.) Gill & Jor.
Catostomus bubalus... 354=Ichthyobus bubalus Raf.
Catostomus erythrurus. 354=Myxostoma duquesnii (Le S.) Jor.
Clupea heterurus..... 354=Dorysoma cepediana heterura (Raf.) Jor.

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* The following is the catalogue as given in this paper:

Perca salmonea	Salmon.
Perca chrysops	Rockfish.
Sciæna grunniens	White Perch.
Sciæna caprodes	Hog Fish.
Bodianus calliurus	Bass.
Sparus cyanelus	Sun Fish.
Sparus nigropunctatus	Bachelor Perch.
Silurus punctatus	Mud Cat Fish.
Silurus olivaris	Yellow Cat Fish.
Silurus amblodon	Black Cat Fish.
Catostomus bubalus	Buffaloe Fish.
Catostomus erythrurus	Red Horse.
Catostomus macropterus	Carp.
Catostomus duquesnei	Sucker.
Clupea heterurus	Gizzard.
Clupea alosoides	Shad.
Glossodon harengoides	Spring Herring.
Glossodon heterurus	Summer Herring.
Hydrargyra dinema	Minny.
Hydrargyra notata	Chub.
Hydrargyra amblops	White Chub.
Lepisosteus fluviatilis	Gar Fish.
Polyodon folium	Shovel Fish.
Polyodon pristis	Spade Fish.
Acipenser platorynchus	Sturgeon.
Silurus pallidus	White Cat.

Not seen yet: Pike, Eels, Lamprey, Black Perch, Yellow Perch, Red Perch.

VII. Further discoveries in Natural History, made during a journey through the Western Region of the United States, by Constantine Samuel Rafinesque, esq. <American Monthly Magazine and Critical Review, October, p. 445. (Describes new genera *Litholepis*, *Dinoctus* and *Pogostoma*, and mentions without description the typical species of each.)

Twenty-two species are catalogued and three species are described, as follows:*

Anguilla laticauda	445=Anguilla vulgaris Fleming.
Esox vittatus	445=Unidentified.
Bodianus calliops.....	445=A myth.

VIII. Further account of Discoveries in Natural History in the Western States, by Constantine Samuel Rafinesque, esq. Communicated in a letter from that gentleman to the editor, Lexington, October 5, 1818. <American Monthly Magazine and Critical Review, November, 1818. (Three new genera described and the typical species of each:)

Pomoxis annularis.....	41=Pomoxys annularis.
Noturus flavus	41=Noturus flavus Raf.
Sarchirus vittatus	41=Lepidosteus osseus (L.) Ag.

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* The following are the species added to the catalogue in this paper:

Lepisosteus platostomus.....	Alligator Fish.
Lepisosteus stenorhynchus.....	Gar Fish.
Anguilla laticauda.....	Ohio Eel.
Cyprinus fasciolaris	Mullet.
Cyprinus trachiaphas.....	Brown Mullet.
Exoglossum argentum	White Chub.
Olmerus albula	White Fish.
Bodianus calliops	Bride Perch.
Pogostoma leucops	White Eye.
Esox vittatus	Jack Pike.
Esox fasciolaris	Salmon Pike.
Catostomus amisopterus.....	Perch Buffalo.
Catostomus amblodon	Black Buffalo.
Catostomus velifer	Sailor Fish.
Glossodon chrysops	Gold Eye Herring.
Clupea chrysochloris.....	Golden Shad.
Silurus pallidus	White Cat Fish.
Silurus cerulescens	Blue Cat Fish.
Glanis limosus.....	Mud Cat Fish.
Accipenser heptipus.....	Brown Sturgeon.
Dinoctus truncatus.....	Blunt-nose Sturgeon.
Litholepis adamantinus	Diamond Fish or Devil Jack.

IX. Description of three new Genera of Fluviatile Fish, Pomoxis, Sarchirus, and Exoglossum. <Journal of Philadelphia Academy of Natural Sciences, November, 1818.

Pomoxis annularis..... 417=Pomoxys annularis Raf.
Sarchirus vittatus .... 419=Lepidosteus osseus (Lac.) Ag. (juv.)
Exoglossum macropterum ..... 420=Hypentelium nigricans (Le S.) Jor.
Exoglossum annulatum 421=Exoglossum maxillingua (Le S.) Hald.
Exoglossum nigrescens. 422=Exoglossum maxillingua.
Exoglossum lesurianum. 420=Exoglossum maxillingua.

X. Description of a new Genus of Fresh-Water Fish, Exoglossum. <Silliman's American Journal of Science and Arts, 1819.

Exoglossum vittatum .. 156=Exoglossum maxillingua.
Exoglossum annulatum. 156=Exoglossum maxillingua.

XI. Prodrome de 70 nouveaux Genres d'Animaux découverts dans l'intérieur des États-Unis d'Amérique durant l'année 1818. <Journal de Physique, de Chymie et d'Histoire Naturelle, June, 1819.

Aplodinotus grunniens. 419=Haploidonotus grunniens Raf.
Etheostoma flabellaris.. 419=Etheostoma flabellaris Raf. (*Catonotus* Ag.).
Etheostoma caprodes... 419=Percina caprodes (Raf.) Grd.
Etheostoma blennioides. 419=Diplesium blennioides (Raf.) Jor.
Pogostoma leucops..... 419=A myth!
Aplocentrus calliops... 420=A myth!
Calliurus punctulatus.. 420=Micropterus salmoides (Lac.) Gill.
Lepomis cyanellus .... 420=Apomotis cyanellus (Raf.) Cope & Jor. (*Bryttus mineopas* Cope).
Lepomis macrochirus .. 420=Lepiopomus macrochirus Raf. (*nephelus* Cope).
Notemigonus auratus... 421=Notemigonus americanus (Lac.) Jor.
Amphiodon alveoides.. 421=Hyodon tergisus Le S.
Amblodon bubalus..... 421=Ichthyobus bubalus (Raf.) Ag. (in part).
Amblodon niger..... 421=Bubalichthys niger (Raf.) Ag.

Cycleptus nigrescens... 421=Cycleptus elongatus (Le S.) Ag.
Noturus luteus..... 421=Noturus flavus Raf.
Pilodictis limosus..... 422=Pelodichthys olivaris (Raf.) Gill & Jor.
Litholepis adamantinus. 422=Litholepis spatula (Lac.) Jor.

XII. Description of the Silures or Cat-Fishes of the River Ohio, by C. S. Rafinesque, Professor of Botany in the Transylvania University of Lexington, Kentucky. <Quarterly Journal of Science, Literature and Arts, Royal Institution, London, 1820, ix.

Silurus maculatus.. ... 48=Ichthælurus punctatus (Raf.) Jor.
var. erythroptera..... 49=Ichthælurus punctatus (Raf.) Jor.
Silurus pallidus ..... 49=Ichthælurus punctatus.
var. marginatus ..... 49=Ichthælurus punctatus.
var. lateralis ..... 49=Ichthælurus punctatus.
var. leucoptera. ..... 49=Ichthælurus punctatus.
Silurus cerulescens..... 49=Ichthælurus punctatus.
var. melanurus..... 49=Ichthælurus punctatus.
Silurus argentinus..... 50=Ichthælurus punctatus.
Silurus nebulosus..... 50=Pelodichthys olivaris (Raf.) G. & J.
Silurus viscosus..... 50=Pelodichthys olivaris.
Silurus lividus..... 51=Amiurus lividus (Raf.) Jor.
var. fuscatus..... 51=Amiurus lividus.
Silurus melas..... 51=Amiurus melas (Raf.) Jor. & Copeland.
Silurus cupreus..... 51=Amiurus lividus cupreus (Raf.) Jor.
Silurus xanthocephalus.. 51=Amiurus xanthocephalus (Raf.) Gill.
Silurus limosus..... 51=Pelodichthys olivaris.

III.—ICHTHYOLOGIA OHIENSIS.

Ichthyologia Ohiensis | or | Natural History | of | the Fishes Inhabiting the | River Ohio | and its Tributary Streams | Preceded by a physical description of the Ohio and its branches | by C. S. Rafinesque, | — | Professor of Botany and Natural History in Transylvania University, Author of the Analysis of Nature, &c., &c., member of the Literary and Philosophical Society of New York, the Historical Society of New York, the Lyceum of Natural History of New York, the Academy of Sciences of Philadelphia, the American Antiquarian Society, the Royal Institute of Natural Sciences of Naples, the Italian Society of Arts and Sciences, the Medical Societies of Lexington and Cin-

cinnati, &c., &c. | — | The art of seeing well, or of noticing and distinguishing with accuracy the objects which we perceive is a high faculty of the mind, unfolded in few individuals, and despised by those who can neither acquire it, nor appreciate its results | — | Lexington, Kentucky | printed for the Author by W. G. Hunt (price one dollar). | — | 1820 | (1 vol., 8vo, 90 pp.)

On the reverse of the title-page:

These Pages | and the Discoveries which they contain | in one of the principal Branches | of Natural History, | are respectfully Inscribed | by the Author | To his fellow-labourers in the same field of Science | Prof. Samuel L. Mitchill, M. D. | who has described the Atlantic Fishes of New York, | and to | C. A. Le Sueur, | who was the first to explore the Ichthyology of the Great American Lakes, &c. | In Token | of Friendship, Respect, and Congratulation.

I. Genus, PERCH, PERCA, Perche. (p. 20.)

1st species, Salmon-Perch, PERCA SALMONEA, Perche Saumone. (p. 21.)

STIZOSTETHIUM SALMONEUM Raf., Cope, etc.

A fair description, as Professor Cope has shown. This fish is probably distinct from *S. vitreum*, although the two species are closely related. On page 23, Rafinesque suggests that *P. salmonea* forms a peculiar subgenus or genus which may be called *Stizostedion*. This name antedates *Lucioperca* of Cuvier, and has been generally adopted by recent American authors.

2d species, Golden-Eyes Perch, PERCA CHRYSOPS, Perche-œuil-d'or. (p. 22.)

ROCCUS CHRYSOPS (Raf.) Gill.

Description not quite accurate but recognizable. On page 23 the subgeneric name of *Lepibema* is proposed for it, but *Roccus* of Mitchill is older. *Lepibema* may be retained as the name of a subgenus of *Roccus*, the body being shorter and deeper and the dentition somewhat dif ferent.

3d species, Black-dotted Perch, PERCA NIGROPUNCTATA, Perche a points-noirs. (p. 23.)

An unrecognizable description, based, as nearly all of Rafinesque's worst descriptions are, "on a drawing" of Mr. Audubon. The original may have been *Percina caprodes*, *Stizostethium canadense*, or nothing. Rafinesque proposes for it the generic name of *Pomacampsis*.

II. Genus, BUBBLER, AMBLODON, Amblodon. (p. 24.)

=*Aplodinotus* Rafinesque, 1819.

=*Haploidonotus* Gill, 1861.

4th species, Grunting Bubbler, AMBLODON GRUNNIENS, Amblodon grognant. (p. 24.)

HAPLOIDONOTUS GRUNNIENS Raf.

Corvina oscula Cuv. & Val., 1830.

Corvina grisea Dekay, 1842.

Amblodon grunniens Agassiz, 1854.

A very good description.

III. Genus, PAINTED TAIL, Calliure. (p. 26.)

Micropterus Lacépède, not *Calliurus* Agassiz, Girard, etc. = *Chænobryttus* Gill.

5th species, Dotted Painted Tail, CALLIURUS PUNCTULATUS, Calliure pointille.

MICROPTERUS SALMOIDES (Lacép.) Gill.

The peculiar coloration of the caudal fin which suggested the name *Calliurus*, "base yellow, middle blackish, tip white", belongs among Ohio fishes only to the young of the Black Bass. *Calliurus*, therefore, as shown by Professor Gill, is a synonym of *Micropterus*, and cannot be applied to a distinct genus.

IV. Genus, SUNFISH, ICTHELIS, Icthele. (p. 27.)

=LEPOMIS Raf., 1819.

1st subgenus, TELIPOMIS. (p. 27.)

=APOMOTIS Raf., 1819=Bryttus C. & V., 1831.

*** 6th species, Gilded Sunfish, ICTHELIS MACROCHIRA, Icthele macrochire.** (p. 27.)

LEPIOPOMUS MACROCHIRUS Raf.

Lepomis nephelus Cope.

This description applies perfectly to *Lepomis nephelus* Cope, a rather

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* Body oval, oblong, *gilt, crowded* with *small brown dotts;* head *small,* scaly, opercule flexuose, spot *narrow, marginal,* and *black; jaws equal;* tail forked; *pectoral fins long and narrow, reaching the anal fin,* which has 13 rays, whereof 3 are spiny.

A *pretty* species from three to four inches long. In the Ohio, Green River, Wabash, &c. Names, Sun-fish, Gold-fish, &c. Head *rather acute,* not scaly before the eyes. Iris gilt brown. Dorsal fin with 22 *long* rays, whereof 11 are spiny; a depression between the two sorts of rays. Anal fin broad and rounded. Tail 20 rays. Thoracic 1 and 5. Pectoral 15. Diameter of the body nearly one-fourth of total length (with caudal).

common species in Southern Ohio and Indiana. *Pomotis macrochira* Kirtland is based, in part at least, on *Lepomis pallidus* (Mitch.). *Ichthelis macrochira* Jordan (Man. Vert.) is a *Xenotis*, to which I have since given the name of *X. aureolus*.

* 7th species, Blue Sunfish, ICTHELIS CYANELLA, Icthele bleuatre.

APOMOTIS CYANELLUS Raf.

Bryttus punctatus Cuv. & Val.
Calliurus longulus Girard.
Calliurus formosus Girard.
Calliurus longulus Bliss (*in lit.*—specimens identified).
Chænobryttus mineopas Cope.
Icthelis melanops Raf. (*Chænobryttus melanops* Cope, not of Gill.)

Rafinesque's description, although erroneous in one or two particulars, refers to a species of *Apomotis*, and the name *cyanella* has priority over all others. As in nearly every case the "diameter" is made too small; evidently Rafinesque trusted his eyes in such cases instead of a tape-line.

† 8th species, Black-Eye Sunfish, ICTHELIS MELANOPS, Icthele æuil-noir.

APOMOTIS CYANELLUS Raf.

Description somewhat erroneous, but characteristic.

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* Body *elliptical, elongate*, diameter one-fifth, *olivaceous gilt, crowded* with irregular *blue dotts; brownish above; head elongate, lower jaw longer, cheeks with blue flexuose lines; spot oblong, blackish, nearly marginal;* tail rounded, notched; anal fin very broad with 12 rays, whereof three are short spiny; pectoral fins very short.

A small species hardly three inches, called Blue-fish or Sun-fish. I found it on the Ohio at the falls. *Appearing entirely blue at a distance.* Head brown above; iris gilt; opercle curved; tail olive-blue with 24 rays. Dorsal fin brownish with 20 rays, whereof 10 are spiny, hardly any middle depression. Pectorals small trapezoidal, 12 rays. Thoracic one and five.

† *Body oblong, diameter one-fourth, olivaceous, covered with blue dotts,* neck brown above, head large, mouth *rather large,* upper jaw longer; *opercule with blue curved and longitudinal* lines beneath; spot *rounded, black at its* base; fins olivaceous, tail bilobed; anal fin with three and nine rays; pectoral fins large oboval.

Length from 2 to 6 inches; common in the tributary streams of the Ohio, the Kentucky, Licking, Miami, &c., and even in small creeks. Vulgar names, Blue-fish, Black-eyes, Sun-fish, Blue-bass, &c. It has black eyes (pupils) like all the other species, but the iris is black also, with a silvery hue or ring. Dorsal fin with 10 and 10 rays, *the spiny ones very short.* Caudal 20. Pectoral 16. Thoracic 1 and 5 as usual, but the spiny ray is very short, as are also those of the anal fin.

2d subgenus, **POMOTIS.** (p. 28.)

9th species, Red-Eye Sunfish, ICTHELIS ERYTHROPS, Icthele œuil-rouge. (p. 29.)

AMPLOPLITES RUPESTRIS (Raf.) Gill.

Bodianus rupestris Rafinesque, 1818.

Description fair. The name *Pomotis*, first proposed in 1819, is a mere synonym of *Lepomis*.

*** 10th species, Eared Sunfish, ICTHELIS AURITA, Icthele oreilleuse.**

XENOTIS LYTHROCHLORIS Jordan. *nom. sp. nov.*

Not *Pomotis auritus* ("L.") Günther.

= *Lepomis auritus* Cope. (Not of Raf. 1818.)

11th species, Big-Ear Sunfish, ICTHELIS MEGALOTIS, † Icthele megalote. (p. 29.)

XENOTIS MEGALOTIS (Raf.) Jordan.

Pomotis nitidus Kirtland.

Not *Ichthelis incisor* (C. & V.) Holbr.

Not *Lepomis megalotis* Cope.

Ichthelis megalotis Raf., Bliss (*in lit.*).

Description pretty good. This cannot be the *Lepiopomus pallidus* (*incisor*), as has been supposed by Professor Cope.

V. Genus, RIVER-BASS, LEPOMIS, Lepome. (p. 30.)

= *Micropterus* Lacépède.

Not *Lepomis* Raf., 1819.

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* Body *oval elliptic* (diameter one-third), *olivaceous with blue and rufous dots;* head small, jaws equal, opercule flexuose, appendage *black, broad and truncate, some blue flexuose lines on the side of the head;* tail brownish lunulate; back brownish; anal fin 3 and 9; pectorals not reaching the vent. Thoracics mucronate.

Length from 3 to 12 inches; common in the rivers, creeks, and ponds of Kentucky. Vulgar name, Sunfish. Iris brown. Dorsal fin brownish, 10 and 10, *spiny rays shorter*, thoracic fins very long; spiny rays rather shorter, first soft ray mucronate; pectorals nearly rhomboidal with 14 rays, tail 16 rays.

† Body oval, rounded (diameter two-fifths), *chestnut color with blue dots, belly red;* head large, lower jaw longer, *opercule with blue flexuose lines, appendage black, very large elliptic*, end rounded; tail black, slightly forked, pectoral large, reaching the vent; anal fin 3 and 9; thoracics long and mucronate; black tail.

A fine species, called Red-belly, Black-ears, Black-tail Sun-fish, &c. It lives in the Kentucky, Licking, and Sandy Rivers, &c. Length from 4 to 8 inches. *Head very sloping*, iris silvery brown, *belly of a bright copper red color.* All the *fins black* except the pectorals, which are olivaceous, trapezoidal, acute and large. The dorsal has 20 rays, whereof 9 *short* ones are spiny. *Body very short, hardly as long as broad, if the head and tail are deducted.* Thoracics like those of the foregoing species.

1st subgenus, APLITES. (p. 30.)

12th species, Pale River-Bass, LEPOMIS PALLIDA, Lepome pale. (p. 30.)

MICROPTERUS PALLIDUS (Raf.) Gill & Jordan.

(Young; "length 6 to 12 inches".)

= *Micropterus nigricans* (C. & V.) Gill.

= *M. floridanus* (Le S.) Goode.

13th species, Streaked-Cheeks, River-Bass, LEPOMIS TRIFASCIATA, Lepome trifasciee. (p. 31.)

MICROPTERUS SALMOIDES (Lac.) Gill. ("Over a foot in length".)

14th species, Brown River-Bass, LEPOMIS FLEXUOLARIS, Lepome flexueux. (p. 31.)

MICROPTERUS SALMOIDES. (Adult; "reaching the length of 2 feet".)

This is made to form another subgenus, *Nemocampsis*.

2d Subgenus, DIOPLITES. (p. 32.)

15th species, Trout River-Bass, LEPOMIS SALMONEA, Lepome saumone. (p. 32.)

MICROPTERUS SALMOIDES. ("Length 6 to 24 inches".)

16th species, Spotted River-Bass, LEPOMIS NOTATA, Lepome tache. (p. 32.)

MICROPTERUS SALMOIDES. ("3 to 8 inches long".)

17th species, Sunfish River-Bass, LEPOMIS ICTHELOIDES, Lepome ictheloide. (p. 32.)

Ambloplites ichtheloides Ag.

AMBLOPLITES RUPESTRIS (Raf.) Gill.

This is made to "almost form a peculiar subgenus", termed *Ambloplites*.

VI. Genus, POMOXIS, POMOXIS, Pomoxe. (p. 33.)

= *Pomoxis* Agassiz.

18th species, Gold-Ring Pomoxis, POMOXIS ANNULARIS, Pomoxe annulaire. (p. 33.)

POMOXYS ANNULARIS Raf.

Cichla storeria Kirtland.

Pomoxys storerius, intermedius, protacanthus, and *brevicauda* Gill.

Description not entirely accurate, but certainly sufficient for identification. This fish is now, as in Rafinesque's time, abundant at the Falls of the Ohio, where it is now called "Bachelor". Throughout Kentucky it is known as the "New Light", and sometimes as "Campbellite". The characters assumed to distinguish *intermedius, protacanthus*, etc., are entirely within the bounds of individual variation.

VII. Genus, RED-EYE, APLOCENTRUS, Aplocentre. (p. 31.)

19th species, Ohio Red-Eye, APLOCENTRUS CALLIOPS, Aplocentre belœuil. (p. 31.)

A myth, described from a drawing by Mr. Audubon. Its characters would indicate a sort of Sunfish with a dorsal fin resembling that of *Coryphæna*, "beginning behind the head with a single long, spiny ray, and ending close to the tail".

The name "Red-Eye" in the region which this fish is supposed to inhabit is chiefly applied to the Rock-Bass (*Ambloplites rupestris*).

VIII. Genus, BARBOT, POGOSTOMA, Barbotte. (p. 34.)

20th species, White-Eyes Barbot, POGOSTOMA LEUCOPS, Barbotte œuilblanc. (p. 35.)

Another mythical species, "described from a drawing of Mr. Audubon" It is a toothless Sunfish, with two small distant dorsal fins, and six barbels about the mouth. Whatever it is, it has probably no longer "a great many vulgar names, such as White-Eyes, Spectacles-Fish, Streaked Sunfish, Black Sunfish, Barbot, Bearded Sunfish, etc.". Nor do the French settlers call it "Barbotte, Poisson Lunette, and Œuil-Blanc". There is no sort of foundation for Professor Agassiz's assertion that "*Pogostoma* is evidently synonymous with *Lota*".

IX. Genus, HOGFISH, ETHEOSTOMA, Etheostome. (p. 35.)

=*Pegedictis* Raf., 1820.

=*Catonotus* Ag., 1854.

=*Etheostoma* Gill. & Jordan emend., 1877.

1st subgenus, APLESION. (p. 36.)

= MICROPTERUS Lacépède.

21st species, Bass Hogfish, ETHEOSTOMA CALLIURA, Etheostome calliure. (p. 36.)

MICROPTERUS SALMOIDES. (Young, 3 to 9 inches long.)

"It has some similarity with the *Lepomis flexuolaris*, and some other River-Bass".—(Raf.)

22nd species, Fantail Hogfish, ETHEOSTOMA FLABELLATA, Etheostome eventail. (p. 36.)

ETHEOSTOMA FLABELLARIS Raf.

Etheostoma flabellaris Raf., 1819.

Catonotus flabellatus Auct.

Description fair. The genus *Etheostoma* was based originally on this

species, *E. blennioides*, and *E. caprodes*. The original diagnosis was drawn from *E. flabellaris*, and the subsequent subtraction of the two latter as *Diplesium* leaves the name properly to be retained here.

***23d species, Black Hogfish, ETHEOSTOMA NIGRA, Etheostome noire.** (p. 37.)

BOLEOSOMA NIGRA (Raf.) Jordan.

Boleosoma maculatum Agassiz.
Boleosoma brevipinne Cope.
Not *Nothonotus maculatus* Agassiz.
Not *Pœcilichthys camurus* Cope.

Description not very good, but I have little hesitation in making the above identification, as the colors of the males of this species in spring are often so intense in life as to give the impression of a truly black fish. The small, dark spots, obvious on close inspection, may be readily overlooked.

The name *Aplesium* cannot be retained for this genus, as in the number of the Western Miscellaneous Mag. in which *Aplesion* was first proposed this species was not included.

I am now convinced that my previous identification of *Etheostoma nigra* with *Pœcilichthys camurus* Cope and *Etheostoma maculatum* Kirt. is erroneous.

†2d subgenus, DIPLESION. (p. 37.)

‡24th species, Blunt-Nose Hogfish, ETHEOSTOMA BLENNIOIDES, Etheostome blennioide. (p. 37.)

DIPLESIUM BLENNIOIDES Raf.

Etheostoma blennioides Kirtland (description but not figure), (not of Agassiz and late authors).
Pileoma cymatogramma Abbott.
Hyostoma cymatogrammum Cope.

Rafinesque's description cannot refer to the "*E. blennioides* Raf." of Agassiz and recent authors (=*Alvordius aspro* Cope and Jor.). The

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* Entirely *black*, pale beneath; scales smooth, *lateral line streight, mouth rather beneath, forehead rounded, upper jaw longer;* preopercule rounded, *spine acute;* vent rather anterior; tail entire nearly truncate.

From one to two inches long. Observed in Green River. Vulgar name Black Minny. Iris black, silvery, and small. Diameter one-seventh of the length, without spots. Head small. Pectoral fins oboval. Tail 20. *Anal fin* 2 *and* 8. *Dorsal* 10 *and* 12.

† Dorsal fin nearly double, divided into two joining parts. Meaning nearly double.

‡ Body elongate, breadth one-eighth of the length, *olivaceous, almost diaphanous, some brown spots on the back, and some brown geminate transversal lines across the lateral line,*

beautiful and singular coloration of that species—a chain of rounded, confluent, black blotches on a yellowish ground—would surely have been noticed. Moreover, the pattern of color of Rafinesque's fish is exactly that of a young "*Hyostoma cymatogrammum*". Furthermore, the characters "head small", "snout rounded", "mouth small, beneath", "cheeks swelled", "dorsal 13 and 13", "a brown stripe upon it", etc., apply perfectly to the "*Hyostoma*" and not to the "*Etheostoma*". In the streams where Rafinesque collected, I find the former species much the more abundant.

25th species, Common Hogfish, ETHEOSTOMA CAPRODES, Etheostome capros. (p. 38.)

PERCINA CAPRODES (Raf.) Girard.

Description good.

X. Genus, GOLDSHAD, POMOLOBUS, Pomolobe. (p. 38.)

<*Alosa* of authors.
=*Pomolobus* Gill.

26th species, Ohio Goldshad, POMOLOBUS CHRYSOCHLORIS, Pomolobe dore. (p. 39.)

POMOLOBUS CHRYSOCHLORIS Raf., Gill., and late authors.

Description good.

XI. Genus, GIZZARD, DOROSOMA, Dorosome. (p. 39.)

=*Chatoëssus* Cuvier and most authors.
=*Dorosoma* Gill.

27th species, Spotted Gizzard, DOROSOMA NOTATA, Dorosoma tache. (p. 40.)

DORYSOMA HETERURA (Raf.) Jor.

Clupea heterurus Raf., 1818.
Chatoëssus ellipticus Kirtland.

Good description of a young specimen.

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which is straight, but raised at the base. *Head small, snout rounded, mouth small beneath, lower jaw shorter;* opercule angular, spine acute; scales ciliated, pectoral fins elongate, tail also, and bilobed at the end.

A strange species, which has the appearance, head and spots of many Blennies. Length 2 or 3 inches, and slender. Seen in the Ohio, Wabash, Muskingum, &c. Color *pale*, sometimes *fulvous, whitish beneath. Cheeks swelled* and smooth, preopercule simple arched, opercule quite angular; iris large and blackish; scales roughened by the ciliation. *Dorsal fin* 13 *and* 13, beginning above the middle of the pectorals and ending with the anal, *one faint, longitudinal brown stripe on it.* Tail 20 rays, with many small transversal lines. Vent medial. Anal fin 2 and 8. Pectoral fins 16, oblong acute.

*XII. Genus, GOLD HERRING, NOTEMIGONUS, Notemigone. (p. 40.)

<*Abramis* Cuvier and many authors (not type).

=*Stilbe* Dekay (pre-occupied in botany).

=*Stilbius* Gill.

=*Luxilus* Girard (not of Rafinesque=*Hypsilepis*).

=*Leucosomus* Storer (not of Heckel).

=*Plargyrus* Putnam (not of Rafinesque, etc.).

†28th species, Ohio Gold Herring, NOTEMIGONUS AURATUS, Notemigone dore. (p. 40.)

NOTEMIGONUS AMERICANUS (L.) Jordan.

Cyprinus americanus Linnæus.

Stilbe chrysoleuca (Mit.) Dek.

Stilbe americana (L.) Cope.

Abramis americanus (L.) Günther.

A very good description, correct in every particular. This fish is rarely or never called Shiner in the Ohio Basin, and it is very often considered by the fisherman as a Shad. If this genus be really distinct from the European *Abramis*, as its serrated teeth indicate, the generic name of *Notemigonus* must be adopted.

XIII. Genus, FALSE HERRING, HYODON, Hyodon. (p. 41.)

1st subgenus, AMPHIODON. (p. 41.)

29th species, Toothed False Herring, HYODON AMPHIODON, Do. (*sic.*) (p. 42.)

HYODON TERGISUS Le Sueur.

It is now generally conceded that there is but one species of *Hyodon*. I find some variation in form of body and number of fin-rays in specimens from different waters, but nothing indicating specific distinction. No author, so far as I know, has paid any attention to the numerous

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* Body fusiform, compressed, scaly. Vent posterior. Abdomen *obtusely carinated, not serrate; back similar before the dorsal fin.* Head scaleless, *mouth small, without teeth, lower jaw longer;* gill-cover double, opercule simple. Abdominal fins with nine rays and *no lateral appendage. Dorsal fin behind them above the vent.* This genus differs from *Clupea* by the carinated back and belly, *without serratures*, and the posterior dorsal. The name means back half angular. 14th G. of my Prodr. N. G. Animals.

† Back *gilt olivaceous, remainder gilt silvery;* fins yellow; lateral line following the curve of the belly; *dorsal with* 9 *rays, anal with* 12; tail equally forked.

Length from 4 to 8 inches, diameter one-fifth of the total length. Iris gilt. Tongue short, toothless. Scales large, radiating with nerves. Head convex above and small. Dorsal fin broad trapezoidal, the first ray longer. Anal broad also, but not so much. Pectoral small with 16 rays. Tail 24. Not uncommon in the Ohio, Kentucky, Miami, &c. The vulgar names are Gold Herring and Yellow Herring. It appears in the fall. It does not bite at the hook. Flesh pretty good.

species of Rafinesque. The name *Glossodon* was published by Rafinesque for this genus in September, 1818, within a few days of the publication of *Hiodon* by Le Sueur. It is not known which has priority, but as Le Sueur's paper was first *written*, and as his name has come into common use, it is probably best to retain it.

30th species, Summer False Herring, **HYODON HETERURUS**, Hyodon heterure. (p. 42.)

2d subgenus, **GLOSSODON.** (p. 42.)

31st species, Summer False Herring, **HYODON VERNALIS**, Hyodon printanier. (p. 43.)

3d subgenus, **CLODALUS.** (p. 43.)

32d species, May False Herring, **HYODON CLODALUS**, Hyodon de May. (p. 43.)

33d species, Lake False Herring, **HYODON TERGISUS**, Hyodon lacustre. (p. 43.)

XIV. Genus, **TROUT SALMO**, Truite. (p. 44.)

34th species, Alleghany Trout, **SALMO ALLEGANIENSIS**, Truite alleganienne. (p. 44.)

SALMO FONTINALIS Mitchill.

35th species, Black Trout, **SALMO NIGRESCENS**, Truite noiratre. (p. 45.)

SALMO FONTINALIS Mitchill.

* XV. Genus, **MINNY, MINNILUS**, Minny. (p. 45.)

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* Body elongated, somewhat compressed, covered with small scales. Vent medial Head flat above, and somewhat shielded. Gill-cover double, scaleless, three branchial rays. Mouth diagonal, small, toothless and beardless, without lips, lower jaw shorter and narrower. A small trapezoidal dorsal fin, nearer to the head than to the tail, opposite to the abdominal fins, and without spines. Abdominal fins with eight rays, and without appendages. (Tail forked in all the Ohio species.)

There are in the United States more than fifty species of small fresh-water fishes (and in the Ohio waters more than sixteen species), commonly called Minnies, Minnows, Bait-fish, Chubs, and Shiners, which should belong to the genus *Cyprinus* of Linnæus, or, rather, to the part of it which has been called *Leuciscus* by Klein and Cuvier; which subgenus (or genus) is distinguished by a small dorsal fin, no spines nor beards; but as the genus *Cyprinus* forms now a large family, and even the genus *Leuciscus* must be divided, since it contains more than one hundred anomalous species, differing in the position of the dorsal fin and the vent, the number of rays to the abdominal fins, &c., I venture to propose this and the three following genera. Three other different genera might be established upon the European species, distinguished as follows:

Dobula. Dorsal fin nearer to the tail, abdominal fins with nine rays and an appendage; upper jaw longer.

Phoxinus differs by ten abdominal rays and no appendage.

Alburnus differs from *Dobula* by no appendage and the lower jaw longer.

Besides my genus *Hemiplus* (Annals of Nature), which has the vent posterior, the lower jaw longer, only five rays and an appendage to the abdominal fins.

All these small fish are permanent; they feed on worms, insects, univalve shells, and spawn; they bite at a small hook, baited with worms or flies, and they form an excellent bait for all the larger fish which feed upon them. They are good to eat when fried.

***36th species, SlenderMinny, MINNILUS DINEMUS, Minny emeraude.** (p. 46.)

NOTOTROPIS DINEMUS (Raf.) Jordan.

Alburnellus jaculus Cope.

The coloration and form are those of *Alburnellus jaculus*, with which I have identified this description.

†37th species, Spotted Minny, MINNILUS NOTATUS, Minny tache. (p. 47.)

HYBORHYNCHUS NOTATUS (Raf.) Ag.

Hyborhynchus notatus Agassiz.
Hyborhynchus superciliosus Cope.

Agassiz's identification of his *Hyborhynchus* with this species is possibly correct, although the description is very irrelevant. The common *Hyborhynchus* of the Ohio region has small but distinct barbels at the angle of the mouth, and is therefore *H. superciliosus* of Cope. The latter name is probably a synonym of *H. notatus*.

‡38th species, Little-Mouthed Minny, MINNILUS MICROSTOMUS, Minny microstome. (p. 47.)

HYBOPSIS MICROSTOMUS (Raf.) Jordan.

Hybopsis longiceps Cope.
Hybopsis microstomus (Raf.) Jordan.

This description agrees very closely with specimens sent me by W. M.

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* Diameter *one-eighth* of total length, *silvery*, back *olivaceous with a brown longitudinal stripe* in the middle; two lateral lines, one straight, the lower curved downwards and shorter; *head gilt and green above.* Dorsal fin 9 rays. *Anal fin* 12 *rays.*

A *small* and *slender* species, *common in the Ohio*, &c., and *going in flocks;* length 2 or 3 inches. Its *head is beautiful when alive; it is above of a fine gold color with green shades, becoming of an emerald-green above the eyes. Iris silvery;* sides opaque, upper lateral line gold-green. Nostrils large. Pectoral fins with 12 rays, not reaching the abdominal. *All the fins silvery.* Tail with 24 rays. Scales very small.

† Diameter one-seventh of total length, silvery, back olivaceous with a large brown stripe in the middle; head brown above, lateral line straight, a black spot at the base of the tail. Dorsal with 8, and anal with 9 rays.

Same size with the preceding, but not so slender, and less common. Iris golden, nostrils very large, mouth small, lateral line shining blue on the opaque sides. Pectoral fins with 12 rays, and not reaching the abdomen. Tail with 14 rays. It is often called Minny Chub.

‡ Diameter one-seventh of total length; *silvery, olivaceous on the back and head, sides with a few black dots*, lateral line straight, pectoral *fins reaching the abdominal fins.* Dorsal and *anal fins with eight rays.*

A small species found in the Kentucky River. *Mouth very small*, nostrils large, iris silvery, fins fulvous, the pectoral with 12 and the caudal with 24 rays. *Head elongated.*

Linney from Salt River, Kentucky. An examination of Professor Cope's types of *Hybopsis longiceps* has convinced me of the identity of that species with Rafinesque's. It is perhaps best to unite *Hybopsis* with *Luxilus*. The distinctive character of the high scales, so noticeable in *L. cornutus*, fades by insensible degrees into the ordinary *Hybopsis* type.

Under *Luxilus* the following subgeneric sections are probably conveniently recognizable:

a. Luxilus: type *cornutus.*
b. Alburnops: type *blennius.*
c. Hybopsis: type *gracilis.*
d. Hudsonius: type *hudsonius.*

*** XVI. Genus, SHINER, Luxilus, Luxile.** (p. 47.)

Hypsilepis Baird, 1854.
Hybopsis Ag., 1854.
Alburnops and *Hudsonius* Grd., 1856.
Luxilus Jordan, 1876.

1st subgenus, CHROSOMUS. (p. 47.)

39th species, Red-Belly Shiner, LUXILUS ERYTHROGASTER, Luxile erythrogastre. (p. 47.)

CHROSOMUS ERYTHROGASTER Raf.

Description characteristic, although slightly erroneous. The coloration described is that of *C. oreas* Cope, rather than that of the *erythrogaster* of Agassiz.

† 2d subgenus, LUXILUS. (p. 48.)

=*Plargyrus* Girard (*nec* Rafinesque).
=*Hypsilepis* Baird and most authors.
=*Luxilus* m.

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* Difference from *Minnilus:* Vent posterior or nearer to the tail. Mouth rather large, commonly with lips and equal jaws. Scales rather large. Preopercule with an angular suture.

†Mouth rather large, with small flat lips, jaws equal, scales large.

***40th species, Gold-Head Shiner, LUXILUS CHRYSOCEPHALUS, Luxile chrysocephale.** (p. 48.)

† LUXILUS CORNUTUS (Mitch.) Jor.

Cyprinus cornutus Mitchill.
Hypsilepis cornutus (Mitch.) Storer and authors.
Plargyrus typicus, cornutus, frontalis, etc., Girard.

Description fair, excepting that the pectorals scarcely reach the ventrals, and older specimens are less elongated. The *cornutus* is very abundant throughout the Ohio Valley, where it is everywhere known as the *Shiner*, a name rarely applied to any other fish. Rafinesque's description is very correct as regards its average appearance in the West when not tuberculate or flushed with red. His account has, however, been carelessly referred to *Cyprinus chrysoleucus* of Mitchill, solely on account of the similarity of the names, although Rafinesque correctly indicates the chief points of difference. As *chrysocephalus* is evidently intended as the type of *Luxilus*, the latter is synonymous with *Hypsilepis*, and we have no alternative but to restore the older name in place of the latter and more scientific appellation.

‡41st species, Kentuckian Shiner, LUXILUS KENTUCKIENSIS, Luxile du Kentucky. (p. 48.)

? ? LUXILUS CORNUTUS (Mit.) Jor.

Not *Luxilus kentuckiensis* Kirtland.

This species is not yet satisfactorily identified. It is certainly not

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* Diameter one-fifth of total length, *silvery* with golden shades on the sides, *head gilt, back and nape dark olivaceous; lateral line curved downwards*, pectoral fins reaching the abdominal. *Dorsal and anal fins with nine rays.*

Vulgar names, Gold Chub, *Shiner*, Goldhead, &c. Length 6 inches. It is found in Kentucky, Ohio, Cumberland, Green River, &c. *Iris golden. Fins fulvous*, the pectoral golden, large, with 14 rays; tail with 24. *It resembles the common Shiner or Butterfish* of Pennsylvania, *Cyprinus chrysoleucos* Mitchill, but that fish is a *Rutilus*, having nine abdominal rays; its body is besides shorter *and the anal fin is falcated with* 15 *rays.*

†Additional evidence of the correctness of this identification is found in a MSS. paper on the Fishes of Pennsylvania, by Rafinesque, now in the possession of Professor Baird. In this paper the species in question is described under the name of *Luxilus cornutus* (Mit.) Raf.

‡ Diameter one-seventh of total length, silvery, back olivaceous, lateral line curved downwards, *dorsal* and *caudal fins red*, the pectoral yellow, not reaching the abdomen. *Dorsal* 8 *and anal* 7 *rays.*

Vulgar names: Indian Chub, Red-tail, Shiner, &c. Length about 4 inches. It is reckoned an excellent bait for anglers, because it will swim a long while with the hook in its body. Eyes small, iris brown with a gold ring. Yellowish-brown above the head. Abdominal and anal fins white. Pectoral and abdominal fins oboval, with 12 rays. Tail with 24 rays.

the Silver-Fin, *Luxilus kentuckiensis* Kirtland, as has been shown by Professor Cope.

* 42d species, Yellow Shiner, **LUXILUS INTERRUPTUS**, Luxile jaunatre. (p. 49.)

Not identified.

The description contains little that is suggestive, and it might apply to almost any of the small silvery species.

XVII. Genus, CHUBBY, SEMOTILUS, Semotile. (p. 49.)

=*Semotilus* Raf.

43d species, Bigback Chubby, SEMOTILUS DORSALIS, Semotile dorsal (p. 49.)

SEMOTILUS CORPORALIS (Mitchill) Putnam.

44th species, Bighead Chubby, SEMOTILUS CEPHALUS, Semotile cephale. (p. 49.)

SEMOTILUS CORPORALIS (Mitchill) Putnam.

†**45th species, Warty Chubby, SEMOTILUS DIPLEMIUS, Semotile verruqueux.** (p. 50.)

LYTHRURUS DIPLÆMIUS (Raf.) Jor.

Not *Leuciscus diplœmius* Kirtland (=*? Lux. cornutus* var.).
Hypsilepis diplœmia Cope.

This can hardly be the *Lythrurus diplœmius*, as that species has a long anal fin, and the male fish has, instead of "some black warts on the head", the whole upper surface of the head and neck studded with minute whitish tubercles. Moreover, the dorsal spot is not "round", and there is no caudal spot. Still, as I can at present suggest no better identification, I allow that made by Professor Cope to stand.

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* Diameter one-sixth of total length; yellowish-olivaceous above, silvery beneath, rufous brown above the head, a rufous line from the dorsal to the tail, two straight and separated half lateral lines, the anterior one above the posterior; pectoral fins reaching the abdominal. Dorsal with 10 and anal with 9 rays.

A small species, only 3 inches long, called Yellow Chub or Shiner. Seen in the Ohio. Sides opaque, with violet shades. Iris silvery, mouth large, lips very apparent. Fins yellowish, pectorals with 16 rays, caudals with 24.

† Diameter one-sixth of total length; olivaceous brown with gold shades above, silvery beneath; lateral line double, the anterior and lower curved upwards at the base, reaching to the abdominal fins, the posterior and upper straight from the pectoral fins to the tail; fins red, a spot at the base of the dorsal and caudal, and many dots over them. Dorsals with nine rays; the anal with eight.

Length from 3 to 4 inches, often called Minny or Red-Fin. Observed in the Kentucky River near Estill. The male fish has a larger mouth than the female and some black warts on the head. Fulvous brown on the head. Iris large, golden and white. Some black dots on the dorsal and caudal fins; the caudal spot is on tail and the dorsal at the anterior base; they are small and round. The pectoral fins do not reach the abdominal fins; they have 18 rays; the tail has 24.

* **XVIII. Genus, FALLFISH, Rutilus, Rutile.** (p. 50)

= LEUCISCUS Klein.

† **46th species, Silverside Fallfish, RUTILUS PLARGYRUS, Rutile plargyre.** (p. 50.)

LUXILUS CORNUTUS (probably).

Rafinesque's account applies about equally well to *Luxilus cornutus* and *Cyprinella analostana* Grd. I prefer to follow Dr. Kirtland and writers generally in identifying it with the preceding species. The name *Plargyrus* is not available for any of our genera of *Cyprinidæ*. As *Cyprinus rutilus* L. is stated to be the type of *Rutilus* Raf., it is the type of that genus, and the provisional name *Plargyrus* is unnecessary.

‡ **47th species, Baiting Fallfiish, RUTILUS COMPRESSUS, Rutile appat.** (p. 51.)

Not yet satisfactorily identified. It is probably not *Leuciscus compressus* of Kirtland. It may have been based in part on *Nototropis rubrifrons* (Cope.)

§ **48th species, Round-Nose Fallfish, RUTILUS AMBLOPS, Rutile amblopse** (p. 51.)

NOCOMIS AMBLOPS (Raf.) Cope & Jordan.

Ceratichthys hyalinus Jordan, Man. Vert. (not of Cope).

Description rather indefinite. As Girard has identified it with a species of *Ceratichthys*, I refer it to a member of that genus common at the

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* Difference from *Minnilus :* Vent posterior, nearer to the tail. Abdominal fins with nine rays. Mouth large and with lips. Scales large.

I call this genus *Rutilus*, in the supposition that the *Cyprinus rutilus* may be the type of it; if it should be otherwise, it may be called *Plargyrus.*

† Diameter one-fifth of total length; silvery, back with the dorsal, pectoral, and caudal fins olivaceous; lateral line curved downwards; snout truncate; mouth almost vertical. Dorsal and anal fins with 9 rays.

Length from 4 to 6 inches; vulgar names:—Silverside, Shiner, White Chub, &c. Common in the streams of Kentucky. Mouth large, upper jaw almost vertical, yet longer than the lower. Iris white. Pectoral fins with 14 rays, reaching almost the abdominals, which are oboval and white. Tail forked as usual with 24 rays. Scales large.

‡ Diameter one-seventh of total length; silvery, back fulvous, sides compressed, lateral line straight, raised upwards at the base, *snout rounded, mouth hardly diagonal*, nearly horizontal. Dorsal and anal fins with 9 rays.

A small fish from 2 to 4 inches long, called Fall-fish, Bait-fish, Minny, &c. It is found in the Alleghany Mountains, in the waters of the Monongahela, Kenhaway, and even in the Potomac. The name of Fall-fish arises from its being often found near falls and ripples. Body more compressed than in the other species; as much so as in the genus *Minnilus.* Scales large; lips a little fleshy; iris silvery-gilt; fins transparent; the pectoral with 14 rays, and not reaching the abdominal; tail with 32 rays.

§ Diameter one-sixth of total length; silvery, head fulvous above, snout round;

Falls of the Ohio, which, if distinct from *C. hyalinus* Cope, as Professor Cope thinks, seems not to have received any other name.

49th species, Black-tail Fallfish, RUTILUS MELANURUS, Rutile melanure. (p. 51.)

MYXOSTOMA DUQUESNII (Le S.) Jor. (young).

Description incorrect and insufficient. The "15 dorsal rays" indicates a Sucker, and the coloration is that of a young "Red-Horse".

*** 50th species, Anomal Fallfish, RUTILUS ANOMALUS, Rutile anomal.** (p. 52.)

? CAMPOSTOMA ANOMALUM (Raf.) Ag.

This description is perhaps intended for *Campostoma*, but it is very imperfect, if not erroneous.

† 51st species, Red Minny, RUTILUS ? RUBER, Rutile rouge. (p. 52.)

LYTHRURUS species.

Probably the male fish of one of the species of *Lythrurus* is intended rather than a *Chrosomus*, as supposed by Professor Agassiz. *Lythrurus ardens* is abundant in the upper waters of the Cumberland. Few fishes in our waters are of so "fine a purple red".

XIX. Genus, FAT-HEAD, PIMEPHALES, Pimephale. (p. 52.)

52d species, Blackheaded Fat-head, PIMEPHALES PROMELAS, Pimephale tete-noire. (p. 53.)

PIMEPHALES PROMELAS Raf.

Description fair. This species is very abundant in small streams about the Falls of the Ohio.

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sides with an opaque band, lateral line straight; pectoral fins with 12 rays, and reaching the abdominal fins. Dorsal and anal fins with 10 rays.

Length 1 or 2 inches. Vulgar name: White Chub, or Fall-fish. It is found at the falls of the Ohio. Back slightly fulvescent, *snout large and rounded*, mouth hardly diagonal, *eyes large, iris silvery, and scales large.* Tail with 30 rays.

* Diameter one-fifth of total length, fulvous above, sides dusky, white beneath, snout rounded, a vertical brown line behind the gills; lateral line straight, raised upwards at the base; pectoral fins yellow, oboval, short, with 15 rays; tail unequally bilobed, the upper lobe larger. Dorsal and anal fins red; dorsal 8 and anal 7 rays.

An anomalous fish, differing from all those of the Cyprinian tribe in the Ohio, by its unequal bilobed tail, which is brownish, and has 22 rays. Mouth diagonal. Eyes small; iris olivaceous gilt. Nape of the neck red, scales rather small. Length 3 inches. Found in Licking River, &c. Vulgar names: Chub, Redfish, Fallfish, &c.

† Entirely red; tail forked.

I add here a fine small fish, which I have never seen as yet, but it is said to live in the small streams which fall into the Elkhorn and Kentucky. It is a slender fish, only 2 inches long, compressed, and of a fine purple red. It may belong to this genus, or to any other of this tribe. It is commonly called Red-minny.

XX. Genus, SUCKER, CATOSTOMUS, Catostome. (p. 53.)

* 1st subgenus, MOXOSTOMA. (p. 54.)

Myxostoma Jor.

(Not *Moxostoma* of Agassiz and authors = *Erimyzon m.*)

† 53d species, Ohio Carp-Sucker, CATOSTOMUS ANISURUS, Catostome anisure. (p. 54.)

MYXOSTOMA ANISURA (Raf.) Jordan.

(Not *Moxostoma anisurus* Agassiz=*Erimyzon oblongus* (Mit.) Jordan.)

Catostomus anisurus Kirtland.

Ptychostomus collapsus Cope.

This species, described by Rafinesque, and described and figured by Dr. Kirtland, is said to possess a lateral line, and to have red fins. Furthermore, it is known as "Carp", and reaches a length of 1 to 3 feet. It is evidently not a *Moxostoma* as that genus is defined by Agassiz, but a *Ptychostomus*. *Moxostoma* becomes, therefore, a synonym of *Ptychostomus*, and having priority must supersede it. In accordance with the etymology of the word, I have changed the first vowel *o* to *y*.

54th species, Buffalo Carp-Sucker, CATOSTOMUS ANISOPTERUS, Catostome anisopture. (p. 54.)

? Carpiodes velifer (Raf.) Ag.

An insufficient description of some *Carpiodes* "from a drawing by Mr. Audubon". Rafinesque remarks: "The *C. tuberculatus* of Le Sueur belongs also to this subgenus, having 8 abdominal rays, but its tail is regularly bifid".

2d subgenus, ICTIOBUS. (p. 55.)

= *Ichthyobus* Agassiz.

"The *C. gibbosus* and *C. communis* of Le Sueur appear to be intermedi-

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* Body oblong, compressed; head compressed, eight abdominal rays, dorsal fin commonly longitudinal; tail commonly unequally forked.

† Diameter one-fifth of the length; *silvery, slightly fulvescent above, fins red*, the dorsal olivaceous, falcated *with* 17 *rays*, nearer to the head and reaching the vent; *lateral line curved upwards and flexuose at the base;* snout gibbose; tail forked, upper part longer. Anal fin falcate with 8 rays.

A *large* species common all over the Ohio and the large streams, as far as Pittsburgh. Permanent and sometimes taken in winter. It is called Carp everywhere. Length from *one to three feet.* It is taken with the hook, seine and dart. Its flesh is pretty good, but soft. The male fish has a *red tail;* while it is olivaceous in the female. *Snout divided from the head by a transverse hollow which makes it gibbose.* Eyes black, iris silvery and golden above. Sides often with copper shades. Scales large with concentric stria. Pectoral fins large, oval acute, with 15 rays, and reaching the abdominal fins. Caudal with 24 rays.

ate between this subgenus and the foregoing, having 9 abdominal rays, but an unequally bilobed tail."—(Raf.)

55th species, Brown Buffalo-Fish, CATOSTOMUS BUBALUS, Catostome bubale. (p. 55.)

ICHTHYOBUS BUBALUS (Raf.) Ag.

Description passable.

*** 56th species, Black Buffalo-Fish, CATOSTOMUS NIGER, Catostome noir.** (p. 56.)

? BUBALICHTHYS NIGER (Raf.) Ag.

Description insufficient.

3d subgenus, CARPIODES. (p. 56.)

Carpiodes Agassiz and authors.

"The *C. cyprinus* and *C. setosus* of Le Sueur belong to this subgenus."—(Raf.)

† 57th species, Olive Carp-Sucker, CATOSTOMUS CARPIO, Catostome carpe. (p. 56.)

CARPIODES CARPIO Raf.

Carpiodes nummifer Cope.

This description apparently refers to the species lately called *C. nummifer* by Professor Cope. I therefore adopt Rafinesque's specific name.

58th species, Sailing-Sucker, CATOSTOMUS VELIFER, Catostome volant. (p. 56.)

CARPIODES VELIFER (Raf.) Ag.

A fair description.

‡ 59th species, Mud-Sucker, CATOSTOMUS XANTHOPUS, Catostome xanthope. (p. 57.)

HYPENTELIUM NIGRICANS (Le S.) Jor.

It is possible that this description was intended for the *Cat. nigricans* Le S., but the latter is certainly not a "mud-fish", as Professor Agassiz

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* 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 sometimes upwards of 50 pounds, and living in separate shoals.

† Diameter one-fourth of the length; olivaceous above, pale beneath, chin white, abdomen bluish; lateral line straight, dorsal fin somewhat falcated with 36 rays, and trapezoidal with 10 rays; head sloping, snout rounded.

Seen at the falls of the Ohio; commonly called Carp. Length from one to two feet. Eyes very small and black; fins olivaceous brown, the pectorals olivaceous, trapezodial, short, and with 16 rays. Tail with 24. Dorsal fin beginning before the abdominal and reaching the end of the anal fin. Not so good to eat as the Buffalo-fish.

‡ Diameter one-fourth of the length; lateral line straight; silvery, back olivaceous,

seemed to suppose. Of all the Suckers, it is the most readily affected by impure water, and it is usually to be found only in clear, running streams.

* 4th subgenus **TERETULUS.** (p. 57.)

Of the species assigned to this subgenus, three belong apparently to *Myxostoma*, three to *Catostomus* proper, two to *Hypentelium*, five to *Erimyzon*, one is a *Cyprinoid*, and the last a myth.

As the name *Teretulus* has been restricted to the genus typified by *Catostomus aureolus* Le S., it is best to consider it as a synonym of *Myxostoma.*

† 60th species, Black-face Sucker, **CATOSTOMUS MELANOPS**, Catostome melanopse. (p. 57.)

ERIMYZON SUCETTA (Lac.) Jor.

? Cyprinus sucetta Lac.
Catostomus melanops Kirtland.
Ptychostomus melanops Agassiz and authors.
Erimyzon melanops (Raf.) Jordan.

Description poor but unmistakable. This fish has the air-bladder in two parts, and the lateral line is obsolete, as stated by Kirtland. It is

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head brown above, snout gibbose rounded; dorsal fin hardly falcate with 14 rays, anal anceolate with 8 rays; lower fins yellowish.

Found below the falls. Length from 6 to 10 inches. It lives in muddy banks and conceals itself in the mud. Flesh very soft. Head large, flattened above, mouth large, eyes large. Iris silvery. Lateral line hardly raised at the base. Dorsal fin above the abdominal, fins olivaceous as well as the tail, which has 20 rays. Pectorals with 18 rays. Scales large.

* 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 Mitchill.

† Diameter one-seventh of the length; head squared, blackish above, snout convex obtuse; *back olivaceous, sides whitish with scattered black dots*, a black spot on the gill cover, and a large one between the dorsal and caudal fins; lateral line straight, dorsal fin with 14 rays, anal with 9 rays.

A singular species seen at the falls. It is rare, and called *Spotted Sucker* or *Black Sucker.* Length from 4 to 6 inches; body cylindrical, flattened beneath as far as the vent. Head flat above, blackish there and in the fore part. Mouth almost terminal with thick whitish lips, the lower one shorter and thicker, a few small black spots on the sides of the head, and a large one on the preopercule. Gill cover silvery. Eyes black, iris brown with a gold ring. Back of a rufescent color with gold shades. A very large black patch above the anal fin before the tail. *Sides pale with small unequal black dots*, belly whitish. *Fins coppery*, the pectoral elliptical elongated with 18 rays, the anal elongated reaching the tail, the dorsal broad and opposed to the abdominal. Tail with 20 rays. *Scales rather large* nervose radiated.

therefore an *Erimyzon* and not a "*Ptychostomus*". Both *E. oblongus* and *E. melanops* abound in the lakes as well as in the Ohio. They are much more tenacious of life than the other Suckers. The description of *Cyprinus sucetta* Lacépède (*Catostomus suceti* C. & V.) seems to refer to this species. I therefore have adopted the prior name *sucetta* in preference to that of *melanops*.

The "lateral line" alluded to by Rafinesque here, as in numerous other instances, is merely a lateral streak along the rows of scales, either due to longitudinal furrows or else to peculiarities of coloration.

*61st species, Black-back Sucker, **CATOSTOMUS MELANOTUS**, Catostome melanote. (p. 58.)

? CAMPOSTOMA ANOMALUM (Raf.) Ag.

The "nine dorsal rays" indicates a *Cyprinoid*, and the only species found at the Falls of the Ohio which at all answers this description are the *Nocomis biguttatus* and *Campostoma anomalum*. It is best to identify it with the latter, and thus to avoid a change of names.

†62d species, Rough-head Sucker, **CATOSTOMUS FASCIOLARIS**, Catostome fascie. (p. 58.)

ERIMYZON OBLONGUS (Mitch.) Jor.

Moxostoma oblongum (Mitch.) Ag.

Description indifferent, "from a drawing by Mr. Audubon". The tuberculated snout indicates a spring male of *oblongus*, rather than *nigricans*, to which Professor Agassiz refers Rafinesque's description.

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* Diameter one-sixth of the length; bluish black above, whitish beneath; head convex, snout obtuse; lateral line straight; dorsal and anal fins with nine rays.

Seen only once at the falls. Length 6 inches, body nearly cylindrical. Mouth rather inferior, lips thick and somewhat gristly. Iris silvery. Scales pretty large. Fins whitish, the dorsal and caudal a little reddish. Pectoral fins elliptical with 16 rays. Tail 20. Dorsal fin trapezoidal, opposed to the abdominal, the first ray shorter. Anal elliptical obtuse. Vulgar names, Black Sucker and Blue Sucker.

† Diameter one-sixth of the length; brown above, white beneath, sides with small transversal black lines; head sloping, tuberculated above, snout obtuse; dorsal fin longitudinal reaching the end of the anal fin, lateral line straight.

I have not seen this species, but describe it from a drawing of Mr. Audubon. It is found in the lower part of the Ohio. Vulgar names: Rough-head Sucker, Pike-Sucker, Striped Sucker. Length about eight inches, body cylindrical tapering behind. Eyes small, mouth beneath. Lower fins trapezoidal, about twenty transversal lines. A doubtful species, perhaps an *Hydrargyrus*, but the mouth is like that of the Sucker.

*63d species, Red-tail Sucker, **CATOSTOMUS ERYTHRURUS**, Catostome rougequeue. (p. 59.)

MYXOSTOMA DUQUESNII (Le S.) Jor.

? Catostomus duquesnei Le Sueur.

Ptychostomus erythrurus (Raf.) Cope.

Ptychostomus duquesnei (Le S.) Ag.

Description not very good. The common "Red-Horse" of the Ohio is certainly Le Sueur's *duquesnei*. Professor Cope recognizes Rafinesque's species as distinct, but I have not yet been able to separate it.

†64th species, Kentucky Sucker, **CATOSTOMUS FLEXUOSUS**, Catostome flexueux. (p. 59.)

CATOSTOMUS TERES (Mitch.) Le S.

Description fair. Professor Agassiz is certainly wrong in referring this species to the *Cat. nigricans* of Le Sueur. The description accords better with *Cat. teres*, and the statements with regard to the habits and common name point very strongly to this species, which is still known everywhere in Kentucky as the "Sucker".

‡65th species, Big-mouth Sucker, **CATOSTOMUS ? MEGASTOMUS** Catostome megastome. (p. 59.)

A myth.

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*Diameter one-fifth of the length: rufous brown above, white beneath: tail olivaceous: head convex, snout rounded: lateral line straight: dorsal fin trapezoidal, reddish with 12 rays: anal fin elongated, yellow, anal falcated, with 7 rays.

A fine species, not uncommon in the Ohio, Kentucky, Cumberland, Tennessee, &c. Vulgar names: Red-horse, Red-tail, Horse-fish, Horse-Suckers, &c. Length about one foot. Scales very large. Mouth beneath. Iris whitish, eyes black. Pectoral fins yellow, elliptical, reaching the abdominals, and with 16 rays. Tail large with 20 rays. Its flesh is dry and not very good to eat.

†Diameter one-fifth of the length; silvery, back brownish, scales rather rough, operculo flexuose; head squared, snout gibbose truncate; lips very thick, the inferior bilobed; lateral line flexuose; tail brown; dorsal fin blackish with 12 rays, anal fin whitish with 7 rays and reaching the tail.

The most common species, in Kentucky, in all the streams and ponds, called merely Sucker. Very good to eat. It conceals itself in the mud in winter. It bites at the hook, living on minnies and little lobsters. Body thick cylindrical. From 10 to 12 inches long. Head large, a deep depression between the snout and the head, mouth large with fleshy lips. Eyes large, black, iris yellow. Operculo hard bony. Lower fins whitish, pectorals elongated elliptical with 20 rays. Tail 20 rays. Dorsal trapezoidal, sloping behind. This fish is the most useful to keep in ponds.

‡Diameter one-fifth of the length; blackish above, yellowish beneath, very broad; a spine at the base of the pectoral fins; lateral line straight.

A very doubtful species seen by Mr. Audubon. It comes sometimes in shoals in March, and soon disappears. Only taken with the seine, not biting at the hook; vulgar name, Brown Sucker. The mouth is very remarkable, being broader than the head, somewhat projecting on the sides; length one foot. The head resembles that of a Cat-fish, but has no barbs. Is it a peculiar genus owing to the mouth and pectoral spine? It might be called *Eurystomus*. The yellow color covers the forehead and reaches to the anal fin. Dorsal opposed to the abdominal and trapezoidal, pectorals elliptical, yellow.

* 5th subgenus, **DECACTYLUS.** (p. 60.)

66th species, Pittsburgh Sucker, CATOSTOMUS DUQUESNI, Catostome duquesne. (p. 60.)

MYXOSTOMA DUQUESNII (Le S.) Jor.

67th species, Long Sucker, CATOSTOMUS ELONGATUS, Catostome alonge. (p. 60.)

CYCLEPTUS ELONGATUS (Le S.) Ag.

XXI. Genus, SUCKREL, CYCLEPTUS, Cyclepte. (p. 61.)

68th species, Black Suckrel, CYCLEPTUS NIGRESCENS, Cyclepte noiratre. (p. 61.)

CYCLEPTUS ELONGATUS (Le S.) Ag.

A very poor description, "on the authority of Mr. Bollman, of Pittsburgh".

† **XXII. Genus, CATFISH, PIMELODUS, Pimelode.** (p. 61.)

Subgenus, ICTALURUS. (p. 61.)

1st section, ELLIOPS. (p. 62.)

Tail forked. Eyes elliptical. Abdominal fins with less than nine rays.

69th species, Spotted Catfish, PIMELODUS MACULATUS, Pimelode tachete. (p. 62.)

ICHTHÆLURUS PUNCTATUS (Raf.) Jor.

Silurus punctatus Raf., 1818.

70th species, Blue Catfish, PIMELODUS CERULESCENS, Pimelode bleuatre. (p. 63.)

ICHTHÆLURUS PUNCTATUS (Raf.) Jor.

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* Body nearly cylindrical, abdominal fins with 10 rays; tail equally forked.

Besides the two following species, the *C. bostoniensis* and *C. hudsonius* must be enumerated here.

† Body scaleless, elongated. Head large, with barbs. Two dorsal fins, the second adipose and separated from the tail, the first short and commonly armed. Pectoral fins commonly armed. Teeth like a file. Vent commonly posterior.

The extensive genus *Silurus* of Linnæus, which is scattered throughout the rivers of both continents, has not yet been completely illustrated, notwithstanding the labors of the modern ichthyologists. I have found in the Ohio about twelve species belonging to it, most of which offer consimilar character, and appear to belong to the genus *Pimelodus* of Lacépède and Cuvier, which have left the name of *Silurus* to the species having one dorsal fin. I have already published a monography of them in the Journal of the Royal Institution of London, under the generic name of Silurus. I now propose to form with them a peculiar *subgenus*, divided in many sections, and different from the subgenera *Bagrus*, *Synodontus*, *Silusox*, &c.

71st species, White Catfish, PIMELODUS PALLIDUS, Pimelode pale. (p. 63.)

ICHTHÆLURUS PUNCTATUS (Raf.) Jor.

72d species, Silvery Catfish, PIMELODUS ARGYRUS, Pimelode argyre. (p. 64.)

ICHTHÆLURUS PUNCTATUS (Raf.) Jor.

2d section, LEPTOPS. (p. 64.)

Tail bilobed. Eyes round and small. Nine abdominal rays. Vent posterior. Adipose fin large.

73d species, Clammy Catfish, PIMELODUS VISCOSUS, Pimelode visqueux. (p. 64.)

PELODICHTHYS OLIVARIS (Raf.) Gill & Jor.

Jaws nearly equal, barbs very short, eyes round, over the head. Body entirely brown, lateral line raised upwards before. Pectoral fins with 1 and 7 rays, anal fin rounded with 15 rays. Tail unequally bilobed and black, upper lobe smaller and white.

75th species, Clouded Catfish, PIMELODUS NEBULOSUS, Pimelode nebuleux. (p. 64.)

PELODICHTHYS OLIVARIS (Raf.) Gill & Jor.

This species is made to form a "peculiar section or even subgenus", termed *Opladelus*.

2d section, AMEIURUS. (p. 65.)

Tail entire. Eyes round. Eight abdominal rays. Vent posterior. Dorsal fin anterior with a spine. Lower jaw not longer. Pectoral fins with one simple spine and seven rays.

75th species, Yellow Catfish, PIMELODUS CUPREUS, Pimelode cuivre. (p. 65.)

AMIURUS LIVIDUS CUPREUS (Raf.) Jor.

***76th species, Brown Catfish, PIMELODUS LIVIDUS, Pimelode livide.** (p. 65.)

AMIURUS LIVIDUS (Raf.) Jor.

Amiurus catus (Grd.) Gill. (Not *Silurus catus* L.)

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* Jaws equal, barbs nearly equal together and as long as the head. Eyes round. Body entirely of a livid-brown color. Tail rounded entire. Lateral line raised upwards at the base. Anal fin elongate with 25 rays.

Silurus lividus, Monogr. sp. 7.

A small species, entirely of a leaden brown. Head short, slightly olivaceous; throat pale. Barbs equal, the upper ones livid, the lower ones rufous. A furrow on the head which is convex above. Operculum flexuose. Tail with 24 rays. Dorsal with 1 and 7. Spines short.

* 77th species, Black Catfish, **PIMELODUS MELAS**, Pimelode noir. (p. 66.)

AMIURUS MELAS (Raf.) Jordan.

Amiurus obesus Gill.

† 78th species, Yellow-Head Catfish, **PIMELODUS XANTHOCEPHALUS**, Pimelode xanthocephale. (p. 66.)

AMIURUS XANTHOCEPHALUS (Raf.) Gill.

4th section, ILICTIS. (p. 66.)

Tail entire, eyes elliptical. Nine abdominal rays. Dorsal fins submedial. Pectoral fins with one flat spine serrated outwards and nine rays. Lower jaw longer.

79th species, Mud-Catfish, **PIMELODUS LIMOSUS**, Pimelode bourbeux. (p. 66.)

PELODICHTHYS OLIVARIS (Raf.) Gill & Jor.

‡ XXIII. Genus, **MUDCAT, PILODICTIS**, Pylodicte. (p. 67.)

PYLODICTIS Raf., 1819.
OPLADELUS Raf., 1820.
HOPLADELUS Gill, 1861.
PELODICHTHYS Gill & Jordan, 1877.

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* Jaws nearly equal. Eyes round. Barbs unequal, shorter than the head. Body entirely black, lateral line straight. Anal fin with 20 rays. Tail nearly truncate, entire.

Silurus melas, Monogr. sp. 8.

A rare species less than a foot long. Hardly pale beneath. Dorsal fin 1 and 7. Found below the falls.

† Upper jaw longer. Barbs unequal, shorter than the head. Eyes round. Body iron gray, with the whole or part of the head yellow. Belly white. Lateral line straight. Anal fin with 22 rays. Tail entirely truncate.

Silurus xanthocephalus, Monogr. sp. 10.

About a foot long. In the Ohio, Kentucky, etc. Head very large, often entirely yellow, or only forward, or covered with yellow patches. Iris white. Fins fleshy reddish. The dorsal with 1 and 6 rays, caudal 24. Good food.

‡ Body scaleless, conical, flattened forwards and compressed behind. Head very broad and flat, with barbs, eyes above the head. Two dorsal fins, both with soft rays. Vent posterior.

This genus was the 10th of my Prod. of 70 N. G. of animals. The name means Mudfish. It differs principally from the foregoing by the second dorsal having rays.

*80th species, Toad Mudcat, PYLODICTIS LIMOSUS, Pylodicte bourbeux. (p. 67.)

PELODICHTHYS OLIVARIS (Raf.) G. & J.

†XXIV. Genus, BACKTAIL, NOTURUS, Noture. (p. 67.)

‡81st species, Yellow Backtail, NOTURUS FLAVUS, Noture jaune. (p. 68.

NOTURUS FLAVUS Raf.

XXV. Genus, TOTER, HYPENTELIUM, Hypentele. (p. 68.)

82d species, Ohio Toter, HYPENTELIUM MACROPTERUM, Hypentele macroptere. (p. 68.)

HYPENTELIUM NIGRICANS (Le Sueur.) Jor.

Catostomus nigricans Le Sueur (young).
Hylomyzon nigricans (Le S.) Ag.
Hypentelium nigricans (Le S.) Jordan.

Description very good. If *Catostomus nigricans* be considered generically distinct from *C. hudsonius*, we have no alternative but to substitute *Hypentelium* for *Hylomyzon* of later date.

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* Lower jaw longer, eyes round, eight barbs, four above and four below. Head verrucose above. Body brown, clouded, and dotted with yellowish, reddish, and bluish; one row of transversal black lines on each side of the back. No lateral line. Tail entire and truncate.

I have not seen this fish, but describe it from a drawing of Mr. Audubon. It is found in the lower part of the Ohio and in the Mississippi, where it lives on muddy bottoms, and buries itself in the mud in the winter. It reaches sometimes the weight of 20 pounds. It bears the name of Mudcat, Mudfish, Mud-Sucker, and Toadfish. It is good to eat, and bites at the hook. The head is broader than the body, and with a very large mouth; the barbs appear to lie in four pairs, two above, longer and near the nostrils, and two smaller under the lower jaw. The first dorsal fins triangular and above the abdominals, which are nearer the pectorals than to the anal. Second elongate with many rays. Number of rays unnoticed.

† Difference from *G. Pimelodus*, *S. G. Ictalurus*, and sect. *Ameiurus*: Adipose dorsal fin very long, decurrent, and united with the tail, which is decurrent on each side, but unconnected with the anal fin.

Genus 18th of the Prodr. N. G. It differs from the genus *Plotosus* of Lacépède by having the anal fin free, and from *Pimelodus* by the connection of the tail with the second dorsal fin. The name means "tail over the back". The *Silurus gyrinus* of Mitchill must belong to this genus.

‡ Entirely yellowish. Upper jaw longer, barbs half the length of the head. Eyes round. Lateral line nearly straight. Anal fin with 14 rays. Tail entirely truncate.

A small species, very common near the falls. Length 4 to 12 inches. It agrees in almost everything with the section *Ameiurus* among the Catfishes. Vulgar name Yellow Catfish, like the *Pimelodus cupreus*. Dorsal fin with 1 and 7 rays, rounded spine very short and obtuse. Second dorsal beginning before the anal and extending to the tail in a curve. All the lower fins rounded. Pectorals with 1 and 7 rays, spine equal and acute. Abdominal fins with 8 rays. All the fins fleshy and fat. Head flat above. Barbs unequal. Belly convex. Hind part of the body compressed.

XXVI. Genus, RIBBON-FISH, SARCHIRUS, Sarchire. (p. 69.)

83d species, Ohio Ribbon-Fish, SARCHIRUS VITTATUS, Sarchire rubanne. (p. 69.)

Lepidosteus sp. (young).

Description inaccurate.

* **XXVII. Genus, PIKE, ESOX, Brochet.** (p. 70.)

† **84th species, Streaked Pike, ESOX VITTATUS, Brochet raye.** (p. 70.)

Thus far unrecognized.

‡ **85th species, Salmon-Pike, ESOX SALMONEUS, Brochet saumonne.** (p. 71.)

ESOX SALMONEUS Raf.

? Esox umbrosus Kirtland.

Description probably second hand and not very good. It is probably *Esox umbrosus*, which species abounds in the bayous of the Ohio, but

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* Body cylindrical or very long, covered with small scales, vent posterior. One dorsal fin behind the abdominal fins. Mouth large, jaws long and flattened, with very strong teeth; opening of the gills very large. Head bony, scaleless. Tail not obliqual. All the fins with rays.

There are several species of Pikes in the Ohio, Mississippi, Wabash, Kentucky, &c. I have not yet been able to observe them thoroughly. I have, however, procured correct accounts and figures of two species; but there are more. They appear to belong to a peculiar subgenus distinguished by a long dorsal fin, a forked tail, and the abdominal fins anterior, being removed from the vent. It may be called *Picorellus*. The French settlers of the Wabash and Missouri call them *Piconeau*, and the American settlers Pikes or Pickerels. They are permanent but rare fishes, retiring, however, in deep waters in winter. They prefer the large streams, are very voracious, and grow to a large size. They prey on all the other fishes except the Gar-fishes, &c. They are easily taken with the hook, and afford a very good food, having a delicate flesh.

† White, with two blackish longitudinal streaks on each side, back brownish; jaws nearly equal, very obtuse, eyes large and behind the mouth; dorsal fins longitudinal between the abdominal and anal fins; tail forked.

E. vittatus. Raf. in American Monthly Magazine 1818, volume 3, page 447.

This fish is rare in the Ohio (although it has been seen at Pittsburgh), but more common in the Wabash and Upper Mississippi. It is called *Piconeau* or *Picaneau* by the Canadians and Missourians. It reaches the length of from three to five feet. The pectoral and abdominal fins are trapezoidal, the anal and dorsal longitudinal with many rays and nearly equal. It is sometimes called Jack or Jackfish. Lateral line straight.

‡ *White, with many narrow transversal brown bands, somewhat curved;* jaws nearly equal, *very obtuse;* dorsal fins brown, longitudinal and extending over the anal fins; tail forked and brown.

It is one of the best fishes in the Ohio; its flesh is very delicate, and divides easily, as in Salmon, into large plates as white as snow. It is called Salmon Pike, White Pike, White Jack or White Pickerel, and *Picaneau blanc* by the Missourians. *It has a short and thick head*, eyes not very large, and situated upwards. Pectoral and abdominal fins trapezoidal. Dorsal fin beginning behind these last and extending over the anal. The number of transversal bands is twelve or more, rather distant, and with the concavity towards the head. It reaches the length of 5 feet. Lateral line nearly straight.

the statement that it "reaches the length of 5 feet" renders the identification doubtful. I have never seen it more than a foot long. The name *Picorellus* may be retained for the section of *Esox*, which has the cheeks and opercles entirely scaly, if a subgeneric name for that group is considered desirable.

XXVIII. Genus, GARFISH, LEPISOSTEUS, Lepisoste. (p. 71.)

1st subgenus, CYLINDROSTEUS. (p. 72.)

86th species, Duck-Bill Garfish, LEPISOSTEUS PLATOSTOMUS, Lepisoste platostome. (p. 72.)

LEPIDOSTEUS PLATYSTOMUS Raf.

Description fair.

87th species, White Garfish, LEPISOSTEUS ALBUS, Lepisoste blanc. (p. 73.)

Probably same as preceding.

88th species, Ohio Garfish, LEPISOSTE OXYURUS, Lepisoste oxyure. (p. 73.)

LEPIDOSTEUS OSSEUS (L.) Ag. (probably).

89th species, Long-Bill Garfish, LEPISOSTEUS LONGIROSTRIS, Lepisoste longirostre. (p. 74.)

LEPIDOSTEUS OSSEUS (L.) Ag.

2d subgenus, ATRACTOSTEUS. (p. 75.)

Atractosteus Grd. and authors.

Litholepis Raf. Am. Monthl. Mag. 1818, III, 447.

90th species, Alligator-Garfish, LEPISOSTEUS FEROX, Lepisoste feroce. (p. 75.)

LITHOLEPIS SPATULA (Lacép.) Jor.

Atractosteus ferox (Raf.) Grd.

Litholepis adamartinus Raf.

Description pretty good. The generic name *Litholepis*, having two years' priority, must supersede *Atractosteus*. The specific name *spatula* (Lacépède) antedates both *adamantinus* and *ferox*.

*** XXIX. Genus, DIAMOND-FISH, LITHOLEPIS, Litholepe.** (p. 76.)

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* Body fusiform, covered with *hard, stony* pentaedral *scales*, vent nearly medial. Abdominal fin near the vent. *One dorsal fin opposite the anal.* Head *bony, scaleless, protruded* anteriorly in a long snout; mouth beneath the head; *jaws not elongated, with strong unequal teeth.* Opening of the gills very large. Tail not obliqual. All the fins with rays.

A very singular genus, which comes very near to the last genus, but differs by the snout, mouth, tail, scales, &c. It must belong, however, to the same family. The name means *Stony Scales.*

* 91st species, Devil-Jack Diamond-fish, **LITHOLEPIS ADAMANTINUS**, Litholepe adamantin. (p. 76.)

LITHOLEPIS SPATULA (Lac.) Jor.

Description at second hand and erroneous in several respects, but unquestionably referring to the Alligator-Gar.

XXX. Genus, EEL, ANGUILLA, Anguille. (p. 77.)

Subgenus CONGER. (p. 77.)

† 92d species, Broad-Tail Eel, **ANGUILLA LATICAUDA**, Anguille large queue. (p. 77.)

ANGUILLA VULGARIS Fleming.

Anguilla bostoniensis (Le Sueur) Dekay and of authors.
Anguilla rostrata (Le Sueur) Dekay(the earliest American name).

If, as is claimed by Dareste, there is but one species of *Anguilla* in the northern hemisphere, the four species of Rafinesque belong to it. *Muræna rostrata* (Le S.), applied to the eel of the inland lakes of New York, is the oldest American name.

93d species, Black Eel, **ANGUILLA ATERRIMA**, Anguilla noire. (p. 78.)

94th species, Yellow-Belly Eel, **ANGUILLA XANTHOMELAS**, Anguilla xanthomele. (p. 78.)

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* *Snout obtuse, as long as the head;* head one-fourth of total length; body fusiform blackish; dorsal and anal fins equal and with many rays; tail bilobed, lateral line obsolete.

Litholepis adamantinus Raf. in American Monthly Magazine 1818, vol. 3, p. 447, and in *Journal de Physique et Hist. Nat.* 70, *N. G. d'Animaux G.* 20.

This may be reckoned the wonder of the Ohio. It is only found as far up as the falls, and probably lives also in the Mississippi. I have seen it, but only at a distance, and have been shown some of its singular scales. Wonderful stories are related concerning this fish, but I have principally relied upon the description and figure given me by Mr. Audubon. Its length is from 4 to 10 feet. One was caught which weighed 400 pounds. It lies sometimes asleep or motionless on the surface of the water, and may be mistaken for a log or a snag. It is impossible to take it in any other way than with the seine or a very strong hook, the prongs of the gig cannot pierce the scales which are as hard as flint, and even proof against lead balls! Its flesh is not good to eat. It is a voracious fish. Its vulgar names are Diamond Fish (owing to its scales being cut like diamonds), Devil Fish, Jack Fish, Garjack, &c. The snout is large, convex above, very obtuse; the eyes small and black; nostrils small, round before the eyes; mouth beneath the eyes, transversal with large angular teeth. Pectoral and abdominal fins trapezoidal. Dorsal and anal fins equal, longitudinal, with many rays. Tail obtusely and regularly bilobed. The whole body covered with large stone scales, lying in oblique rows; they are conical, pentagonal and pentaedral, with equal sides from half an inch to one inch in diameter, brown at first but becoming of the color of turtle shell when dry. They strike fire with steel! and are ball proof!

† One individual of this species poisoned once slightly a whole family, causing violent colicks, which was ascribed to its having been taken in the vitriolic slate rocks of Silver Creek, near the falls.—(*Raf.*)

95th species, Yellow Eel, **ANGUILLA LUTEA**, Anguilla jaune. (p. 78.)

XXXI. Genus, **STURGEON, ACCIPENSER**, Eturgeon. (p. 76.)

1st subgenus, **STURIO** (5 rows of plates). (p. 79.)

96th species, Spotted Sturgeon, **ACCIPENSER MACULOSUS**, Eturgeon tachete. (p. 79.)

ACIPENSER MACULOSUS Le S. and authors.

97th species, Shovel-Fish Sturgeon, **ACCIPENSER PLATORHYNCHUS**, Eturgeon pelle. (p. 80.)

SCAPHIRHYNCHOPS PLATYRHYNCHUS (Raf.) Gill.

2d subgenus, **STERLETUS** (3 rows of plates). (p. 80.)

98th species, Fall Sturgeon, **ACCIPENSER SEROTINUS**, Eturgeon tardif. (p. 80.)

This and the next are probably *Acipenser rubicundus* Le Sueur, but I can throw no new light on this perplexing subject.

99th species, Ohio Sturgeon, **ACCIPENSER OHIENSIS**, Eturgeon de l'Ohio. (p. 81.)

100th species, Big-Mouth Sturgeon, **ACCIPENSER MACROSTOMUS**, Eturgeon beant. (p. 81.)

XXXII. Genus, **DOUBLE-FIN, DINECTUS**, Dinecte. (p. 82.)

A sturgeon with "two dorsal and no abdominal fins".

101st species, Flat-Nose Double-Fin, **DINECTUS TRUNCATUS**, Dinecte camus. (p. 82.)

Description from a drawing by Mr. Audubon, which represents, as suggested by Rafinesque, "only a sturgeon incorrectly drawn".

XXXIII. Genus, **SPADE-FISH, POLYODON**, Polyodon. (p. 82.)

102d species, Western Spade-Fish, **POLYODON FOLIUM**, Polyodon feuille. (p. 82.)

POLYODON FOLIUM Lacépède.

Description mainly correct.

XXXIV. Genus, **PADDLE-FISH, PLANIROSTRA**, Planirostre.

103d species, Toothless Paddle-Fish, **PLANIROSTRA EDENTULA**, Planirostre edente. (p. 83.)

POLYODON FOLIUM Lacépède (adult).

XXXV. Genus, LAMPREY, PETROMYZON, Lamproie. (p. 84.)

***104th species, Black Lamprey, PETROMYZON NIGRUM, Lamproie noire.** (p. 84.)

AMMOCŒTES NIGER (Raf.) Jor.

Petromyzon niger Grd.

Description insufficient, but I am unable to find that the common little Black Lamprey of the West has received any other name.

SUPPLEMENT. (p. 85.)

†XXXVI. Genus, SPRING-FISH, PEGEDICTIS, Pegedicte. (p. 85.)

ETHEOSTOMA Raf. Gill & Jordan emend.

CATONOTUS Agassiz.

‡105th species, Cat's-Eye Spring-Fish, PEGEDICTIS ICTALOPS, Pegedicte œuil de chat. (p. 85.)

ETHEOSTOMA FLABELLARIS Raf.

Description indifferent. The characters indicate a species of Darter, and the eight dorsal spines point to the *flabellaris*.

6th genus, ETHEOSTOMA. (p. 85.)

106th species, Springs Hogfish, ETHEOSTOMA FONTINALIS, Etheostome des fontaines. (p. 86.)

ETHEOSTOMA FLABELLARIS Raf.

Description very good.

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* Entirely blackish, tail oval acute, second dorsal over the vent, several rows of teeth.

A very small species, from 4 to 5 inches long; it is found as high as Pittsburgh. Dorsal fins shallow, and distant from each other and the tail. Eyes round and large. Branchial holes small. No lateral line. Mouth oval, teeth white and yellow. It torments sometimes the Buffalo-fish and Sturgeons upon which it fastens itself. It is never found in sufficient quantity to be used as food.

† Body conical, with *small scales*, belly flat, vent medial. Head broad, scaleless, gill covered with a membranaceous appendage and a concealed spine, mouth toothed. Two dorsal fins, the first with simple, soft, semi-spinescent rays. Thoracic fins with five rays.

This new genus belongs to the family *Percidia* and has many affinities with the *G. Holocentrus, Lepomis, Etheostoma, &c.*, but its conical form and many other secondary peculiarities distinguish it completely. The name means Fountain-fish.

‡ Jaws equal, forehead knobby, eyes elliptical. Body *olivaceous with some black transversal unequal brown bands;* a concealed spine on the gill cover; lateral line straight; tail elliptical. The first dorsal fin with 8 *rays, the second with* 12, as well as the anal and pectoral fins.

I have discovered this species in the summer of 1820 near Lexington. It has no vulgar name. Length hardly 2 inches. Head large, brown, convex above, with several small knobs on the forehead, flat beneath. Eyes as in the Catfishes with oblong eyes, iris gilt brown. Spine of the gill cover concealed under the skin. Teeth small and acute. *Pectoral fins large lanceolate.* Belly white and flat. Fins hyalin with some brown spots. Five transversal bands. The specific name means cat's eye.

17th genus, SEMOTILUS. (p. 86.)

***107th species, Silver-Spotted Chubby, SEMOTILUS ? NOTATUS, Semotile tache.** (p. 86.)

ZYGONECTES NOTATUS (Raf.) Jor.

Zygonectes olivaceus (Storer) Agassiz.

This description evidently refers to some Cyprinodont fish. The translucent spot on the head of *Zygonectes* is so characteristic and conspicuous in life that I have no doubt that Rafinesque had that common species in mind.

26th genus, SARCHIRUS. (p. 86.)

†108th species, Silver Ribbon-Fish, SARCHIRUS ? ARGENTEUS, Sarchire argente. (p. 86.)

Unidentifiable.

Description erroneous and insufficient.

31st genus, ACCIPENSER. (p. 86.)

109th species, Gourd-Fish Sturgeon, ACCIPENSER LAGENARIUS Eturgeon gourde. (p. 86.)

? Polyodon folium.

Description second hand and erroneous.

XXXVII. Genus, SAWFISH, PRISTIS, Poisson-scie. (p. 86.)

110th species, Mississippi Sawfish, PRISTIS MISSISSIPPIENSIS, Poisson-scie du Mississippi. (p. 86.)

PRISTIS ANTIQUORUM Shaw.

Passable description (of the saw only).

‡XXXVIII. Genus, HORNFISH, PROCEROS, Proceros. (p. 87.)

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* Breadth one-sixth of the length, brownish, pale beneath; *head small obtuse with a large silver spot on the forehead before the eyes*, jaws nearly equal; *dorsal fin opposed to the anal, tail oboval entire.*

It is found in the *Cumberland River* and the Little River, a branch of it. Communicated by Mr. Wilkins. It is rather doubtful whether it belongs to this genus, or *Minilus, Rutilus*, &c. It might perhaps be found to constitute a peculiar one by the small mouth without lips, and the posterior dorsal fin. Vent posterior. *Pectoral and abdominal fins oboval.* Eyes large. Length 3 inches; good bait for Perch, Bass, Red-eyes or Ring-eyes, &c.

† Entirely silvery, without bands or spots.

Communicated by Mr. Owings. It is found in Licking River, Slate Creek, &c. Length from two to three feet. It is called Pike, and may be one, but as it is described without scales and very slender, I have added it to this genus until it is better known.

‡ Apodal. Body elongated. Vent posterior. One dorsal fin opposed to the anal. Mouth beneath transversal toothed. Snout protruded in a straight horn. Four spiracles or branchias on each side.

Singular new genus of the family of Sharks or *Antacea*, from which however it differs by the want of abdominal fins. There are two species of it; the second, which I have called *Proceros vittatus*, lives in Lake Ontario, and has longitudinal stripes.

*111th species, Spotted Horn-Fish, **PROCEROS MACULATUS**, Proceros tachete. (p. 87.)

A myth; description evidently second hand. What fish, if any, suggested it is past my guessing.

IV.—LIST OF SPECIES NOT NOTICED BY RAFINESQUE.

The following species occurring in the valley of the Ohio, most of them within a radius of one hundred miles from Lexington, do not seem to have been noticed by Rafinesque. These species are given upon the authority of the present author unless otherwise noted. In case no particular locality is mentioned, the species is supposed to be generally diffused. Various other nominal species have been described from the Ohio Valley, but I omit all of whose validity I am not reasonably certain.

Microperca punctulata Putnam.—White River, Indiana.
Boleichthys eos Jordan & Copeland.—Wabash River.
Pœcilichthys variatus (Kirt.) Ag.—Everywhere.
Pœcilichthys spectabilis Ag.
Nanostoma zonalis (Cope) Jor.—Miami River (Cope).
Nothonotus camurus (Cope) Jor.
Nothonotus sanguifluus (Cope) Jor.—Cumberland River (Cope).
Nothonotus maculatus (Kirt.) Ag.
Pleurolepis pellucidus Ag.
Alvordius aspro Cope & Jordan.
Ericosma evides Jordan & Copeland.—White River.
Rheocrypta copelandi Jor.—White River.
Imostoma shumardii (Grd.) Jordan.—Wabash River.
Diplesium simoterum (Cope) Copeland.—Rock Castle River.
Alvordius phoxocephalus (Nelson) Cope & Jor.—Wabash River.
Percina manitou Jor.—Wabash River.
Sandrus canadensis (Smith) Jor.—Ohio River. Introduced.
Stizostethium vitreum (Mit.) Jord.—Ohio River. (Introduced.?)
Morone interrupta Gill.—Lower Ohio.
Centrarchus irideus (Lac.) C. & V.—Lower Ohio.
Pomoxys nigromaculatus (Le Suer) Grd.—White River. Scarce.

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*Iron grey, with white spots on the sides; tail forked; horn one-fourth of total length.

This fish lives in the Mississippi, and is sometimes caught at St. Genevieve, in the State of Missouri. The French settlers call it *Poisson arme.* It has no scales, but its head is bony. Eyes very small. Dorsal and anal fins rounded. Length 2 or 3 feet; very good to eat. Communicated by Mr. M——, of St. Genevieve.

Chænobryttus gulosus (C. & V.) Cope.—Wabash River.
Lepiopomus pallidus (Mit.) Gill & Jord.—Everywhere.
Lepiopomus anagallinus (Cope.)—Salt River, Kentucky.
Xenotis inscriptus (Ag.) Jor.—White River.
Xenotis aureolus Jor.
Eupomotis pallidus (Ag.) Gill & Jor.—Lower Ohio.
Eupomotis aureus (Walb.) Gill & Jor.—Introduced. (?)
Asternotremia isolepis Nelson.—Southern Illinois.
Aphododerus cookianus Jordan.—Wabash River.
Potamocottus bairdii (Grd.) Gill.—Muskingum River. (Grd.)
Potamocottus carolinæ Gill.—Cave Region, etc.
Potamocottus wilsoni (Grd.) Gill.—White River.
Lota lacustris (Walb.) Gill.—Rare. Introduced.?
Labidesthes sicculus Cope.—Abundant.
Zygonectes dispar Ag.—Wabash River.
Fundulus diaphanus (Le S.) Ag. (?)
Melanura limi (Kirt.) Ag.—Scarce.
Amblyopsis spelæus Dek.—Caves.
Typhlichthys subterraneus Grd.—Caves.
Chologaster agassizii Putnam.—Caves.
Percopsis guttatus Ag.—Rare. (Introduced.?)
Exoglossum maxillingua (Le S.) Hald. (? ?)
Hybognathus argyritis Grd.
Hybognathus nuchalis Ag.
Ericymba buccata Cope.—Abundant.
Nocomis dissimilis (Kirt.) Cope & Jor.—Common.
Rhinichthys obtusus Ag.—Common.
Phenacobius teretulus Cope.—West Virginia. (Cope.)
Phenacobius uranops Cope.—Rock Castle River.
Luxilus storerianus (Kirt.) Jordan—Kentucky. (Grd.)
Luxilus stramineus (Cope) Jordan.—White River.
Luxilus tuditanus (Cope) Jordan.—Wabash River. (Cope.)
Luxilus galacturus (Cope) Jordan.—Abundant.
Luxilus coccogenis (Cope) Jordan.—Cumberland River.
Cliola scabriceps (Cope.) Jor.
Cliola ariomma (Cope) Jor.—White River, etc.
Cyprinella analostana (Grd.) Jordan.
Photogenis spilopterus Cope.—Wabash River.

Nototropis photogenis (Cope) Jor.—Ohio R.
Nototropis rubrifrons (Cope) Jor.—Abundant.
Nototropis rubellus (Ag.) Jor.—Abundant.
Nototropis dilectus (Grd.) Jor.—Falls of Ohio.
Nototropis micropteryx (Cope) Jor.—Rock Castle River.
Myxostoma breviceps Cope.—Ohio River.
Placopharyx carinatus Cope.
Carpiodes bison Ag.
Carpiodes difformis Cope.
Carpiodes cutisanserinus Cope.
Bubalichthys bubalinus Jor. (*Cat. bubalus* Kirt. not of Raf.)
Icthælurus furcatus (Val.) Gill.
Ichthaelurus robustus Jor.
Amiurus natalis (Le S.) Gill.
Noturus miurus Jordan.
Noturus liacanthus Jor.
Noturus lemniscatus (Le S.) Grd.—Ohio.
Noturus exilis Nelson.—Southern Illinois.
Amia calva L.
Ammocœtes argenteus (Kirt.) Jor.—Common.

INDEX TO GENERIC NAMES REFERRED TO IN THIS PAPER.

Department of the Interior:

U. S. NATIONAL MUSEUM.

— 10 —

BULLETIN

OF THE

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ADVERTISEMENT.

This work is the tenth of a series of papers intended to illustrate the collections of natural history and ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,

Secretary of the Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, May, 1877.

CONTRIBUTIONS

TO

NORTH AMERICAN ICHTHYOLOGY

BASED PRIMARILY ON THE

COLLECTIONS OF THE UNITED STATES NATIONAL MUSEUM.

II.

A.—Notes on *Cottidæ*, *Etheostomatidæ*, *Percidæ*, *Centrarchidæ*, *Aphododeridæ*, *Dorysomatidæ*, and *Cyprinidæ*, with revisions of the genera and descriptions of new or little known species.

B.—Synopsis of the *Siluridæ* of the fresh waters of North America.

BY

DAVID S. JORDAN.

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No. 2.

A.—NOTES ON COTTIDÆ, ETHEOSTOMATIDÆ, PERCIDÆ, CENTRARCHIDÆ, APHODODERIDÆ, UMBRIDÆ, ESOCIDÆ, DORYSOMATIDÆ, CYPRINIDÆ, CATOSTOMIDÆ, AND HYODONTIDÆ, WITH REVISIONS OF THE GENERA AND DESCRIPTIONS OF NEW OR LITTLE KNOWN SPECIES.

COTTIDÆ.

1. COTTOPSIS SPILOTUS, (*Cope*) *Jor.*

Uranidea spilota, COPE, Proc. Ac. Nat. Sci. Phila. 1865, 82.
Cottopsis ricei, NELSON, Bull. Ills. Trans. Nat. Hist., 1876.—JORDAN, Proc. Ac. Nat. Sci. Phila. 1877, 61.

An examination of the types of *U. spilota* shows their probable identity with Mr. Nelson's species as above indicated. Prof. Cope's specimens are in bad condition, and have lost the peculiar dermal spines. Prof. Gill thinks that *Cottopsis spilotus* and *Cottopsis semiscaber* Cope are not truly *Cottopsis*, the only species properly referable to that genus, being *C. asper* Rich. (of which *C. parvus* Grd. is the young). At any rate, *C. spilotus* and *C. semiscaber* form a well-marked group or section intermediate between *Cottopsis* and *Potamocottus*.

ETHEOSTOMATIDÆ.

2. AMMOCRYPTA BEANII, *gen. et sp. nov.*

Generic characters.—Allied to *Pleurolepis* Agassiz. Body greatly elongated, subcylindrical, and translucent. Head as in *Pleurolepis*, but

entirely naked; body *entirely naked, except* the *caudal peduncle*, which is sparsely covered with thin, imbedded scales, and a *series of rather large scales* along the sides, *on which the lateral line runs;* upper jaw somewhat protractile; mouth rather wide, nearly terminal; *a single anal spine.* The name *Ammocrypta* is given in allusion to the habit of hiding in the sand, which is characteristic of the species of this genus and *Pleurolepis.*

Specific characters.—General form of *Pleurolepis pellucidus*, but the head heavier. Depth about 6 in length (to base of caudal—as in all cases in this paper); head $3\frac{3}{4}$; mouth large, the upper jaw rather longest, and somewhat protractile; cheeks and opercles entirely naked. A series of rather large scales, about 65 in number, forming the lateral line; a few scattering scales immediately above or below lateral line; behind anal and second dorsal, the caudal peduncle is covered with small, thin, imbedded scales.

Fin rays: Dorsal X—10. Anal I, 9. The two dorsal fins very high, wide apart, about equal to each other and to the large anal. Caudal fin emarginate.

Color clear translucent, without bars or spots, the lateral line shining-golden in life (*Bean*). Spinous dorsal fin with a large black spot on the membrane anteriorly, another near the middle, and some small ones behind; other fins with their membranes dusted with small punctulations.

Habitat.—Notalbany River, near Tickfaw, La. Collected in December, 1876, by Dr. Tarleton H. Bean, of the Smithsonian Institution, for whom the species is named. The type—about $2\frac{1}{2}$ inches in length—is in the United States National Museum.

The much greater height of the dorsal and anal fins, as well as the generic character of the naked body, distinguish this species from its sand-diving relatives, *Pleurolepis pellucidus* and *P. vitreus.*

3. NANOSTOMA, *Putnam*, MSS., *gen. nov.*

The name of *Nanostoma*, a manuscript genus of Darters, has been current in ichthyological circles for some time, and it has once or twice appeared in print, but no attempt has ever been made to characterize it. I find in the National Museum two species of Etheostomoid fishes, labelled by Prof. Putnam *Nanostoma*, one of which seems to be identical with *Pœcilichthys zonalis* Cope. These species cannot well be referred to *Pœcilichthys*, as they have a complete lateral line. From

Boleosoma they are separated by the non-protractile upper jaw, and they seem to have little relation with the species referred to *Nothonotus*.

Nanostoma, then, appears to be a distinct genus, or at least a strongly marked section, and I propose to accept the name and to select, as the type of the group, *P. zonalis* Cope (=*N. pictum* Putnam, MSS.). *Nanostoma* bears somewhat the same relation to *Nothonotus* that *Boleichthys* does to *Pœcilichthys*.

Generic characters.—Body fusiform, little compressed, entirely scaly, without enlarged ventral plates. Mouth small, subinferior, the upper jaw not protractile; vomerine teeth; scales large; lateral line complete; cheeks and opercles scaly; dorsals well separated, the second much larger than anal, higher but rather shorter than spinous dorsal. The separation of the dorsals, the form of the body, the small size of the mouth, and the large size of the scales separate *Nanostoma* from *Nothonotus*. The scaliness of the cheeks, neck, and throat are differences of some importance.

4. HADROPTERUS TESSELLATUS, *sp. nov.*

? *Boleosoma tessellatum*, THOMPSON, Appendix Hist. Vt. p. 31, 1853 (not of De Kay, 1842).

? *Cottogaster tessellatus*, PUTNAM, Bull. Mus. Comp. Zool. i, 1863, 5.

? *Boleosoma tessellatum*, THOMPSON, *nec* De Kay, Jordan & Copeland, Bull. Buff. Soc. Nat. Hist. 1876, 135, 163.—JORDAN, Man. Vert. 1876, 222.

A specimen of an Etheostomoid in the United States National Museum, labelled *Cottogaster*, has the characters assigned by Prof. Putnam to his genus of that name, and is presumably the species which he catalogues, without description, as *C. tessellatus*. Prof. Putnam accepted the specific name from Thompson, who seems to have supposed, erroneously, that he was describing De Kay's *Boleosoma tessellatum*. Prof. Putnam states that his *Cottogaster tessellatus* is a species of *Boleosoma*, but the species now under consideration is certainly a *Hadropterus*, as I understand the latter genus. I therefore propose for my species the name of *Hadropterus tessellatus* Jordan. If Prof. Putnam's species proves different, it should be renamed, as there has been already a *tessellatum* in *Boleosoma*, and mine will keep its name. If the two are, as I suspect, identical, then we will write *Hadropterus tessellatus* (Putnam) Jordan, and no confusion in nomenclature need arise.

H. tessellatus has the form of *Imostoma shumardii*, fusiform, with a broad, heavy head; mouth wide, the upper jaw rather longest, not protractile; cheeks and opercles naked (? in life); chest naked; neck

scaly; no ventral plates; belly entirely scaled; lateral line complete; anal about equal to second dorsal.

Fin rays:—Dorsal about X—12. Anal II, 8. The soft rays barred. Coloration otherwise obliterated. Length of type 2½ inches.

Habitat.—Foxburgh, Pa., Allegheny River. Type No. 1199, United States National Museum.

5. ERICOSMA EVIDES, *Jordan & Copeland, gen. nov.*

Alvordius evides, JORDAN & COPELAND, Proc. Acad. Nat. Sci. Phila. 1877, p. 51.

The coloration of this species, described in the paper above cited, is that of the female fish. The recent collection of a very large number of both sexes, in the breeding dress, at the same locality where the types were taken, enables me to supplement the original account. The following are the life colors of a male fish in spring:—

Lateral bars, which in the female are black or brown, a dark, rich blue-green, with metallic lustre. At the base of the bars they are somewhat connected by a narrow band of a greenish-bronze color, passing below the lateral line. Just below this is a narrow streak of yellowish—a sort of luminous, sunshine color. Above, toward the back, in each of the interspaces between the bars, is a bright blotch of bronze-red. The entire lower parts of the body are of a bright clear yellow, which becomes on the under side of the head, throat, and branchiostegals a very bright orange-red. A blackish-green bar below eye and a streak forward from it.

Dorsal fin orange-colored, with a bright bronze edge, a blackish spot on the last rays. Second dorsal and caudal pale orange; two luminous spots at base of caudal fin; anal bronze, with blue-black shading. Ventral fins dark blue-black. Pectorals faintly orange. Cheeks orange-red, exactly the color of bright iron-rust.

Males with the rays of the ventral and anal fins covered with small bluish tubercles, exactly as in some *Cyprinidæ*.

This species is probably not strictly congeneric with the type of *Alvordius*. It differs from the latter genus chiefly in the less complete dentition and the reduced number of vertebræ, the latter character giving to the fish a short, compact form, quite unlike that of *Alvordius aspro* and related species. I propose to designate the group typified by *A. evides* by the name of *Ericosma* (ηρ, springtime; κοσμεώ, to adorn), from the gay coloration of the males at that season.

The principal characters separating *Ericosma* from *Alvordius* are shown below.

ALVORDIUS, *Grd.* (Type, A. *maculatus* Grd.)	ERICOSMA, *Jordan.* (Type, *Alvordius evides* Jor. & Copel.)
Vertebræ numerous, about 44 in all; 22 in front of anus.	Vertebræ fewer, about 39 in all; 17 in front of anus.
Body and head elongate; mouth wide, with well-developed teeth on vomer and on palatines.	Body short and compact; mouth small, with about six minute teeth on vomer and none on palatines.
Sexes similar; males never with the fins tuberculate.	Sexes dissimilar; the males brilliantly colored, with the lower fins tuberculate.
Dorsal spines 12 to 15; the two dorsal fins well apart.	Dorsal spines 10 or 11; the two fins contiguous.
Caudal fin slightly emarginate.	Caudal fin deeply emarginate.

6. RHEOCRYPTA, *Jordan, gen. nov.*

Allied to *Imostoma* and *Alvordius*. Body rather slender and elongate, with a pretty large, rather long, and somewhat narrowed head, resembling that of *Boleosoma;* mouth small, horizontal, subinferior, with weak teeth in the jaws, five or six small teeth on the vomer, and none on the palatines; upper jaw protractile, separated by a distinct furrow from the forehead; two distinct dorsal fins, of which the second is rather smaller than the first and than anal; anal with two distinct spines; ventral region with a series of enlarged plates, as in *Alvordius* and *Percina*, these caducous, in many specimens replaced by a scaleless strip; cheeks naked; opercles with a few scales; lateral line complete.

This genus is perhaps nearest *Imostoma*, with which it agrees in the protractile mouth. It differs from *Imostoma* and agrees with *Alvordius* Grd. in the presence of ventral plates. The name *Rheocrypta* (ῥεώ, to flow rapidly—κρυπτος, concealed, *i. e.*, hiding in the rapids) is given in allusion to the peculiar habits of this interesting species.

7. RHEOCRYPTA COPELANDI, *Jordan, sp. nov.*

Head $4\frac{1}{4}$ in length; depth $5\frac{1}{2}$; eye large, $3\frac{1}{3}$ in head; scales moderate, strongly ctenoid, 56 in lateral line; those of the ventral much enlarged, forming serrated plates; cheeks naked; opercles with a few scales; neck and throat naked. Fin-rays:—Dorsal X–XII, 10; anal II, 9.

General color a semi-transparent brownish-yellow, a series of rather small horizontally oblong black spots along lateral line, forming an interrupted lateral band; back tesselated, as in *Boleosoma*, a blackish streak forward from eye and another downward; ventral fins dusky; vertical fins with dusky specks, but scarcely barred; a black spot on anterior rays of spinous dorsal.

Length of specimens 2 to 2½ inches.

Habitat.—White River, Indiana. The specimens in my possession, some thirty in number, were all taken at the same point, a shallow rapid, where the river flows over fine gravel. This locality, the "Red Bridge", about five miles north of Indianapolis, is the only one thus far known for this species and for *Ericosma evides*. It is the best point for the collection of *Pleurolepis pellucidus* which I know of in the West. As many as thirty specimens of the latter species have been taken there at low water at a single haul of the net. *Rheocrypta copelandi* and *Ericosma evides* are both extremely local, as a few rods above or below the rapids it is impossible to find either.

I dedicate this species to the memory of my friend, the late Professor Copeland, to whose patient study of these beautiful little fishes we owe much that is now known of their habits and ways. I have named this graceful species, taken at the rapids where he and I had so often fished together, for him, in recognition of his genuine love of nature, and in token of our long scientific association and personal friendship.

8. ARLINA ATRIPINNIS, *Jordan, sp. nov.*

I admit the genus *Arlina* provisionally for those species of *Boleosoma* which have two well-developed anal spines; but, as I have never seen *Arlina effulgens*, the type of the genus, I am not certain that that species possesses this character.

The species of this genus to which the above name has been given may be thus characterized:—

Body rather short for the genus, somewhat compressed behind; the depth 4½ in length. Head extremely short and deep, 4⅛ in length of body; the snout very short and bluntly rounded. Eye quite large, 3½ in head. Mouth quite small, with equal jaws, the upper protractile. Cheeks and opercles scaly, the scales on cheeks small and closely set; a triangular series of scales above the opercle behind the eye. Throat smooth; neck above closely scaly; no ventral plates; belly closely scaled.

Fins large; rays, dorsal XII, 10; anal II, 7. Base of spinous dorsal $1\frac{1}{3}$ times length of head, $3\frac{1}{5}$ in length; the spines high, the highest about $\frac{3}{4}$ the length of the head.

Dorsal fins contiguous, with a slight connecting membrane. Second dorsal higher, but smaller than first, its base about equal to the length of the head. Pectoral fins moderate, reaching past the middle of the dorsal.

Color olivaceous; head above entirely black; a black bar below eye; back with eight dark cross-blotches; about eleven bar-like blotches, somewhat indistinct, arranged along the lateral line. Fins chiefly black. Membranes of the second dorsal and ventral fins entirely black, that of spinous dorsal with a broad, black, horizontal bar at base, above which are numerous distinct black oblique streaks; anal with a broad black bar and caudal and pectorals largely dusky. It is likely that females, and male fish at other seasons, will be found to be paler in color.

Length of type-specimen $2\frac{1}{2}$ inches.

Collected in a tributary of the Cumberland River, near Nashville, Tenn., by Prof. A. Winchell, to whom the National Museum is indebted for a fine series of Tennessee fishes.

9. ETHEOSTOMA SQUAMICEPS, *sp. nov.*

Catonotus fontinalis, PUTNAM, MSS. (1860) (not *E. fontinalis* Raf.).

A species of the genus *Etheostoma*, found in the streams of Kentucky, has been for a long time indicated in manuscript, but has never yet been fully described.

The following account is taken from two fine specimens in the United States National Museum (No. 1345), collected by Dr. Bebb, at Russellville, Ky., and labelled *Catonotus fontinalis* by Prof. Putnam.

Body oblong, rather elongate, pretty strongly compressed, the general form being much like that of *E. flabellaris*, but with deeper caudal peduncle, the depth being about one-fifth of the length. Head large, $3\frac{1}{5}$ in length, shorter and stouter than in *E. flabellaris;* the jaws much shorter and exactly equal; eye rather large, $4\frac{1}{2}$ in head. Cheeks and opercles thickly scaly, as are the throat and region in front of the dorsal; middle line of the belly with ordinary scales. Lateral line almost complete, wanting on about ten of the posterior scales, but with occasional perforated scales behind the continuous series.

Scales about 5–50–6. Fin-rays:—dorsal IX (or VIII), 12; anal II, 7 or 8.

Spinous dorsal low and short, the spines about equal, the longest less than half the height of the soft rays of the second dorsal. The bases of the two fins are about equal, and they are slightly connected by membrane.

In the male specimen, the dorsal spines are somewhat swollen and white at their tips, but rather less so than is usual in the genus.

Color partly obliterated by the alcohol. The male is rather dark, not spotted, striped, or banded. The female is somewhat mottled, and has about six cross-blotches on the back. The second dorsal, caudal, and pectorals are barred with black and pale, the caudal especially so. The other fins are black in the male; in the female, the lower fins are pale. A large black humeral spot. Length $2\frac{3}{4}$ inches.

This species is technically an *Etheostoma*, of which genus it possesses the general form, fin coloration, and dorsal fin. It has the mouth of *Pœcilichthys*, the scaly head of *Nanostoma*, with a condition of the lateral line intermediate between *Pœcilichthys* and *Nanostoma*. The other species of *Etheostoma* have the head naked.

The specific name *fontinalis* was used by Prof. Putnam on the supposition that this species is identical with that described under the same name by Rafinesque.

ANALYSIS OF GENERA OF ETHEOSTOMATIDÆ.

The following analytical synopsis gives the characters at present assigned to the genera of *Etheostomatidæ* admitted in this paper. The categories recognized are very closely related, but are susceptible of definition:—

*. Lateral line complete; body much elongate, subcylindrical, pellucid, with at least the entire ventral region naked:

a. Body entirely naked, except the caudal peduncle and the lateral line; dorsal fins high, well separated, equal to the anal fin and to each other; a single anal spine; head entirely scaleless; mouth large, with vomerine teeth, the upper jaw subprotractile ..... AMMOCRYPTA, 1.

aa. Body covered above with small thin imbedded scales, the ventral region entirely naked, the dorsal scales obscure but present; dorsal fins small, wide apart; two anal spines; cheeks and opercles scaly; mouth large, with vomerine teeth, the upper jaw subprotractile ..... PLEUROLEPIS, 2.

**. Lateral line complete; body less elongate, entirely scaly, or with definitely naked areas on throat, neck, or ventral line:

†. Second dorsal not larger than spinous dorsal, and little, if any, larger than anal; the dorsal fins distinct, the first the longer and usually the larger; body little compressed; two distinct anal spines (except in *Alvordius peltatus*, a species of uncertain affinities):

b. Upper jaw not protractile; vomerine teeth present:

c. Mouth narrow, inferior, overlapped by a tapering, truncate, more or less pig-like snout; ventral plates present, or, if fallen, a naked strip; body elongated; cheeks and opercles scaly; size largest of all the darters, PERCINA, 3.

cc. Mouth wider, terminal, the upper jaw being but little longer than the lower:

d. Ventral plates developed, or, if fallen, middle line of belly with a naked strip:

e. Body and head elongate; the vertebræ in increased number, more than 20 in front of anus; well-developed teeth on vomer and palatines; dorsal spines 12 to 15; fins never tuberculate ..... ALVORDIUS, 4.

ee. Body and head shortened; vertebræ fewer, less than 20 in front of anus; a few minute teeth on vomer and none on palatines; dorsal spines 10 to 12; colors brilliant, the male in spring with the lower fins tuberculate, ERICOSMA, 5.

dd. Ventral plates not developed; middle line of belly scaled like the sides, HADROPTERUS, 6.

bb. Upper jaw protractile, a distinct furrow separating it from the skin of the forehead:

f. No ventral plates; posterior ventral region scaled; anterior region largely naked; vomer well toothed; head and body stout and heavy; cheeks and opercles scaly; anal fin (in adult males?) greatly elevated, reaching to base of caudal fin ..... IMOSTOMA, 7.

ff. Ventral plates well developed, or, if fallen, a naked strip; vomer with a few minute teeth; palatines naked; body rather slender, with rather narrow head and smaller subinferior mouth; cheeks naked; opercles scaly; anal fin not enlarged ..... RHEOCRYPTA, 8.

††. Second dorsal considerably larger than anal fin; no ventral plates, the middle line of the belly always covered with small scales like those of the sides:

g. Upper jaw protractile:

h. No teeth on vomer or palatines; mouth small, contracted, subinferior; head short and thick, with swollen cheeks; spinous dorsal rather long; cheeks and opercles scaly; anal spines strong; body elongated, little compressed, DIPLESIUM, 9.

hh. Vomerine teeth present; dorsals contiguous, but distinct; the spinous dorsal short; head narrowed; the mouth rather small, horizontal, subinferior:

i. Anal spines two, well developed; the first the longer ..... ARLINA, 10.

ii. Anal spine single, more or less obscure and undifferentiated from the soft rays ..... BOLEOSOMA, 11.

gg. Upper jaw not protractile:

j. Dorsal fins well apart; body fusiform, little compressed; scales large; cheeks and opercles scaly; mouth small, horizontal, subinferior (as in *Boleosoma*); caudal peduncle rather slender ..... NANOSTOMA, 12.

jj. Dorsal fins slightly connected at base; body rather short, deep, strongly compressed; scales small; cheeks naked; mouth rather large, oblique (as in *Pœcilichthys*); caudal peduncle deep ..... NOTHONOTUS, 13.

***. Lateral line incomplete or wanting; no ventral plates; upper jaw not protractile; second dorsal larger than anal; vomer with teeth:

k. Lateral line present on anterior part of body:

l. Dorsal fins contiguous, the membrane of the first reaching to the base of the second:

m. Spinous dorsal fin well developed, two-thirds or more the height of the second; the spines graduated, never ending in little fleshy knobs; lateral line extending more than half the length of the body; mouth moderate, the upper jaw usually a little the longer; opercles scaly; cheeks naked; body rather short and deep. ..... PŒCILICHTHYS, 14.

mm. Spinous dorsal low and small, the spines subequal, scarcely half the height of the soft rays, in males ending in little fleshy knobs; mouth rather large, the lower jaw the longest; body elongated, compressed; lateral line extending less than half the length of the body; head naked (except in the aberrant *E. squamiceps*, which is an exception to all these characters, save those drawn from the dorsal fin).....ETHEOSTOMA, 15.

ll. Dorsal fins about equal, well separated; body elongated; cheeks and opercles scaly:

n. Lower jaw longest; lateral line unknown (genus admitted provisionally, the type-species apparently has not been seen since its original description):
ALVARIUS. 16.

nn. Jaws about equal; lateral line curved upward over the pectorals, not reaching to middle of body; body elongated.....BOLEICHTHYS, 17.

kk. No lateral line; dorsal fins small, subequal, well separated; mouth small, with nearly equal jaws; scales large; size smallest of all spiny-rayed fishes,
MICROPERCA, 18.

CATALOGUE OF SPECIES OF ETHEOSTOMATIDÆ.

The following catalogue includes those species of *Etheostomatidæ* which appear to be valid, with the geographical distribution of each so far as recorded. Species unknown to me are indicated by a star (*). In arranging the genera, I begin with the type most generalized, or most like ordinary *Percidæ*, *Hadropterus*. The relations of the aberrant genera *Pleurolepis* and *Ammocrypta* are probably most with *Alvordius*, a fact which cannot well be shown in a linear series. I omit several species, which very likely may prove valid, but of whose relations I can form no definite opinion from the published accounts. In each genus, the type-species is placed first.

HADROPTERUS, *Agassiz.*

1. Hadropterus nigrofasciatus, Ag.—South Carolina to Tennessee and Louisiana.
2. Hadropterus tessellatus, Jordan.—Vermont (?) to Pennsylvania.
3. Hadropterus aurantiacus, (Cope) Jor.*—Virginia to Tennessee.

ERICOSMA, *Jordan.*

4. Ericosma evides, Jordan & Copeland.—Wabash Valley.

ALVORDIUS, *Girard.*

5. Alvordius maculatus, (Grd.).—Pennsylvania to North Carolina.
6. Alvordius aspro, Cope & Jordan.—Upper Mississippi Valley and Upper Lake Region.
7. Alvordius nevisensis, Cope.*—North Carolina.

8. Alvordius peltatus, (Stauffer,) Cope & Jor.*—Conestoga River, Pennsylvania.
9. Alvordius macrocephalus, Cope.—Upper Ohio Valley.
10. Alvordius phoxocephalus, (Nelson) Cope & Jordan.—Indiana to Tennessee and Kansas.

PERCINA, *Haldeman.*

11. Percina caprodes, (Raf.) Grd.—Great Lake Region to Alabama.
12. Percina carbonaria, (B. & G.) Grd.—Texas.
13. Percina zebra, Agassiz.—Great Lake Region (*d. s.*).
14. Percina manitou, Jordan.—Indiana to Minnesota.

RHEOCRYPTA, *Jordan.*

15. Rheocrypta copelandi, Jordan.—Wabash Valley.

IMOSTOMA, *Jordan.*

16. Imostoma shumardii, (Grd.) Jor.—Indiana to Iowa and Arkansas.

DIPLESIUM, *Rafinesque.*

17. Diplesium blennioides, Raf.—Mississippi Valley.
18. Diplesium newmani, (Ag.) Jor. & Copel.—Tennessee River.
19. Diplesium simoterum, (Cope) Copeland.—Cumberland and Upper Tennessee Rivers.

BOLEOSOMA, *De Kay.*

20. Boleosoma olmstedi, (Storer) Ag.—Great Lakes to New England and south to Georgia, east of the Alleghanies.
21. Boleosoma atromaculata, (Grd.) Jor.—New York to Virginia (? var.).
22. Boleosoma nigra (Raf.) Jor.—Mississippi Valley and Upper Great Lakes.
23. Boleosoma æsopus, Cope.*—Alleghany River.
24. Boleosoma mesæa, (Cope) Jordan.—Kansas (*d. g.*).

ARLINA, *Girard.*

25. Arlina effulgens, Grd.—Maryland to North Carolina (*d. g.*).
26. Arlina stigmæa, Jordan.—Georgia to Louisiana.
27. Arlina maculaticeps, (Cope) Jordan* (*d. g.*).
28. Arlina atripinnis, Jordan.—Cumberland River.

NANOSTOMA, *Putnam.*

29. Nanostoma zonalis, (Cope) Jordan.—Mississippi Valley.

NOTHONOTUS, *Agassiz.*

30. Nothonotus maculatus, (Kirt.) Ag.—Ohio.
31. Nothonotus camurus, (Cope) Jor.—Ohio Valley.
32. Nothonotus sanguifluus, (Cope) Jor.*—Cumberland River.
33. Nothonotus vulneratus, (Cope) Jor.*—Tennessee to North Carolina (*d. g.*).
34. Nothonotus rufilineatus, (Cope) Jordan.*—Kentucky to North Carolina.

PŒCILICHTHYS, *Agassiz.*

35. Pœcilichthys variatus, (Kirtland) Ag.—Upper Mississippi Valley and tributaries of Lake Erie and Lake Michigan.
36. Pœcilichthys spectabilis, Agassiz.—Upper Mississippi Valley and tributaries of Lakes Erie and Michigan.
37. Pœcilichthys lepidus, Girard.—Texas and west.
38. Pœcilichthys punctulatus, Agassiz.—Missouri to Arkansas.
39. Pœcilichthys leonensis, (Grd.) Jor. & Copel.*—Texas (*d. g.*).
40. Pœcilichthys grahami, (Grd.) Jor. & Copel*.—Texas.

ETHEOSTOMA, *Rafinesque.*

41. Etheostoma flabellaris, Rafinesque.—Ohio Valley to Tennessee and Virginia.
42. Etheostoma linslii, H. R. Storer.—Western New York (? var).
43. Etheostoma kennicottii, (Putnam) Jor.*—Illinois (*d. s.*).
44. Etheostoma lineolata, (Agassiz) Jordan.—Wisconsin to Iowa (? var.).
45. Etheostoma squamiceps, Jordan.—Ohio Valley, Kentucky.

ALVARIUS, *Girard.*

46. Alvarius lateralis, Grd.*—Texas, Mexico.

BOLEICHTHYS, *Girard.*

47. Boleichthys exilis, Grd.*—Upper Missouri Region.
48. Boleichthys eos, Jordan & Copeland.—Tributaries of Great Lakes and Upper Mississippi River.
49. Boleichthys erochrous, (Cope) Jordan.—New Jersey, Pennsylvania.
50. Boleichthys elegans, Girard.—Georgia to Texas.

51. Boleichthys gracilis, (Grd.) Jordan.—Texas.
52. Boleichthys fusiformis, (Grd.) Jordan.—Massachusetts.
53. Boleichthys barratti, (Grd.) Jordan.—North Carolina to Georgia.
54. Boleichthys warreni, Grd.*—Upper Missouri.

MICROPERCA, *Putnam.*

55. Microperca punctulata, Putnam.—Upper Mississippi Valley and tributaries of Lake Michigan.

PLEUROLEPIS, *Agassiz.*

56. Pleurolepis pellucidus, (Baird) Agassiz.—Ohio Valley.
57. Pleurolepis vitreus, (Cope) Jord. & Copel.*—North Carolina and Tennessee.

AMMOCRYPTA, *Jordan.*

58. Ammocrypta beanii, Jordan.—Louisiana.

Incertæ sedis.

Etheostoma tessellata, Storer.*—Florence, Ala. (*?Pœcilichthys*).
Etheostoma cinerea, Storer.*—Florence, Ala. (*?Pœcilichthys*).
Aplesion pottsii, Grd.*—Chihuahua, Mexico (*?Pœcilichthys*).
Diplesion fasciatus, Grd.*—Texas (*? Pœcilichthys*).

LIST OF NOMINAL SPECIES OF ETHEOSTOMATIDÆ.

The following list includes all the species of *Etheostomatidæ* described in works to which I have access, arranged in chronological order, with my identification of each. Those species of which I have examined the type-specimens are designated by a dagger (†).

Nominal species.	Date.	Identification.
Sciæna caprodes, Raf	1818	Percina caprodes.
Etheostoma flabellaris, Raf	1819	Etheostoma flabellaris.
Etheostoma blennioides, Raf	1819	Diplesium blennioides.
Etheostoma flabellata, Raf	1820	Etheostoma flabellaris.
Etheostoma nigra, Raf	1820	Boleosoma nigra.
Pegedictis ictalops, Raf	1820	Etheostoma flabellaris.
Etheostoma fontinalis, Raf	1820	Etheostoma flabellaris.
Etheostoma variata, Kirt	1840	Pœcilichthys variatus.
Etheostoma maculata, Kirt	1840	Nothonotus maculatus.
Etheostoma olmstedi, Stor	1842	Boleosoma olmstedi.
Perca nebulosa, Hald	1842	Percina caprodes.

Nominal species.	Date.	Identification.
Perca minima, Hald	1842	Boleosoma olmstedi.
Pileoma semifasciata, De Kay	1842	Percina caprodes.
Boleosoma tessellata, De Kay	1842	Boleosoma olmstedi.
Percina bimaculata, Hald	1843	Percina caprodes.
Etheostoma cœrulea, Stor	1845	Pœcilichthys variatus.
Etheostoma tessellata, Stor	1845	(?)
Etheostoma cinerea, Stor	1845	(?)
Pileoma zebra, Ag	1850	Percina (caprodes var.?) zebra.
Boleosoma maculatum, Ag.	1850	Boleosoma nigra.
Etheostoma linsleyi, H. R. Stor	1850	Etheostoma (flabellaris var. ?) linslii.
Pœcilosoma erythrogaster, Kirt	1854	Pœcilichthys variatus.
Pœcilichthys spectabilis, Ag. †	1854	Pœcilichthys spectabilis.
Pœcilichthys versicolor, Ag	1854	Pœcilichthys variatus.
Pœcilichthys punctulatus, Ag †	1854	Pœcilichthys punctulatus.
Catonotus lineolatus, Ag	1854	Etheostoma (flabellaris var. ?) lineolata.
Hadropterus nigrofasciatus, Ag	1854	Hadropterus nigrofasciatus.
Hyostoma newmani, Ag. †	1854	Diplesium newmani.
Boleosoma fusiforme, Grd. †	1854	Boleichthys fusiformis.
Boleosoma barratti, Holbr	1855	Boleichthys barrattii.
Pileoma carbonaria, B. & G.†	1856	Percina carbonaria.
Pœcilichthys lepidus, B. & G. †	1856	Pœcilichthys lepidus.
Arlina effulgens, Grd	1859	Arlina effulgens.
Estrella atromaculata, Grd	1859	Boleosoma (olmstedi var. ?) atromaculata.
Oligocephalus humeralis, Grd	1859	Etheostoma flabellaris.
Alvordius maculatus, Grd.†	1859	Alvordius aspro.
Catonotus fasciatus, Grd	1859	Etheostoma flabellaris.
Hadropterus maculatus, Grd	1859	Alvordius maculatus.
Hadropterus shumardii, Grd	1859	Imostoma shumardii.
Alvarius lateralis, Grd	1859	Alvarius lateralis.
Diplesion fasciatus, Grd	1859	Pœcilichthys sp. (?)
Aplesion pottsi, Grd	1859	Pœcilichthys sp.
Oligocephalus grahami, Grd	1859	Pœcilichthys sp. (?)
Oligocephalus leonensis, Grd	1859	Pœcilichthys sp. (?)
Oligocephalus pulchellus, Grd	1859	Pœcilichthys sp. (?)
Boleosoma gracile, Grd. †	1859	Boleichthys gracilis.
Boleichthys exilis, Grd	1859	Boleichthys exilis.
Boleichthys whipplei, Grd	1859	Pœcilichthys punctulatus.
Boleichthys elegans, Grd	1859	Boleichthys elegans.
Boleichthys warreni, Grd	1859	Boleichthys warreni.
Pœcilosoma transversum, Abbott †	1860	Pœcilichthys variatus.
Pileoma cymatogrammum, Abbott †	1860	Diplesium blennioides.

Nominal species.	Date.	Identification.
Asproperca zebra, Heckel	1860	Percina caprodes.
Catonotus kennicottii, Putn	1863	Etheostoma sp.
Microperca punctulata, Putn.†	1863	Microperca punctulata.
Cottogaster tessellatus, Putn	1863	Hadropterus tessellatus (?).
Pleurolepis pellucidus, (Baird) Ag	1863	Pleurolepis pellucidus.
Pœcilichthys mesæus, Cope †	1864	Boleosoma mesæa.
Etheostoma peltatum, Stauff	1864	Alvordius peltatus.
Hololepis erochrous, Cope †	1864	Boleichthys erochrous.
Etheostoma macrocephalum, Cope †	1866	Alvordius macrocephalus.
Boleosoma brevipinne, Cope †	1868	Boleosoma nigra.
Cottogaster aurantiacus, Cope	1868	Hadropterus aurantiacus.
Pœcilichthys zonalis, Cope †	1868	Nanostoma zonalis.
Hyostoma blennioperca, Cope †	1868	Diplesium blennioides.
Hyostoma simoterum, Cope	1868	Diplesium simoterum.
Etheostoma nevisense, Cope	1870	Alvordius nevisensis.
Pœcilichthys sanguifluus, Cope	1870	Nothonotus sanguifluus.
Pœcilichthys camurus, Cope	1870	Nothonotus camurus.
Pœcilichthys rufilineatus, Cope	1870	Nothonotus (?) rufilineatus.
Pœcilichthys vulneratus, Cope	1870	Nothonotus (?) vulneratus.
Pœcilichthys vitreus, Cope	1870	Pleurolepis vitreus.
Boleosoma maculaticeps, Cope	1870	Arlina maculaticeps.
Boleosoma æsopus, Cope	1870	Boleosoma æsopus.
Plesioperca anceps, Le Vaillant	1873	Hadropterus nigrofasciatus.
Boleosoma mutatum, Le Vaillant	1873	Boleosoma nigra.
Boleichthys eos, Jordan & Copeland †	1876	Boleichthys eos.
Etheostoma phoxocephalum, Nelson †	1876	Alvordius phoxocephalus.
Alvordius evides, Jor. & Copel †	1877	Ericosma evides.
Alvordius aspro, Cope & Jordan	1877	Alvordius aspro.
Percina manitou, Jor. †	1877	Percina manitou.
Boleosoma stigmæum, Jor.†	1876	Arlina stigmæa.
Ammocrypta beanii, Jor. †	1877	Ammocrypta beanii.
Hadropterus tessellatus, Jor. †	1877	Hadropterus tessellatus.
Rheocrypta copelandi, Jor.†	1877	Rheocrypta copelandi.
Arlina atripinnis, Jor.†	1877	Arlina atripinnis.
Etheostoma squamiceps, Jor	1877	Etheostoma squamiceps.

CENTRARCHIDÆ.

10. EUPOMOTIS.

Eupomotis, GILL & JORDAN, Field and Forest, 1877, v. 2, p. 190.

In the Journal de Physique, June, 1819, page 420,* Rafinesque first proposes the name *Lepomis* for the American Sunfishes, the type to be *Labrus auritus* of authors. The genus *Lepomis* he then proposes to divide into two subgenera, *Pomotis* and *Apomotis*, the former having the body rounded and the opercle auriculated, the latter having the body rounded or oblong and the opercle without auricle.

Of auriculated species, only one, *auritus*, is mentioned. This species is then obviously the type of *Pomotis;* but it had been already indicated as the type of *Lepomis*. *Pomotis* then is typical *Lepomis*, and is a simple synonym of the latter name.

In the Ichthyologia Ohiensis, in 1820, Rafinesque characteristically changed some of these names; *Lepomis* here becomes *Icthelis*, and *Apomotis*, *Telipomis*. *Pomotis* is still used in the same sense as before. In 1829, Cuvier and Valenciennes revived the name *Pomotis* of Rafinesque in precisely the same sense in which Rafinesque used it, but including several additional species. Cuvier does not credit the name *Pomotis* to Rafinesque, but, in accordance with a custom then as now too prevalent, in modifying the characters assigned to the genus, allowed his own name to supersede that of the earlier author. That Cuvier accepted the name *Pomotis* from Rafinesque is evident from the fact that he quotes Rafinesque's descriptions in a foot-note. *Pomotis* and *Bryttus* of Cuvier and Valenciennes are practically equivalent to *Po-*

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*"13. *Lepomis* (Thoracique). Corps arrondi, ovale ou oblong, très comprimé. Tête et opercules écailleux, ceux-ci mutiques, le postérieur flexueux, membraneux, quelquefois auriculé. Bouche petite, mâchoire à petits dents, lèvre supérieure à peine extensible. Une nageoire dorsale; nageoire thoracique à 6 rayons dont 1 épineux sans appendices. Anus au milieu. Ce genre est nombreux en espèces, je'n connois 7 à 8 des États-Unis; son type est le *Labrus auritus* des auteurs, sous le nom duquel il y a 4 ou 5 espèces confondues. Il diffère particulièrement du Sparus par son opercule écailleux et le défaut d'appendice thoracique. Il se devise en deux sous-genre: 1. *Pomotis*. Corps arrondi, opercule auriculé. 2. *Apomotis*. Corps arrondi ou oblong, opercule sans auricule; mais tous ont le corps tacheté et une tache noire sur l'opercule. J'en ai découvert deux nouvelles espèces dans l'Ohio. 1. *L. cyanellus*. Corps oblong, tout couvert de points bleus, joues à lignes flexueuses bleues, opercule sans auricule; tache oblongue, queue bilobée. 2. *L. macrochirus*. Corps ovale, points bruns, point d'auricule; tache oblongue, toute noire; pectorales très longues atteignant l'anale; queue fourchée."—(RAFINESQUE.)

motis and *Apomotis* of Rafinesque. The fact that *Pomotis* has been long in use and is a very familiar name is its only claim for retention, a claim which does not appear to justify its retention in opposition to established rules of nomenclature.

The name *Pomotis* being therefore untenable for any genus of *Centrarchidæ*, Prof. Gill and myself have proposed the name *Eupomotis* for *Sparus aureus* Walbaum (=*Pomotis vulgaris* Cuvier) and its congeners.

Three species of this genus are known from autopsy to Prof. Gill and myself—*E. aureus* (Walb.), *E. speciosus* (Holbrook), and *E. pallidus* (Agassiz).

11. EUPOMOTIS PALLIDUS, (*Agassiz*) *Gill & Jordan.*

Pomotis pallidus, AG., Am. Journ. Sci. Arts, 1854, 303.—JORDAN, Man. Vert. 1876, 240.

This is a large stout species, somewhat elongate, resembling *Lepiopomus pallidus* in form and coloration. Head 3 in length; depth $2\frac{1}{8}$; eye 4. Head and profile scarcely gibbous; snout protruding; mouth rather large, somewhat oblique, reaching the front of eye; eye rather large; opercular flap wide and rounded, shorter than in *E. aureus*, with a rather wide pale border, chiefly below and behind. Scales very large, 4–35–13, about 4 rows on the cheeks. Spines rather high and strong, the longest dorsal spine as long as from muzzle past middle of pupil; soft fins high; pectorals long, but not reaching anal. Gill-rakers short and weak.

Color pale olive or brassy; no trace of blue or orange in spirits; some blackish markings on last rays, but hardly a spot. Pharyngeal teeth very strongly "paved", as in the related species. Described from No. 4157, National Museum.

Habitat.—Tennessee River (Agassiz). Mississippi River, at Saint Louis; Alabama River (specimens in National Museum).

12. XENOTIS.

Xenotis, JORDAN, Proc. Acad. Nat. Sci. Phila. 1877, 76.

The peculiar character of the gill-rakers, which separates this genus from *Lepiopomus*, has not yet been fully defined, and indeed a more minute study is still desirable, although it may be readily recognized. In *Lepiopomus*, the gill-rakers of the anterior branchial arch are comparatively long, somewhat firm, having apparently an ossified basis, and they are provided toward their tip, on one side at least, with minute, pointed, tooth-like roughnesses. These teeth may be readily felt with the

tweezers or seen with a hand-glass. The appendages of the anterior gill-arch only are thus enlarged, those of the other arches remaining undeveloped.

In *Xenotis*, the gill-rakers are not essentially dissimilar on the different arches. They are short, comparatively thick, soft, having a cartilaginous or unossified basis, and are nearly destitute of teeth or tooth-like roughnesses. The brilliant colors, low dorsal spines, and especially the great development of the opercular flap in *Xenotis*, form additional distinctive characters, although not independently of generic value.

13. XENOTIS SOLIS, (*Valenciennes*) *Gill & Jordan.*

Pomotis solis, *Valenciennes (1831), Hist. Nat. des Poissons, vii, 468. (Specimens sent by Le Sueur from near New Orleans. Those referred to from New York doubtless belong to *Lepiopomus auritus*.)

Numerous specimens of a sun-fish from the Tangipahoa River, Louisiana, have been identified by us with Valenciennes's species as above, and examples have been distributed by the United States National Museum under the name of *Xenotis solis*. Of course, it is not possible from Valenciennes's description to know certainly which one of our numerous similar species he had in mind, but it is safer to identify with the present species than with any other, and our *X. solis* does not seem ever to have received any other name.

Xenotis solis is an elongate species for the genus, most of the species of which are short and deep. It is, however, heavy forward, the region before the dorsal being quite prominent, forming a marked angle over the eye with the rising profile of the face. The greatest depth is $2\frac{1}{3}$ in the length. The head is large, 3 in length, without the opercular flap; $2\frac{1}{3}$ including the flap.

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* The following is Valenciennes's description :—

Le POMOTIS SUN-FISH (*Pomotis solis nob.*).

Un autre pomotis du lac Pontchartrain, envoyé par M. Le Sueur, pourrait bien encore être d'une espèce distincte.

La couleur parait d'être un jaune verdâtre uniform, plus ou moins doré, sans aucune trace de taches ou de raies sur le corps et sur les nageoires. Le lambeau de l'oreille est plus long et plus étroit que dans aucun autre. Les nombres sont, D. 10–11 : A. 3-10, etc.

Il est long de quatre à cinq pouces.

Les Anglo-Américains de la Nouvelle-Orléans donnent à cette espèce le nom de *sun-fish* (poisson de soleil). M. Le Sueur ne nous explique pas ce qui a motivé cette dénomination.

Nous rapportons à cette espèce des individus mal colorés, qui nous ont été envoyés de New York par M. Milbert.

The eye is quite large, 4 in the head proper; 1½ times in the opercular flap.

The opercular flap is quite long and narrow, narrowly bordered with pale throughout its length; its length is contained about 2½ times in the length of the rest of the head, its width is little more than half its length. It is somewhat broadened toward the tip, and is set obliquely upward and backward. Much variation in the size and form of this appendage may be expected.

The dorsal spines are moderately developed, rather high for the genus, the longest as long as from snout to middle of orbit. The caudal peduncle in this species is rather more than usually elongate: with the caudal fin it forms about one-third of the total length.

The scales on the cheek are rather large, in five or six rows. There are 39 scales in the lateral line; about five rows above and eleven below it. Fin-rays as usual, D. X, 10; A. III, 9.

The coloration has been modified by the alcohol. It seems to have been chiefly of a greenish or golden orange in life, with numerous small pale blue spots. Blue lines on the sides of the head and in front of the eyes. The fins, now unicolor, were probably largely orange in life.

This species is related to *X. inscriptus* and *X. megalotis*. It is longer-bodied and has higher spines than *fallax*, *breviceps*, *megalotis*, and *sanguinolentus*.

Its spines are much higher than in *lythrochloris* and the flap is different. *X. inscriptus*, *aureolus*, *marginatus*, and *peltastes* are smaller, less elongate, and have a different flap. In some respects it approaches nearer *Lepiopomus auritus* than do any of the above species, and specimens of the *auritus* were apparently confounded with it by Valenciennes.

14. XENOTIS SANGUINOLENTUS, (*Agassiz*) *Jordan*.

Pomotis sanguinolentus, AGASSIZ, Am. Journ. Sci. Arts, 1854, 301.

This handsome species seems to be widely distributed in the Southern States; I have seen specimens from the Tennessee, Savannah, Alabama, and Mississippi Rivers. It represents, in the South, *X. megalotis* of the Northern States. *X. sanguinolentus* may be known by the rather higher spines—the longest as long as from snout just past middle of pupil—and by a peculiarity of coloration, blue spots on the sides being arranged in vertical chain-like bands, which are striking and conspicuous even after the fish has been long in alcohol.

15. XYSTROPLITES, *gen. nov.*

This genus bears nearly the same relation to *Eupomotis* that *Lepiopomus* does to *Xenotis*. It comprises those *Centrarchidæ* which, wanting the supernumerary maxillary bone, have the teeth of the lower pharyngeals blunt and paved as in *Eupomotis*, and the gill-rakers long and relatively slender as in *Lepiopomus*. The pharyngeal bones themselves are much narrower and smaller than in *Eupomotis*, being in form more like those of *Xenotis*. The teeth are less strongly "paved", being smaller, less crowded, and rounded rather than truncate; on the inner border of the bone are a few enlarged acute teeth. The species of *Xystroplites*, as of *Eupomotis*, have the short rounded ear-flap bordered below and behind with orange. The type is the species below described under the name of *Xystroplites gillii*. *Pomotis heros* B. & G. also belongs to this genus. The known species strongly resemble *Lepiopomus pallidus* (*incisor*) in outward characters, and lack the brilliant coloration of *Eupomotis aureus*. The name *Xystroplites* is from ξυστρον, an instrument for scraping (gill-raker), and ὁπλίτης, armed, in allusion to the armature of the gill-rakers.

16. XYSTROPLITES GILLII, *sp. nov.*

Head 2½ in length; depth 2; eye about equal to flap, 4½ in head. Body elongate, very deep in the middle, abruptly narrowed each way. Greatest depth at the beginning of dorsal; a rapid slope from this point to the base of elongate caudal peduncle; a steep curve from dorsal to occiput, where an abrupt angle is formed with the projecting snout. Top of head sloping at an angle of about 45°.

Mouth wide, lower jaw a trifle longest; maxillary reaching just past the front of the pupil. Flap moderate, broad, with a very wide pale edge below and behind. Dorsal spines moderate, as long as from snout to middle of orbit; pectorals medium, barely reaching anal. Dorsal X, 10. Anal III, 9. Scales large, 6–42–13; 5 rows on the cheek.

Coloration obliterated; apparently uniform olive; traces of dusky mottlings on last rays of dorsal and anal.

Type, No. 5995, United States National Museum, from Garden Key, Florida.

This species may be known from its congener *X. heros* by the peculiar form, and from the species of *Lepiopomus* by its dentition.

17. LEPIOPOMUS ISCHYRUS, *Jordan & Nelson, sp. nov.*

Ichthelis aquilensis, NELSON, Bull. Ills. Mus. Nat. Hist. i, 1876, 37 (not *Pomotis aquilensis* GRD.).

Numerous young specimens purporting to be types of Baird and Girard's *P. aquilensis* are in the National Museum. Two species seem to be represented among them, the one a *Xenotis*, the other a *Lepiopomus*. Neither of them is identical with *I. aquilensis* Nelson, and as the latter species seems not to have been hitherto named, the above appellation is proposed for it.

18. LEPIOPOMUS APIATUS, *Cope.*

Lepomis apiatus, COPE, Proc. Am. Philos. Soc. 1877. (In press.)

This is a large species related to *L. macrochirus* Raf., and more closely to *L. elongatus* (Holbr.), but stouter built than either, and with marked peculiarities of coloration.

Body deep, compressed, the form somewhat as in *Eupomotis aureus*. Profile rising rapidly from the snout; the nape swollen, forming an angle above the eye; caudal peduncle deep, not especially elongated. Mouth moderate; maxillary reaching to just past anterior margin of the eye, the lower jaw projecting somewhat when the mouth is closed. A small patch of teeth on the anterior edge of the palatines (sometimes obsolete); eye large; opercular flap short and deep, considerably shorter than the eye.

Dorsal spines high, those in the middle highest, so that a slight notch is made at the beginning of the soft rays; the soft parts of the vertical fins are largely scaly. Pectoral fins moderate, barely reaching anal. Anal spines strong, the soft rays high. Longest dorsal spine nearly equal to the distance from the snout to the posterior edge of the orbit.

Head 3 in length, the depth $1\frac{7}{8}$; eye 4 in head, larger than the opercular flap, which is short and deep.

Gill-rakers rather long, stiff, pretty strongly dentate.

Fin-rays:—D. X, 11. A. III, 10.

Scales 6–40–13, those on the cheek large, in about seven rows.

Coloration somewhat altered by the alcohol. There are no spots on the fins, and there are no traces of blue lines on the cheeks. The most marked feature of coloration is the presence on various parts of the body of little dark brown or black spots, chiefly at the base of the

scales, smaller than pins' heads, about the size of the nasal openings, and resembling fly-specks.

On the lower part of the sides of the body, these spots are most distinct, and form irregular lines along the rows of scales. They are present also on the opercular region, and are more or less appreciable on most parts of the body. On some specimens, these spots are distinct over the whole body, being enlarged on the back.

The black opercular spot is very small for the genus, no larger than in the species of *Apomotis*. Besides the black spots, there are also faint pale spots at the base of some of the scales of the sides. These were perhaps conspicuous in life.

The fins generally are rather dark, unspotted; the ventral fins are black.

The length of the specimens described is from 4 to $4\frac{1}{2}$ inches.

Habitat.—St. John's River, Florida. Many specimens in the United States National Museum.

This species was indicated in MSS. some years ago by Prof. Gill, and specimens have been distributed by the Smithsonian Institution under the name *L. stercorarius* Gill. As Prof. Cope's paper will probably appear in advance of this, I have adopted his specific name, instead of publishing it as a new species.

19. LEPIOPOMUS MINIATUS, *sp. nov.*

General form of *Xenotis inscriptus*. Oblong and somewhat regularly elliptical. Head $2\frac{3}{4}$ in length; depth $2\frac{1}{4}$; eye large, $3\frac{1}{2}$ in head; opercular flap rather short and broad, entirely black; mouth rather large; scales of cheek large, in four series; scales large, 4–40–11; palatine teeth present; gill-rakers short for *Lepiopomus*, but stiff and rough. Dorsal spines rather long, as long as from snout just past middle of eye; pectorals long, reaching anal. Dorsal X, 10. Anal III, 9.

Color in spirits dark, rows of bright red or scarlet spots running lengthwise of the body; one spot on each scale, and two blackish markings on each side of the red; dorsal fin dusky behind, but unspotted; iris red. Length 4 inches.

Type, No. 16918, United States National Museum. Numerous specimens from Tangipahoa River, Louisiana. This species is perhaps most nearly related to *Lepiopomus auritus*.

20. APOMOTIS PHENAX, *Cope & Jordan, sp. nov.*

Chænobryttus phenax, COPE, MSS.

Form and appearance of *Lepiopomus pallidus*. Head $2\frac{1}{2}$ in length;

depth $2\frac{1}{5}$; eye moderate, as long as snout, rather smaller than opercular flap, about $4\frac{1}{2}$ in head. Mouth moderate, the lower jaw slightly longest, the maxillary reaching middle of eye, with a strong supplemental bone; snout short, projecting, an angle over eye. Gill-rakers very long; flap larger than in the other species of the genus.

Scales on cheek in 7 rows; on body 6–43–14. Mucous cavities strong. Dorsal spines short and strong, as long as from snout to middle of eye; soft dorsal high, soft anal higher, both largely scaly; caudal fin emarginate; pectoral fins long, reaching anal. Dorsal X, 10. Anal III, 9.

Color in spirits uniform olive-green, paler lines along the rows of scales; soft fins somewhat mottled, but no black blotch on dorsal or anal.

This species bears much more resemblance to *Lepiopomus* and *Xystroplites* than to its congeners. From *A. cyanellus*, it differs in the greater depth and compression of the body, in the longer spines, longer opercular flap, smaller mouth, and larger scales.

Type, two specimens about six inches long, in the Museum of the Philadelphia Academy of Natural Sciences, collected at Beaseley's Point, New Jersey, by Dr. Leidy.

21. ENNEACANTHUS PINNIGER, *Gill & Jordan, sp. nov.*

A very handsome species, rather larger than any other of this genus, and with larger fins.

Body rather short, deep, compressed, regularly ovate in form; the depth half the length (without caudal); the head one-third. Eye large, $3\frac{1}{3}$ in head. Mouth rather small, very oblique, the maxillary reaching to just opposite the front of the orbit.

Dorsal spines rather long, the soft rays greatly elevated; in the male fish as long as the head, reaching, when depressed, to the middle of the caudal; in the female fish considerably shorter; anal spines long, not rapidly graduated, the longest soft rays as long as those of the dorsal.

Ventral fins elongate; the filiform tips of the longest rays in the males reaching the first soft rays of the anal, the spines falling short of the anal spines. In the females, the ventral fins are shortened and scarcely reach the anal. Pectoral fins moderate, reaching the soft rays of the anal. Caudal fin elongate, nearly as long as head. Lateral line complete.

The female fish has all of the fins very much less elevated, the

longest rays of the dorsal and anal not reaching to caudal; the scales of the body more exposed, and the coloration duller.

Fin-rays:—D. IX, 10; A. III, 10. Scales 4–33–10.

The color of the male specimens in spirits is as follows:—Body olive, with, in some cases, a very faint suggestion of lateral vertical bars; a large black spot at the angle of the opercles, with pearly-blue markings about its base; an obscure bar below eye.

A number of round, luminous, or pearly-blue spots on the sides of the head, irregular in position but very distinct; other similar spots—white in spirits, doubtless sky-blue in life—on the membranes of the vertical fins, and in scattered irregular rows along the sides of the body, in some specimens on nearly the whole surface, forming imperfect lines along the sides. Each row of spots is accompanied by two faint blackish streaks. These spots are largest and most regular in position along the middle of the sides, but most definite in outline on the belly and fins.

The female is duller in color, the flap plain black, with some pale edging, and the body with larger spots, more regular in position but not so well defined. The spots on the fins are also larger and paler.

Length of largest specimens examined 3½ inches.

Habitat.—The types were collected at Kinston, N. C., by Mr. J. W. Milner. Upward of thirty specimens were preserved.

This species seems to be the largest and handsomest of the species of *Enneacanthus.* Its relationships are most close with the next species; but it is probably the most strongly marked of the genus. The sexual distinctions, evident in all the species, are here carried to the extreme.

22. ENNEACANTHUS MARGAROTIS, *Gill & Jordan, nom. sp. nov.*

?Enneacanthus guttatus, COPE (1869), Journ. Acad. Nat. Sci. Phila.—(not *Pomotis guttatus* MORRIS (1859), Proc. Acad. Nat. Sci. Phila. 9, which is *E. obesus*).

Enneacanthus obesus, JORDAN (1876), Man. Vert. 232 (excl. expression "barred", copied from Prof. Baird; specimens from Trenton, N. J., supposed to be the male of *obesus*) (not *Pomotis obesus* Grd.).

?Enneacanthus gloriosus, UHLER & LUGGER (1876), Fishes of Maryland—(not description, which seems to be copied from Holbrook) (not *Bryttus gloriosus* Holbr.).

No description of this common little species seems ever to have been published. Dr. Morris's notice of his *Pomotis guttatus* is very superficial, and apparently refers to *E. obesus;* the only tangible feature mentioned being the presence of black bars along the sides, which this species does not have.

The following description is taken from a large number of individuals sent by Dr. C. C. Abbott to the Smithsonian Institution from Trenton, N. J., and from others collected by Prof. Baird at Beaseley's Point, N. J.:—

Body rather short and deep, but more elongate than in any of the others; the head $2\frac{3}{4}$ in length, the depth $2\frac{1}{4}$; the eye large, longer than snout, $3\frac{1}{4}$ in head; mouth moderate, very oblique, the maxillary reaching to just past the front of the orbit.

Dorsal spines medium; the soft rays in the males somewhat elevated, reaching when depressed just to the base of the caudal; the longest soft ray as long as from the snout to the preopercular margin. In the females, the rays are shortened, but the sexual differences are much less marked than in *E. pinniger*. Anal spines long, rather rapidily graduated, the longest soft rays as long as those of the dorsal.

Ventral fins as in *E. pinniger*, the longest rays in the males filamentous and reaching the soft rays of anal; in the females shorter. Pectoral fins rather long, reaching middle of anal. Lateral line complete.

Fin-rays:—D. IX, 10; A. III, 9. Scales 3–30–9.

General coloration similar to that of *E. pinniger*. Body dark olive; very young specimens with faint traces of vertical bars; a moderate-sized opercular spot, smaller than in *E. obesus*, bordered above and below with luminous blue. Near the anterior edge of the "ear-flap" is a crescent-shaped pearly-blue spot, which, though small, is very conspicuous. Traces of a similar mark may be observed on *E. obesus*. Sides of head, whole body, and vertical fins with round bright blue spots arranged in irregular rows; these spots most distinct on the cheeks and opercles and on the lower parts of the sides.

This species resembles the preceding; but the males may be distinguished at once by the much less development of the fins and by the smaller size. The females of the two species bear more resemblance to each other, but differ in a similar way, though to a less degree.

Length of specimens examined about $2\frac{3}{4}$ inches.

Many specimens in the United States National Museum from the Potomac River, Delaware River and from localities in New Jersey.

The real affinities of *E. margarotis* are probably rather with *E. obesus*, and especially *E. gloriosus*, than with *E. pinniger*.

Bryttus fasciatus Holbrook seems to be identical with *E. obesus*.

I have seen no specimens of *E. gloriosus*, and know it only by Holbrook's description and figure.

The several species have been contrasted in the following table prepared by Dr. Gill and myself:—

*. Dorsal and anal moderately developed in the male as well as female (extending, when declined backward, little if any beyond the base of the caudal); scales on cheek and opercles not crowded, and forming more or less distinct vertical series:

†. Body marked with about eight well-defined dark cross-bars; opercular angle with a pretty large black spot, half or more the size of the eye; spots on body and fins purplish, red, or golden; scales large, little crowded; caudal fin moderately elongate, as long as from snout to about the middle of the opercle; lateral line usually incomplete behind ..... OBESUS.

††. Body without definite cross-bars or bands; opercular spot smaller, but little larger than pupil; caudal fin short, about as long as from snout to the posterior margin of the preopercle:

‡. Spots on body and fins pinkish or golden; dorso-ocular profile moderately convex; interorbital space quite depressed, the protruding snout forming an angle above the eye; body rather short and deep, the depth about half-length; a small black spot at root of caudal ..... GLORIOSUS.

‡‡. Spots on body and fins bright blue; dorso-ocular profile little convex, without decided concavity above orbits; body comparatively elongate, the depth less than half-length; no black caudal spot ..... MARGAROTIS.

**. Dorsal and anal fins much enlarged in the males (extending when declined backward as far as the middle of the caudal fin), but not in the female; scales on cheeks and opercles crowded together, forming oblique series; caudal fin very long, in the males as long as from the snout to the black opercular spot; in the females somewhat shorter; anal spines less rapidly graduated; body and fins with round pale spots, some or all of which are bright blue; lateral line complete, PINNIGER.

23. CENTRARCHUS.

Two species, at least, of the genus *Centrarchus* inhabit the waters of the Southern States, which seem to have been named by Lacépède, respectively, *Labrus macropterus* and *Labrus irideus*. *Labrus sparoides* Lacépède is also a *Centrarchus*, either identical with *L. macropterus*, or else it is a species not yet known. It is said to have ten dorsal and ten anal spines. *Centrarchus sparoides* C. & V. is apparently *C. macropterus*.

Centrarchus macropterus is a more elongate species than the common *Centrarchus irideus*. Its mouth is larger, the eye is larger, the fins are much larger, and with longer and more numerous spines. The anal fin in particular is advanced forward, so that the long spine of the ventral fin laps over on the anal as in *Copelandia*.

The most striking differences are shown in the following comparative table of characters :—

	C. macropterus, (Lac.) Jor., Ocmulgee River, Ga.	C. irideus, (Lac.) C. & V., Coosa River, Ala., Neuse River, N. C.
Dorsal rays (usually)	XII, 12	XI, 12.
Anal rays (usually)	VIII, 14	VII, 14.
Head in length	3	$3\frac{1}{6}$.
Depth in length	$2\frac{1}{3}$	2.
Lateral line	5–43–12	5–44–14.
Ventral spine in head	$1\frac{3}{4}$	$2\frac{1}{2}$.
Ventral spine reaching	4th anal spine	Not to vent.
Longest dorsal spine in head	$1\frac{1}{2}$	$1\frac{3}{4}$.
Longest soft dorsal ray in head	$1\frac{1}{3}$	$1\frac{2}{3}$.
Longest soft anal ray in head	$1\frac{1}{6}$	$1\frac{1}{2}$.
Mandible	More than half head	Less than half head.

The coloration in the two species appears to be essentially the same.

GENERA OF CENTRARCHIDÆ.

Prof. Gill now recognizes sixteen genera of *Centrarchidæ*, for which he suggests the following sequence, beginning with the most generalized type, *Micropterus*.

Subfamily MICROPTERINÆ, *Gill.*

1. *Micropterus*, Lacépède.

Subfamily LEPIOPOMINÆ, *Gill.*

§ 1.

2. *Chænobryttus*, Gill.
3. *Ambloplites*, Raf.
4. *Archoplites*, Gill.
5. *Acantharchus*, Gill.

§ 2.

6. *Apomotis*, Raf.
7. *Lepiopomus*, Raf.
8. *Xenotis*, Jordan.
9. *Xystroplites*, Jordan.
10. *Eupomotis*, Gill & Jordan.

§ 3.

11. *Mesogonistius*, Gill.

§ 4.

12. *Enneacanthus*, Gill.
13. *Hemioplites*, Cope.
14. *Copelandia*, Jordan.

Subfamily CENTRARCHINÆ, *Gill.*

15. *Centrarchus*, Cuv. & Val. 16. *Pomoxys*, Raf.

The first section of the subfamily of *Lepiopominæ* is distinguished by the development of an oval patch of teeth on each entopterygoid bone, as well as a continuation on each pterygoid bone of a band of teeth from the palatine bone, a character not hitherto noticed, to which Prof. Gill has called my attention. The setiform gill-rakers, reminding us of the Cichlid genus *Chætobranchus*, form an important distinctive charac ter of *Centrarchinæ*.

ANALYSIS OF THE GENERA OF CENTRARCHIDÆ.

I include here, for the sake of comparison, the aberrant genus *Elassoma*, whose precise affinities are as yet undetermined:—

A. Lateral line well developed; vomerine teeth present; branchiostegals, 6; fins largely developed, with normally more than five dorsal spines (true *Centrarchidæ*):

*. Dorsal fin much more developed than anal fin (the base of the former 1½ to 3 times that of the latter), the soft parts of the two fins about equal, of 8 to 14 rays, and ending at the same vertical behind:

†. Body elongate, not greatly compressed; spines little developed, those of the anal fin, three in number, small and weak; those of the dorsal ten, the eighth and ninth quite short, so that there is a deep notch between the spinous and soft parts of the dorsal, almost breaking the continuity of the fin; caudal emarginate; operculum emarginate behind, ending in two flat points; mouth very large, the lower jaw longest; palatine teeth well developed; tongue and pterygoids toothless; gill-rakers long and stout, armed with teeth; supplemental maxillary bone well developed (*Micropterinæ*) ..... MICROPTERUS, 1.

††. Body comparatively short and deep, compressed; anal spines well developed; dorsal with strong spines, which are continuous with the soft rays, or at least not deeply notched (*Lepiopominæ*):

a. Tongue and pterygoid bones conspicuously armed with teeth: mouth large, lower jaw longest; maxillary bone broad and flat, with a strong supplemental ossicle behind it; palatine teeth well developed; gill-rakers long and strong, provided with coarse teeth; form stout and heavy:

b. Operculum emarginate behind; anal spines 5 to 7:

c. Caudal fin emarginate; scales ctenoid:

d. Tongue with two patches of teeth; anal spines normally 7; dorsal 12; gill-rakers longer, and somewhat more numerous than in the next, ARCHOPLITES, 2.

dd. Tongue with a single median patch of teeth; anal spines normally 6; dorsal 10 or 11 ..... AMBLOPLITES, 3.

cc. Caudal fin rounded behind; scales cycloid; anal spines normally 5, ACANTHARCHUS, 4.

bb. Operculum ending behind in a convex "flap", black in color; anal spines 3; dorsal 10; caudal emarginate ..... CHÆNOBRYTTUS, 5.

aa. Tongue and pterygoid bones toothless; mouth moderate or small:

d. Operculum ending behind in an entire convex process or flap, which is always more or less black; dorsal fin not notched; dorsal spines normally 10; anal spines 3, the soft rays in each about 10 in number; caudal fin emarginate:

e. Maxillary with a supplemental bone; gill-rakers long, stout, dentate; mouth rather large, the lower jaw protruding; palatine teeth present; spines low; flap small ..... APOMOTIS, 6.

ee. Maxillary without supplemental bone; mouth rather small, with subequal jaws:

f. Lower pharyngeal bones comparatively narrow, with the teeth all conic and sharp, the outer short and small, the inner long and pointed:

g. Gill-rakers of anterior branchial arch more or less elongate, ossified, beset with small teeth (gill-rakers long and slender, beset on one side with minute teeth, no palatine teeth, subgenus *Helioperca;*—or comparatively short and thick, with larger teeth, palatine teeth usually present, subgenus *Lepiopomus*) ..... LEPIOPOMUS, 7.

gg. Gill-rakers undifferentiated, all short, thickish, weak, unossified, provided with but few weak teeth; no palatine teeth; opercular flap always large, often greatly developed; coloration brilliant; spines low ..... XENOTIS, 8.

ff. Lower pharyngeal bones with the teeth or most of them rounded or truncate above, *i. e.*, teeth paved, palatine teeth little developed, or more usually wanting:

h. Lower pharyngeals narrow, formed as in *Lepiopomus*, the teeth rounded, not truncate above; gill-rakers rather long and slender; spines rather high ..... XYSTROPLITES, 9.

hh. Lower pharyngeals broad, concave, with large truncate teeth close together; gill-rakers short and thick, more or less strongly dentate; spines high ..... EUPOMOTIS, 10.

dd. Operculum emarginate behind, ending in two flat points, with a dermal border; caudal fin rounded behind; gill-rakers in small number, long and strong, dentate; species of small size and brilliant coloration:

h. Dorsal fin angulated, the middle spines longer than some of the posterior ones; supplemental maxillary wanting (? or rudimentary); anal spines 3; dorsal 10 ..... MESOGONISTIUS, 11.

hh. Dorsal fin continuous; supplemental maxillary bone well developed:

i. Dorsal spines 9; anal 3 ..... ENNEACANTHUS, 12.

ii. Dorsal spines 8; anal 4 ..... HEMIOPLITES, 13.

iii. Dorsal spines 10; anal 4; anal fin with an elongate basis, its anterior rays being advanced ..... COPELANDIA, 14.

** Dorsal and anal fins about equal in extent, the soft portions of the latter longest and most posterior, the two fins being obliquely opposed; lower jaw longest; supplemental maxillary bone present; palatine teeth present; operculum emarginate behind; gill-rakers setiform, very long, finely dentate, in large number (20 to 30 of the large ones on anterior branchial arch); fins large, the soft rays of the dorsal and anal each with 14 to 18 rays; caudal fin emarginate; scales not strongly ctenoid (*Centrarchinæ*):

j. Spinous dorsal longer than soft part, the spines about 12 in number, not rapidly graduated; anal spines normally 8; body deep; mouth moderate. CENTRARCHUS, 15.

jj. Spinous dorsal shorter than soft part, the spines 5 to 8 in number, rapidly graduated; anal spines normally 6; body compressed and rather elongate; mouth large ..... POMOXYS, 16.

AA. No lateral line; no vomerine teeth apparent; fins little developed, the dorsal with 5 spines, the anal with 3; branchiostegals apparently 5; scales cycloid; upper jaw unusually protractile; jaws with strong teeth; size small (*Elassominæ*):

k. Mouth small, oblique, the lower jaw the longer; jaws with apparently one row of stout conical teeth; branchiostegal membranes broadly connected across the pectoral region; body rather elongate, compressed; caudal fin rounded; cheeks and opercles scaly.....ELASSOMA, 17.

CATALOGUE OF SPECIES OF CENTRARCHIDÆ.

I give below a catalogue of the species of *Centrarchidæ*, which appear to be valid, with their geographical distribution. Those of which I have not been able to examine specimens are indicated by a star (*). Several species, as *Lepomis ophthalmicus* Cope, *Bryttus humilis* Grd., are known only from specimens too immature for me at least to come to any certain conclusion as to their true relations.

The type-species of each genus is placed first; *d. s.* indicates doubtful species; *d. g.*, doubt as to whether placed in the proper genus.

MICROPTERUS, *Lacépède.*

1. Micropterus salmoides, (Lac.) Gill.—New England and Great Lake Region to Alabama.
2. Micropterus pallidus, (Raf.) Gill & Jordan.—Great Lake Region and Red River of the North to Virginia, Florida, and Mexico.

CHÆNOBRYTTUS, *Gill.*

3. Chænobryttus gulosus, (C. & V.) Gill.—Upper Great Lakes, Mississippi Valley, and Southwest.
4. Chænobryttus viridis, (C. & V.) Jordan.—Virginia to Florida, east of the Alleghanies.

AMBLOPLITES, *Rafinesque.*

5. Ambloplites rupestris, (Raf.) Gill.—Lake Champlain to the Saskatchawan and south to Florida and Texas. (Includes two or three geographical varieties or nascent species.)
6. Ambloplites cavifrons, Cope.—Virginia to North Carolina.

ARCHOPLITES, *Gill.*

7. Archoplites interruptus, (Grd.) Gill.—Streams of the Pacific Slope.

ACANTHARCHUS, *Gill.*

8. Acantharchus pomotis, (Baird) Gill.—New York to South Carolina, coastwise.

APOMOTIS, *Rafinesque.*

9. Apomotis cyanellus, Raf.—Entire Mississippi Valley and streams of Texas.
10. Apomotis *albulus, (Grd.) Jor., *d. g.*—Texas, &c.
11. Apomotis signifer, (Grd.) Jor., *d. s.*—Texas, &c.
12. Apomotis phenax, Cope & Jordan.—New Jersey.

LEPIOPOMUS, *Rafinesque.*

13. Lepiopomus auritus, (L.) Raf.—Maine to Florida—exclusively east of the mountains.
14. Lepiopomus apiatus, Cope.—Florida.
15. Lepiopomus miniatus, Jordan.—Louisiana.
16. Lepiopomus elongatus, (Holbr.) Gill & Jor.—Florida.
17. Lepiopomus *bombifrons, (Ag.) Jor., *d. g.*—Tennessee River.
18. Lepiopomus obscurus, (Ag.) Jor.—Georgia, Alabama, Tennessee.
19. Lepiopomus ischyrus, Jor. & Nelson.—Illinois.
20. Lepiopomus pallidus, (Mit.) Gill & Jor.—New Jersey to Great Lake Region, Mississippi Valley south to Florida and Texas.
21. Lepiopomus *mystacalis, Cope.—Florida.
22. Lepiopomus humilis, (Grd.) Cope.—Texas.
23. Lepiopomus macrochirus, Raf.—Ohio Valley to Illinois.
24. Lepiopomus anagallinus, Cope.—Kentucky to Kansas.
25. Lepiopomus oculatus, Cope.—Upper Mississippi Valley.

XYSTROPLITES, *Jordan.*

26. Xystroplites gillii, Jordan.—Florida.
27. Xystroplites heros, (B. & G.) Jord.—Texas.
28. Xystroplites notatus, (Ag.) Jord.—Tennessee River.

EUPOMOTIS, *Gill & Jordan.*

29. Eupomotis aureus, (Walbaum) Gill & Jordan.—Upper Mississippi Valley, Great Lake Region to New England, and south to Florida east of the Alleghanies. Not found in the Mississippi Valley south of Iowa.
30. Eupomotis speciosus, (Holbr.) Gill.—Florida.
31. Eupomotis pallidus, (Ag.) Gill & Jordan.—Lower Mississippi Valley, Illinois, and south.

XENOTIS, *Jordan.*

32. Xenotis fallax, (B. & G.) Jordan.—Texas.
33. Xenotis breviceps, (B. & G.) Jordan.—Louisiana to Texas.
34. Xenotis popii, (Grd.) Jord., *d. s.*—Texas.
35. Xenotis megalotis, (Raf.) Jord.—Ohio Valley and Upper Mississippi Valley.
36. Xenotis sanguinolentus, (Ag.) Jord.—South Carolina to Tennessee and Louisiana.
37. Xenotis lythrochloris, Jordan.—Ohio Valley.
38. Xenotis solis, (Val.) Gill & Jor.—Louisiana.
39. Xenotis aureolus, Jordan.—Ohio Valley.
40. Xenotis aquilensis, (B. & G.) Jor., *d. g.*—Texas.
41. Xenotis *marginatus, (Holbr.) Jor., *d. g.*—Florida.
42. Xenotis peltastes, (Cope) Jor.—Michigan to Illinois.
43. Xenotis inscriptus, (Ag.) Jor.—Ohio to Missouri and south.
44. Xenotis ophthalmicus, (Cope) Jor., *d. s.*, *d. g.*—Roanoke River.

MESOGONISTIUS, *Gill.*

45. Mesogonistius chætodon, (Baird) Gill.—New Jersey to Maryland.

ENNEACANTHUS, *Gill.*

46. Enneacanthus obesus, (Grd.) Gill.—Massachusetts to North Carolina.
47. Enneacanthus margarotis, Gill & Jordan.—New Jersey to Virginia.
48. Enneacanthus pinniger, Gill & Jor.—North Carolina.
49. Enneacanthus *gloriosus, (Holbr.) Jordan.—Florida.
50. Enneacanthus *milnerianus, Cope.—Florida.

HEMIOPLITES, *Cope.*

51. Hemioplites simulans, Cope.—Virginia.

COPELANDIA, *Jordan.*

52. Copelandia eriarcha, Jordan.—Wisconsin.

CENTRARCHUS, *Cuvier & Valenciennes.*

53. Centrarchus irideus, (Lacépède) C. & V.—North Carolina to Illinois and south, in lowland streams.
54. Centrarchus macropterus, (Lac.) Jor.—South Carolina to Alabama.

POMOXYS, *Rafinesque.*

§ *Pomoxys.*

55. Pomoxys annularis, Raf.—Entire Mississippi Valley south of Wisconsin and Ohio.

§ *Hyperistius.*

56. Pomoxys nigromaculatus, (Le S.) Girard.—Mississippi Valley, Great Lake Region, and streams of the Atlantic States from New Jersey to Florida.

LIST OF NOMINAL SPECIES OF CENTRARCHIDÆ, WITH IDENTIFICATIONS.

I give a list, in chronological order, of the species of *Centrarchidæ* hitherto described, so far as known to me, with my identification of them. Those species of which I have examined the original type are designated by a dagger (†).

Nominal species.	Date.	Identification.
Labrus auritus, Linné	1758	Lepiopomus auritus.
Sparus aureus, Walbaum	1792	Eupomotis aureus.
Labrus macropterus, Lacépède	1802	Centrarchus macropterus.
Labrus sparoides, Lac	1802	Centrarchus macropterus (?).
Labrus salmoides, Lac	1802	Micropterus salmoides.
Labrus irideus, Lac	1802	Centrarchus irideus.
Micropterus dolomieu, Lac	1802	Micropterus salmoides.
Morone maculata, Mit	1814	Eupomotis aureus.
Sparus mocasinus, Raf	1814	Eupomotis aureus.
Labrus palladus, Mit	1814	Lepiopomus pallidus.
Bodianus achigan, Raf	1817	Micropterus salmoides.
Bodianus rupestris, Raf	1817	Ambloplites rupestris.
Sparus erythrops, Raf	1818	(Erroneous.)
Labrus appendix, Mit	1818	Lepiopomus pallidus.
Pomoxis annularis, Raf	1818	Pomoxys annularis.
Calliurus punctulatus, Raf	1819	Micropterus salmoides.
Lepomis cyanellus, Raf	1819	Apomotis cyanellus.
Lepomis macrochirus, Raf	1819	Lepiopomus macrochirus.
Icthelis melanops, Raf	1820	Apomotis cyanellus.
Icthelis erythrops, Raf	1820	Ambloplites rupestris.
Icthelis aurita, Raf. (not of 1819)	1820	Xenotis lythrochloris.
Icthelis megalotis, Raf	1820	Xenotis megalotis.
Lepomis pallida, Raf	1820	Micropterus pallidus.
Lepomis trifasciata, Raf	1820	Micropterus salmoides.
Lepomis flexuolaris, Raf	1820	Micropterus salmoides.
Lepomis salmonea, Raf	1820	Micropterus salmoides.

Nominal species.	Date.	Identification.
Lepomis notata, Raf	1820	Micropterus salmoides.
Lepomis ictheloides, Raf	1820	Ambloplites rupestris.
Etheostoma calliura, Raf	1820	Micropterus salmoides.
Cichla ænea, Le Sueur	1822	Ambloplites rupestris.
Cichla fasciata, Le S	1822	Micropterus salmoides.
Cichla ohioensis, Le S	1822	Micropterus salmoides.
Cichla floridana, Le S	1822	Micropterus pallidus.
Cichla minima, Le S	1822	Micropterus salmoides.
Huro nigricans, C. & V	1828	Micropterus pallidus.
Centrarchus pentacanthus, C. & V	1829	Ambloplites rupestris.
Cantharus nigromaculatus, Le Sueur	1829	Pomoxys nigromaculatus.
Pomotis vulgaris, C. & V	1829	Eupomotis aureus.
Pomotis gulosus, C. & V	1829	Chænobryttus gulosus.
Centrarchus hexacanthus, C. & V	1831	Pomoxys nigromaculatus.
Centrarchus viridis, C. & V	1831	Chænobryttus viridis.
Bryttus punctatus, C.& V	1831	Apomotis cyanellus.
Bryttus reticulatus, C. & V	1831	Chænobryttus viridis.
Bryttus unicolor, C. & V	1831	(?)
Pomotis ravenelii, C. & V	1831	Eupomotis aureus.
Pomotis holbrookii, C. & V	1831	Eupomotis aureus.
Pomotis incisor, C. & V	1831	Lepiopomus pallidus.
Pomotis gibbosus, C. & V	1831	Lepiopomus pallidus.
Pomotis solis, C. & V	1831	Xenotis solis.
Pomotis catesbœi, C. & V	1831	Eupomotis aureus.
Cichla storeria, Kirt	1838	Pomoxys annularis.
Pomotis nitida, Kirt	1841	Xenotis megalotis.
Centrarchus obscurus, De Kay	1842	Micropterus salmoides.
Pomotis rubricauda, Storer	1842	Lepiopomus auritus.
Pomotis aquilensis, B. & G.†	1853	Xenotis (?) aquilensis.
Pomotis breviceps, B. & G.†	1853	Xenotis breviceps.
Pomotis longulus, B. & G.†	1853	Apomotis cyanellus.
Grystes nobilis, Ag	1854	Micropterus pallidus.
Pomotis sanguinolentus, Ag	1854	Xenotis sanguinolentus.
Pomotis inscriptus, Ag	1854	Xenotis inscriptus.
Pomotis notatus, Ag	1854	Xystroplites (?) notatus.
Pomotis obscurus, Ag	1854	Lepiopomus obscurus.
Pomotis bombifrons, Ag	1854	Lepiopomus (?) bombifrons.
Pomotis pallidus, Ag	1854	Eupomotis pallidus.
Pomotis speciosus, B. & G.†	1854	Lepiopomus pallidus (var.?).
Pomotis fallax, B. & G.†	1854	Xenotis fallax.
Pomotis convexifrons, B. & G.†	1854	Xenotis fallax.
Pomotis nefastus, B. & G	1854	Xenotis (?) aquilensis.
Pomotis heros, B. & G.†	1854	Xystroplites heros.

Nominal species.	Date.	Identification.
Grystes nuecensis, B. & G †	1854	Micropterus pallidus.
Centrarchus interruptus, Grd. †	1854	Archoplites interruptus.
Centrarchus maculosus, Ayres	1854	Archoplites interruptus.
Pomotis obesus, Grd. †	1854	Enneacanthus obesus.
Pomotis elongatus, Holbr	1855	Lepiopomus elongatus.
Pomotis speciosus, Holbr	1855	Eupomotis speciosus.
Pomotis marginatus, Holbr	1855	Xenotis marginatus.
Bryttus fasciatus, Holbr	1855	Enneacanthus obesus.
Bryttus gloriosus, Holbr	1855	Enneacanthus gloriosus.
Calliurus floridensis, Holbr	1855	Chænobryttus viridis.
Pomotis chætodon, Baird †	1855	Mesogonistius chætodon.
Centrarchus pomotis, Baird	1855	Acantharchus pomotis.
Grystes megastoma, Garlick	1857	Micropterus pallidus.
Pomoxis nitidus. Grd. †	1857	Pomoxys annularis.
Calliurus melanops, Grd. †	1857	Chænobryttus gulosus.
Calliurus diaphanus. Grd	1857	Apomotis cyanellus.
Calliurus formosus. Grd. †	1857	Apomotis cyanellus.
Calliurus microps, Grd. †	1857	Apomotis cyanellus.
Calliurus murinus, Grd. †	1857	Apomotis cyanellus.
Bryttus albulus, Grd	1857	Apomotis (?) albulus.
Bryttus signifer, Grd. †	1857	Apomotis signifer.
Bryttus humilis, Grd. †	1857	Lepiopomus humilis.
Pomotis luna, Grd	1857	Lepiopomus pallidus.
Pomotis popei, Grd. †	1858	Xenotis popii.
Pomotis guttatus, Morris	1859	Enneacanthus obesus.
Pomotis microlophus, Gthr	1859	Eupomotis speciosus.
Hyperistius carolinensis, Gill	1864	Pomoxys nigromaculatus.
Pomoxys brevicauda, Gill †	1865	Pomoxys annularis.
Pomoxys intermedius, Gill	1865	Pomoxys annularis.
Pomoxys protacanthus, Gill	1865	Pomoxys annularis.
Bryttus oculatus, Cope †	1865	Lepiopomus oculatus.
Lepomis longispinis, Cope †	1865	Lepiopomus pallidus (var. ?).
Bryttus mineopas, Cope †	1865	Apomotis cyanellus.
Ambloplites cavifrons, Cope †	1869	Ambloplites cavifrons.
Hemioplites simulans, Cope †	1869	Hemioplites simulans.
Lepomis anagallinus, Cope †	1869	Lepiopomus anagallinus.
Lepomis ardesiacus, Cope †	1869	Lepiopomus pallidus (juv.).
Lepomis ophthalmicus, Cope †	1869	Xenotis sp. ? (juv.).
Lepomis gillii, Cope †	1869	Chænobryttus viridis.
Lepomis charybdis, Cope	1869	Chænobryttus gulosus.
Lepomis nephelus, Cope †	1869	Lepiopomus macrochirus.
Lepomis purpurascens, Cope †	1870	Lepiopomus pallidus (var. ?).
Lepomis peltastes, Cope *	1870	Xenotis peltastes.

Nominal species.	Date.	Identification.
Dioplites treculii, Le Vaillant & Bocourt.	1874	Micropterus pallidus (?).
Dioplites variabilis, (Le S.) Le V. & Boc...	1874	Micropterus pallidus (?).
Copelandia erjarcha, Jor. †	1876	Copelandia eriarcha.
Xenotis lythrochloris, Jor. †.....	1877	Xenotis lythrochloris.
Xenotis aureolus, Jor. †	1877	Xenotis aureolus.
Xystroplites gillii, Jor. †	1877	Xystroplites gillii.
Lepiopomus ischyrus, Jor. & Nels. †	1877	Lepiopomus ischyrus.
Apomotis phenax, Cope. & Jor. †	1877	Apomotis phenax.
Lepiopomus miniatus, Jor.†	1877	Lepiopomus miniatus.
Enneacanthus pinniger, Gill & Jor. †.....	1877	Enneacanthus pinniger.
Enneacanthus margarotis, Gill & Jor....	1877	Enneacanthus margarotis.
Enneacanthus milnerianus, Cope, MSS....	1877	Enneacanthus milnerianus.
Lepomis apiatus, Cope, MSS.....	1877	Lepiopomus apiatus.
Lepomis mystacalis, Cope, MSS.....	1877	Lepiopomus mystacalis.
Xystroplites longimanus, Cope, MSS.....	1877	Eupomotis speciosus (?).

24. XENOTIS LYTHROCHLORIS.

Icthelis aurita, RAF., Ichthyologia ohiensis, 1820 (not *Labrus auritus* Linn.; not *Lepomis auritus* Raf., 1819).

Lepomis auritus, COPE, Journ. Acad. Nat. Sci. Phila. 1868 (not *Lepomis auritus* Gill).

Ichthelis sanguinolentus, JORDAN, Man. Vert. 1876 (in part, confounded with *X. megalotis* and *X. sanguinolentus*.)

Xenotis lythrochloris, JORDAN (1877), Bull. U. S. Nat. Mus. ix, —.

This elegant species is fairly described by Rafinesque, and quite accurately by Prof. Cope, but no other writers seem to have distinguished it. It does not seem best to retain the name *auritus*. Rafinesque apparently took this species for the Linnean *auritus*, and, if so, this is simply a case of mistaken identification, and the name thus given in error should not be retained. If we suppose that Rafinesque intended to describe his *aurita* as a new species, we have the anomalous case of an author describing a new species under the specific name borne by an old species which he himself elsewhere precisely indicates as the type of his genus. In this view, which would be absurd in regard to any author other than Rafinesque, we should have two species, strongly resembling each other, in closely related genera, both bearing the same specific name, *Lepiopomus auritus* and *Xenotis auritus*. This undesirable arrangement we can avoid by supposing, what is probably the fact, that Rafinesque wrongly identified his *Icthelis aurita* with *Labrus auritus* of Linnæus. Rafinesque's *aurita* being thus without a specific name,

I supply that of *lythrochloris*, in allusion to the blood-red and pale-green coloration.

Xenotis lythrochloris needs comparison chiefly with *X. megalotis*. The body is elongate proportionally, somewhat as in the species of *Apomotis*, but the profile is quite steep. The back along the base of the dorsal fin is unusually straight, not strongly bowed as in *megalotis*. The colors are different in life; there is more red on the cheeks and fins in *X. lythrochloris*, but the ground-color of the back is a decided olive-green with blue spots. The belly, as in *megalotis*, is orange. The membrane of the soft parts of the vertical fins in *X. lythrochloris* is bright orange-red. The spines are extremely short, the longest about equal to length of snout. The most available distinctive point is in the opercular flap, which is extremely long, longer than in *megalotis* or *sanguinolentus*, and *entirely black, without any trace of pale edging whatever*, except at base. In *megalotis*, the flap is conspicuously edged with paler.

X. megalotis abounds most in ponds and still deep places in the rivers. *X. lythrochloris* runs up the small brooks into places where it and *Apomotis cyanellus* are the only Centrarchine inhabitants, whence it often comes to adorn the urchin's string in company with *Semotilus corporalis*, *Catostomus teres*, *Campostoma anomala*, and other "boys' fish".

25. XENOTIS AUREOLUS, *Jordan.*

? *Pomotis macrochira*, KIRTLAND (1839), Bost. Journ. Nat. Hist. iii, 469.—STORER (1846), Synopsis, 298 (not *Icthelis macrochira* Raf.=*Lepomis nephelus* Cope).
Ichthelis macrochira, JORDAN (1876), Bull. Buff. Nat. Hist. Soc. 92; Manual Vert. 236 (not of Raf.).
Xenotis aureolus, JORDAN (1877), Bull. ix, U. S. Nat. Mus. —.

Body oblong, rather heavy forward; the forehead usually quite convex, but sometimes the profile straightish or almost concave; depth about $2\frac{1}{8}$ in length; head $2\frac{2}{3}$; eye about as large as flap in adult, 4 in head; mouth moderate; scales on cheeks rather large, in 5 or 6 rows.

Fin-rays as in related species; dorsal spines short, rather longer than in *X. lythrochloris*, but scarcely longer than snout; pectorals moderate; ventrals elongate.

Colors very clear and translucent, the young almost transparent, the adult lustrous, clear pale green above; sides with much spotting of golden orange or brassy, the spots numerous but not well defined, shading into the green; the orange predominating below; the belly clear orange; some blue spotting on sides, a purplish-red lustre on the sides in life, peculiar to this species. This disappears at death.

Soft parts of vertical fins, particularly the anal, with the membrane, clear orange; ventral fins bluish; cheeks with three bread bronze-orange bands, between which are bands of bluish-green; two bronze bands in front of eye; space beneath eye largely blue-green and iridescent.

Opercular flap not long, narrow, varying to rather wide, with a conspicuous purple margin; iris red; pupil black.

Size small. I have seen none over four inches in length.

Habitat—Ohio Valley; rather common in bayous and still places in small creeks. It occurs in company with *Xenotis lythrochloris*, and, like that species, is commonly among the treasures of the small boy as he comes back from the swimming-hole.

This species much resembles the young of *X. megalotis*, the only species with which it need be compared. *X. megalotis* is more positively and brilliantly colored; there is more blue; the spines are lower, and the scales on the cheeks smaller. *X. aureolus* is chiefly of a golden orange, and in life has a translucency of hue unlike the colors of any other species. In spirits, it becomes of a pale yellowish or white. It is probable that Kirtland's description of *Pomotis macrochira* was drawn up from a specimen of this species. It is certain, however, that Kirtland confounded two or three species under the name of *macrochira*, among them probably *Lepiopomus pallidus*. This cannot well be the species called *macrochira* by Rafinesque. I have therefore proposed the new name of *aureolus*, in allusion to its gilded coloration.

26. XENOTIS INSCRIPTUS, (*Agassiz*) *Jor.*

Pomotis inscriptus, AGASSIZ (1854), Amer. Journ. Sci. Arts, 302.
Lepomis inscriptus, COPE (1869), Journ. Acad. Nat. Sci. Phila. —.
Ichthelis inscriptus, JORDAN (1876), Manual Vert. 237.
Xenotis inscriptus, JORDAN (1876), Ann. N. Y. Lyc. Nat. Hist. —.

Body oblong, little elevated, the depth 2½ in length; profile and dorsal outline forming a nearly uniform curve from snout to caudal peduncle; eye large, larger than in *megalotis;* mouth moderate; cheek-scales large.

Pectoral fins short, not reaching anal; dorsal spines low, but high for this genus, more developed than in any of the other species, the longest about as long as from snout to middle of pupil; ventral fins not reaching anal.

A small compact handsome species of a dark color, not at all translucent; color dark olive-green, with blue shades; cheeks with blue

lines; opercular flap pretty long, rather narrow, its lower margin being shorter than the upper, directed more obliquely upward than in the other species, bordered above and below with pinkish, many of the scales of the back and sides marked with a short horizontal black line like a pencil-mark, these usually forming interrupted lines along the rows of scales. These markings are often obsolete. Fins dark olive, only the anal usually with red; no black dorsal spot.

Length of specimens examined about 4 to 5 inches.

Habitat.—Tennessee River (Agassiz, Cope); Etowah River (Jordan); White River, Indiana (Jordan); Mississippi River at Cairo (Jordan).

This species may be known to be a *Xenotis* by the ear-flap and the weak gill-rakers. From the other Ohio species, its longer spines, dark green coloration, and the peculiar upward direction of the opercular flap distinguish it. The black streaks which suggested the name *inscriptus* usually disappear with death.

27. LEPIOPOMUS PALLIDUS, (*Mitchill*) *Gill & Jordan.*

Labrus pallidus, MITCHILL, 1814, = *Labrus appendix*, MITCHILL, 1818, = *Pomotis incisor*, CUV. & VAL., 1831.

We have here restored the oldest and therefore correct specific name to this species. The genus *Helioperca*, recently proposed by me for this species and its immediate relatives, does not seem sufficiently distinct from *Lepiopomus*. I therefore abandon it, for the present, at least.

28. MICROPTERUS PALLIDUS, (*Rafinesque*) *Gill & Jordan.*

Lepomis pallida, RAFINESQUE, 1820, = *Cichla floridana*, LE SUEUR, 1822, = *Huro nigricans*, C. & V., 1828.

Rafinesque's description of his *Lepomis pallida* seems to have been drawn from this species. His specific name should therefore be adopted. This change is especially desirable, as it does away with the objectionable local name *floridanus* for this widely distributed species.

PERCIDÆ.

29. STIZOSTETHIUM, *Rafinesque.*

The American species of this genus have been involved in considerable confusion, and no one seems to know positively whether we have

two, three, four, or five species, or how those species may be distinguished from each other, or, finally, what names any of them should bear. Having lately been enabled to examine a large number of specimens in a fresh state, through the kindness of John C. Klippart, the efficient fish commissioner of the State of Ohio, I have come to certain provisional conclusi ons, which I have thought it advisable to insert here.

Among the species of *Stizostethium*, there are two well-marked groups, known to our lake fishermen respectively as the "Saugers" and the "Pikes". These differ somewhat in external peculiarities of form and coloration, and strongly in the arrangement of the pyloric cœca.

In the "Pike" group, there are three pyloric cœca, long and large, subequal, and all longer than the stomach. In the "Saugers", the pyloric cœca are much shorter and smaller. There are four larger than the rest, not quite equal, and all shorter than the stomach. Besides the four larger ones, there are one, two, or three small ones. The total number is usually six, but sometimes the small ones are obsolete.

In the extreme generic subdivision which at present obtains, any such decided anatomical peculiarity may be held to indicate generic distinction. I therefore propose to consider the "Saugers" as at least subgenerically distinct from the "Pikes".

The name *Stizostedion* was proposed by Rafinesque for his *Perca salmonea*, the "White Salmon of the Ohio". Rafinesque's description is not altogether satisfactory; but, as a certain fish of this genus is still known as the "White Salmon," at the Falls of the Ohio, it is possible to make an undoubted identification. The *Perca salmonea* is a "Pike", and therefore the name *Stizostedion* (or rather *Stizostethium*, for the name is stated to mean "pungent throat") should be retained for the Pikes.

Since the preceding paragraphs were in type, Prof. Gill and the writer have been enabled to compare the American species of *Stizostethium* with the two inhabiting the waters of Europe, viz, *Stizostethium lucioperca* (L.) G. & J. (*Lucioperca sandra* C. & V.) and *Stizostethium volgense* (Pallas) G. & J. The genus divides at once into four strongly marked sections or subgenera, of which two—that typified by *S. canadense* and that by *S. volgense*—bear little resemblance to each other, and could be readily considered as generically distinct were not the other two sections intermediate. (1) The section typified by *S. volgense* in several respects approaches the genus *Perca:* it may be termed *Mimoperca* (G. & J.). (2) The Sauger group, from the development of the canine teeth, may be appropriately designated as *Cynoperca* (G. & J.).

(3) The American Pike-perch group was called *Stizostethium* by Rafinesque, and (4) the Sandres of Europe were called nearly simultaneously *Lucioperca* by Cuvier and *Sandrus* by Stark. The *Lucioperca marina* Cuv. & Val. (*Perca labrax* Pallas), if correctly described, has apparently no affinity with the genus.

The following analysis of the characters of these groups has been compiled by Prof. Gill and myself after a rigorous comparison of the several forms. It may be stated that we have been unable to ascertain certainly the character of the pyloric cœca in *Mimoperca* and *Lucioperca*, the two specimens of each species in the National Museum being deprived of their intestines:—

*. Dorsal fins well separated, the interspace between them more than the diameter of the eye; the distance from the base of the last spine of the first dorsal and the first of the second equal to the space occupied by the last 4 to 6 spines of the first dorsal; anal fin II, 12, longer than high; second dorsal I, 17, to I, 21; spines of the second dorsal and anal closely attached to the soft rays; last dorsal spine scarcely erectile, more or less firmly bound down by the membrane; canine teeth strong (American species):

†. Soft dorsal comparatively short (its base one-fourth shorter than that of spinous dorsal) and with about 17 short rays; cheeks, opercles, and top of head more or less closely scaled; body depressed, subterete; size small; pyloric cœca forming two groups, the primary one of four, unequal, moderate, much shorter than the stomach; the secondary of few (1–3) rudimentary ones, which are sometimes atrophied ..... CYNOPERCA.

††. Soft dorsal rather long (one-sixth shorter than spinous dorsal), with about 20 soft rays; cheeks and upper surface of head nearly naked; body more compressed; size large; pyloric cœca three, subequal, all long (about as long as stomach), STIZOSTETHIUM.

**. Dorsal fins approximated, connected by low membrane, the interspace much less than the diameter of the eye; the distance between the last spine of the first and the first spine of the second only equalling the base covered by the last four or fewer rays of the spinous dorsal; spines of second dorsal and anal connected with succeeding rays by loose membrane; last dorsal spine erectile; second dorsal usually I, 22 or 23; anal fin at least as high as long; body compressed; size large (European species, the body more or less distinctly transversely barred and the first dorsal with series of roundish black spots):

‡. Soft dorsal considerably (one-fifth) *shorter* than spinous dorsal; anal fin II, 12, as long as high; canine teeth strong; "pyloric cœca 4 to 6" ..... LUCIOPERCA.

‡‡. Soft dorsal somewhat *longer* than spinous dorsal; anal fin short and high; its length two-thirds its height; its rays II, 10; canine teeth weak, not much differentiated; body strongly compressed as in the genus *Perca;* "pyloric cœca three" (*Günther*) ..... MIMOPERCA.

Of American species I know certainly three, the Wall-eyed Pike or Yellow Pike (*Stizostethium vitreum*), the Blue Pike or White Salmon (*Stizostethium salmoneum*), and the Sauger or Gray Pike (*Stizostethium griseum* or *canadense*). The "Sauger" of the Saint Lawrence, *S. canadense*, may be distinct from *S. griseum*, but at present I think it is not;

and, finally, the "Blue Pike" is possibly, but improbably, distinct from the "White Salmon".

Without further discussion, I will give the synonymy and characters of the species now recognized.

30. STIZOSTETHIUM VITREUM (*Mitchill*) *Jordan & Copeland.*

Wall-eyed Pike—Glass Eye—"Dory"—"Salmon"—Pike-perch—Doré—Okow—Horn Fish—Green Pike—Yellow Pike (?female).

Perca vitrea, MITCHILL (1818), Supplement Am. Monthly Mag. ii, 247 (Cayuga Lake).

Stizostedium vitreum, JORDAN & COPELAND (1876), Check List N. Am. Fresh Water Fishes, Bull. Buff. Soc. Nat. Hist. 136.

Stizostethium vitreum, JORDAN (1877), Ann. N. Y. Lyc. Nat. Hist.—JORDAN (1877), in Klippart's Rept. Fish Commr. Ohio.

Lucioperca americana, CUV. & VAL. (1829), ii, 122.—RICHARDSON (1836), Fauna Bor.-Am. iii, 10.—KIRTLAND (1838), Zool. Ohio, 192; Bost. Journ. Nat. Hist. iv 237.—THOMPSON (1842), History Vt. 130.—DE KAY (1842), Zool. N. Y. Fishes, 17.—STORER (1846), Synopsis, 276.—AGASSIZ (1850), Lake Superior, 294.—JARDINE (1852), Nat. Libr. Perches, 107.—GÜNTHER (1859), Cat. Fishes, i, 74—JORDAN (1874), Ind. Geol. Survey, 212; and of writers generally.

Stizostedium americanum, COPE (1865), Proc. Acad. Nat. Sci. Phila. 82, 85.—COPE (1870), Proc. Am. Philos. Soc. 448.—MILNER (1872-3), Rept. U. S. Fish Comm. 425.—JORDAN (1876), Man. Vert. 225.—UHLER & LUGGER (1876), Fishes of Maryland, 110.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 36.

Body elongate, rather slender and subcylindric, becoming deep with age; the depth in young of 14 inches, $4\frac{1}{2}$ to 5 in length; head long, $3\frac{2}{3}$ in length. Mouth large, the maxillary reaching beyond the pupil to posterior margin of orbit; its length $2\frac{3}{4}$ to 3 in head. Mandible a little more than half length of head; eyes large, less than in *salmoneum*, shorter than snout and than preopercle, $4\frac{1}{2}$ to 5 in head. Jaws equal, or the lower slightly projecting, its sides somewhat included. Cheeks scaly, varying to nearly smooth, usually a few scales at least behind the eye. Opercle with a strong flat spine, which is sometimes bifid or trifid; no smaller ones below it. Dorsal spines high, more than half the length of head, as long as from snout past eye and $\frac{1}{3}$ to $\frac{1}{5}$ past opercle.

General color a heavy olive, varying considerably, finely mottled with brassy, the latter color forming indistinct lines, which run obliquely upward and backward along the rows of scales. Sides of head more or less vermiculated; lower jaw flesh-colored; belly and lower fins pinkish.

Spinous dorsal fin without black spots except a large jet-black blotch, which involves the membrane of the last two or three spines. Second

dorsal and caudal mottled olive and yellowish. Base of pectorals without distinct black spot.

Fin-rays:—Dorsal XII or XIII—1, 20 or 21. Anal II, 12. Lateral line with about 90 scales. Pyloric cæca long and large, subequal, three in number.

Size very large; this species reaches a length of nearly three feet and a weight of twenty or thirty pounds.

Habitat.—Upper Mississippi River, Great Lake Region and streams of the Atlantic slope, south of New England, north to the Fur Countries.

31. STIZOSTETHIUM SALMONEUM, *Rafinesque.*

Blue Pike (Lake Erie)—White Salmon (Ohio River).

Perca salmonea, RAF. (1818), Am. Monthly Mag. v, 354; (1820), Ich. Oh. 21.
Stizostedion salmoneum, RAF. (1820), Ich. Oh. 23.
Stizostedium salmoneum, COPE (1865), Proc. Acad. Nat. Sci. Phila. 82.—JORDAN (1876), Man. Vert. 225.—COPE (1870), Proc. Am. Philos. Soc. 449.—JORDAN & COPELAND (1876), Check List, 136.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 36.
Stizostethium salmoneum, JORDAN (1877), Ann. N. Y. Lyc. Nat. Hist. —; (1877), in Klippart's Rept. Fish Commrs. Ohio, —.
?? *Perca nigropunctata*, RAF. (1820), Ich. Oh. 23 (very erroneous).
?? *Pomacampsis nigropunctatus*, RAF. (1820), Ich. Oh. 23.

This species is very similar to the preceding in its technical characters, and it may prove to be merely a variety. The body is shorter, thicker, and deeper, with slenderer caudal peduncle, the diameter of which is not much greater than that of the large eye. The mouth is smaller, the maxillary not reaching quite to the posterior margin of the pupil, 3 in head; the eye is larger, its diameter equal to the length of the snout or that of the preopercle; the lower jaw is slightly included.

The dorsal spines are evidently considerably lower than in *S. vitreum*, the longest about equal to the distance from the snout to a point just short of hinder margin of orbit, about $2\frac{1}{3}$ in head.

The coloration is similar to that of *S. vitreum*, but the adult is bluer or greener, with scarcely any of the brassiness characteristic of the latter species. The coloration of the fins is darker, and there are traces of a blackish horizontal band along the dorsal in addition to the large black blotch on the hinder rays. Young specimens (from Ohio River) are more silvery, with traces of faint black bars along the back.

Fin-rays:—Dorsal XIV—1, 20. Anal II, 13. Lateral line with 95 scales. Opercular spine single, as in *S. vitreum*. Cheeks largely naked. Pyloric cœca three, large, longer than stomach, as in the preceding species.

Size much less than that of *S. vitreum*. The largest specimens seen by me were about fourteen inches in length. The accompanying figure represents the stomach and pyloric cœca of one of these.

Habitat.—Lake Erie, Ohio River, and southward to Georgia.

32. STIZOSTETHIUM (CYNOPERCA) CANADENSE, (*C. H. Smith*) *Jordan*.

Sauger—Gray Pike—Sand Pike.

? Lucioperca canadensis, C. H. SMITH, MSS. (1834).—GRIFFITH'S Cuvier's Animal Kingdom, x, 275.—RICHARDSON (1836), Fauna Bor.-Am. Fishes, iii, 17.—DE KAY (1842), N. Y. Fauna, Fishes, 19.—STORER (1846), Synopsis, 276.—GÜNTHER (1859), Cat. Fishes, i, 75.—JORDAN (1877), Klippart's Report, 225.

? Stizostedium canadense, JORDAN (1876), Man. Vert. 225.—JORDAN & COPELAND (1876), Check List, 136.

Lucioperca grisea, DE KAY (1842), N. Y. Fauna, Fishes, 19.—STORER (1846), Synopsis, 276.—GÜNTHER (1859), Cat. Fishes, i, 76.—JORDAN (1874), Ind. Geol. Surv. 212.

Stizostedium griseum, MILNER (1875), Rept. U. S. Fish Com. 1872-3.—JORDAN (1876), Man. Vert. 225.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 36.—JORDAN & COPELAND (1876), Check List, 136.

Lucioperca borea, GRD. (1857), Proc. Acad. Nat. Sci. Phila. Nov. (not Okow or Horn Fish of Richardson, which is *S. vitreum*).

Stizostedion boreus, GRD. (1858), Pac. R. R. Survey, x, 31.

Stizostedium boreum, JORDAN & COPELAND (1876), Check List, 136.

I have never seen a specimen of the Sauger with the opercular spines exactly as represented in Smith's figure of his *canadensis*. I find, however, much variation in this respect, and I have seen specimens with 1, 2, 3, and 4 spines; and also specimens with the two sides unlike. Until it is known that there is a second species of Sauger in our waters differing from *griseum* by the constant presence of four opercular spines, it is safest to unite *griseum* and *canadense*.

The types of *Stizostedion boreus* Girard are preserved in the United States National Museum, and seem to be the common "Sauger", *S. canadense*. Part of Dr. Girard's description of this species is borrowed from Richardson, and applies to *S. vitreum*.

Body most elongated, more terete than in *Stizostethium* proper, with the back scarcely compressed, so broad that the lateral line may be seen in a view from above, the back somewhat angulated as it descends to the sides, the depth of the body 4½ to 5 in length.

Head quite pointed, about 3½ in length, the slope of the profile greater than in *Stizostethium*. Eye smaller, 5 to 5½ in head in adult; mouth rather smaller, the lower jaw included; maxillary reaching to opposite posterior margin of eye.

Opercle with a sharp flat spine, usually a smaller one below it and an obscure one above; sometimes two or three smaller ones below, often none; the position and number of these spines extremely variable. Cheeks usually closely scaled, the hinder third or less sometimes naked. Median furrow on top of head closely scaled.

Coloration paler and more translucent, the shades less blended than in the *Stizostethia;* olive-gray above, sides considerably brassy or pale orange, with much black mottling, the black gathered into several definite dark areas, the most distinct of these being opposite the second dorsal; two others fainter, at each extremity of the spinous dorsal and one at base of caudal. These blotches are irregular and diffuse, but very characteristic. Young specimens are pale orange, with broad black shades.

Spinous dorsal with two or three rows of round black spots, one of each row on the membrane between each pair of spines; no distinct blotch on posterior part of the fin; a large black blotch at base of pectorals. Second dorsal with about three rows of irregular dark spots; caudal yellowish and dusky, almost barred. Fin-rays:—dorsal XII—1, 17, varying to XIII—1, 18; anal II, 12. Lateral line with 92 to 98 scales.

Pyloric cœca 4 to 7; four of them larger than the rest, of different lengths, all small and shorter than the stomach. The usual number is six, but the two small ones are sometimes one or both absent, sometimes duplicated. Length of adult 10 to 15 inches.

Habitat.—Great Lake Region, and Upper Mississippi Rivers, also in the Ohio, where it has been introduced from the lakes, through the canals, according to the fishermen.

The different form and coloration, particularly the markings of the dorsal fin, distinguish this species at once from the *Stizostethia.* This species has, moreover, always fewer dorsal rays, more scaly cheeks, and a different armature of the operculum.

The following is a catalogue of the known species of *Stizostethium*, with references to Dr. Günther's Catalogue of the Fishes in the British Museum, vol. i:—

1. STIZOSTETHIUM (CYNOPERCA) CANADENSE, (*Smith*) *Jordan.*

Lucioperca canadensis, Günther, i, p. 75.
Lucioperca grisea, Günther, i, p. 76.
Lucioperca (*borea*), Günther, i, p. 501 (*d. s.*).

2. STIZOSTETHIUM (STIZOSTETHIUM) VITREUM, (*Mitchill*) *Jordan & Copeland.*

Lucioperca americana, Günther, i, p. 74.

3. STIZOSTETHIUM (STIZOSTETHIUM) SALMONEUM, *Rafinesque.*

4. STIZOSTETHIUM (LUCIOPERCA) LUCIOPERCA, (*Linnæus*) *Gill & Jordan.*

Lucioperca sandra, Günther, i, p. 75.

5. STIZOSTETHIUM (MIMOPERCA) VOLGENSE, (*Pallas*) *Gill & Jordan.*

Lucioperca wolgensis, Günther, i, p. 74.

ELASSOMINÆ.

33. ELASSOMA, *Jordan, gen. nov.*

In a collection of fishes lately sent to me by Prof. H. S. Reynolds, taken in the Little Red River, White County, Arkansas, I find two specimens of a curious little fish, representing a type entirely new to me, for which I would propose the above generic name (ελασσωμα, a being reduced or diminished).

The characters of the pharyngeal bones cannot well be ascertained on account of the small size of the specimens; I am, therefore, unable at present to definitely refer the genus to its proper family. It possibly, however, belongs to the family of *Cichlidæ*, so numerously represented in the fresh waters of South America, of which but one species, *Heros cyanoguttatus* (B. & G.), has thus far been recorded from the United States.

The following are the generic characters of *Elassoma*, so far as they can be made out from the type-specimens:—

Form and to some extent aspect of *Aphododerus*, but more compressed; fins small; dorsal with five spines; anal with three; ventrals distinct, thoracic, each with one small spine and five soft rays; branchiostegals apparently five; mouth small, oblique, the lower jaw longest; each jaw apparently with a single row of large conical teeth; no vomerine teeth (?); cheeks and opercles scaly; body entirely scaly; no visible lateral line; branchiostegal membrane broadly united across the pectoral region; caudal fin truncate; vent normal.

Typical species *Elassoma zonata*, Jordan.

34. ELASSOMA ZONATA, *Jordan, sp. nov.*

Form rather elongate, compressed, especially behind; the nape rather broad and depressed, forming a straightish profile, the head narrowed forward, short but rather pointed, broadest below. Head 3 in length; depth about $3\frac{1}{2}$. Eye large, greater than snout; 3 in head. Mouth

considerably protractile, small, oblique, the maxillary scarcely reaching pupil.

Fin-rays:—Dorsal V, 7 (6 to 10; the exact number of soft rays I am unable to make out). Anal III, 6 (5 to 8); the spines of the dorsal continuous with the soft rays.

Color olive-green, finely punctulate everywhere; sides with about eleven parallel vertical bands of dark olive, about equal in width, narrower than the eye, the bands about as wide as the pale interspaces.

A roundish black spot, nearly as large as the eye, under the beginning of the spinous dorsal, just above the axis of the body, as in many South American *Cichlidæ;* soft fins faintly barred; cheeks and under parts of head profusely speckled with fine black dots, as in *Aphododerus cookianus.*

Length of each of the three specimens known just one inch. It probably grows to a somewhat larger size, but the fact that it has thus far apparently been overlooked by collectors, leads me to think that its maximum dimensions are quite small.

Habitat.—Little Red River, Arkansas; collector, Henry S. Reynolds; two specimens. Rio Brazos, Texas, a single specimen noticed in a bottle of Sunfishes in the United States National Museum, without other label than that of the locality.

This species seems to bear little relation to any of the genera of *Cichlidæ* described from South America by Dr. Günther or Professor Cope. I therefore propose to consider it as forming a distinct subfamily, and leave the matter of its relationships for future investigation.

APHODODERIDÆ.

35. ASTERNOTREMIA, *Nelson*, MSS., *nom. gen. nov.*

Sternotremia, NELSON, Bull. Ills. Mus. Nat. Hist. 1876.

Some objection has been made to the name *Sternotremia* on the ground that it is anatomically incorrect and misleading, the vent not being in the "*sternon*", as in *Aphododerus*, but entirely behind it. As the name *Sternotremia* was given through a misunderstanding of the meaning of "*sternon*", Mr. Nelson proposes to modify it to *Asternotremia*, which term is anatomically correct, and indicates the chief distinction between this genus and *Aphododerus.*

36. APHODODERUS COOKIANUS, *Jordan.*

Proc. Acad. Nat. Sci. Phila. 1877, p. 60.

Many specimens of this species are in the United States National Museum from various points in Illinois. The chief distinctive character of this species, the small size of the scales, seems to be constant.

Specimens of an *Aphododerus*, from near New Orleans, the original locality of *Aphredederus gibbosus* Le Sueur, seem to be identical with *A. sayanus*.

The etymology of "*Aphredoderus*" is apparently *αφοδος*, excrement; *δερη*, neck. The word should therefore be spelled *Aphododerus*.

37. ASTERNOTREMIA MESOTREMA, *sp. nov.*

General form, appearance, and coloration of *Asternotremia isolepis* Nelson, but the vent not as in the latter species between the anterior bases of the ventral fins, but about an eye's diameter in front of them. Head nearly 3 times in length; depth $3\frac{1}{2}$; lateral line, 45 scales. Dorsal III, 8. Anal III, 7.

Type 9296, United States National Museum, from Georgia. Collector, Hugh M. Neisler; precise locality not indicated. Specimen $2\frac{1}{2}$ inches long, in very bad condition.

The peculiar position of the vent indicates a direct transition from the more generalized type of *Asternotremia* toward *Aphododerus*. In this species, it is about two-fifths of the distance between its normal position in the former genus and that of the latter, farther forward than in *Asternotremia isolepis*.

Since this paper was in press, I have received two more specimens which I refer to this species. They are in much better condition than the original types, and from them I am enabled to supplement and correct the original description.

Head 3 in length; depth $3\frac{1}{8}$; eye 4 in head; distance to dorsal $2\frac{1}{2}$ in body; base of dorsal 4.

Fin-rays:—D. III, 10; A. III, 6; V. 7. Scales in 60 to 70 rows, very small, and difficult to count.

Vent in front of the ventrals, about one-third the distance to the little knob at the throat.

Color precisely like that of the other members of the family.

Length of specimens $2\frac{3}{4}$ and $2\frac{1}{2}$ inches respectively. They were taken in Little Red River, Arkansas, by Prof. H. S. Reynolds.

The species of this family now known are the following, beginning with the form least specialized :—

1. *Asternotremia isolepis* Nelson.—Illinois, both in tributaries of Lake Michigan and of the Ohio and Mississippi.

2. *Asternotremia mesotrema* Jordan.—Georgia to Arkansas.

3. *Aphododerus cookianus* Jordan.—Wabash Valley ; at various points both in Indiana and Illinois. Many specimens in United States National Museum.

4. *Aphododerus sayanus* (Gilliams) De Kay.—Streams coastwise, New York, New Jersey, south to Louisiana.

UMBRIDÆ

38. UMBRA PYGMÆA, (*De Kay*) *Bean*, MSS.

Leuciscus pygmæus, De Kay, Fishes N. Y. 214.—Storer, Synopsis, 414.
Melanura pygmæa, Baird, Ninth Smithsonian Rept. 1855.
Fundulus fuscus, Ayres, Bost. Journ. Nat. Hist. iv, 296.—Storer, l. c. 431.
Umbra or *Melanura limi*, part, various authors (all quotations from Southern New York and streams of the Atlantic coast).

My friend Dr. T. H. Bean, of the Smithsonian Institution, calls my attention to the fact that the Mud Minnow of our eastern streams is quite a different species from the *Umbra* or *Melanura limi*, with which it has thus far been confounded by all writers who were aware of the relations of the fish. The synonymy of *M. pygmæa* is given above. Its characters are as follows :—

Head about 4 in length ; depth $4\frac{1}{2}$; body more terete and less compressed than in *M. limi;* head broader, less depressed, with larger eye ; interorbital space more convex ; snout shorter, profile more gibbous. Dorsal 13 ; anal 7 (dorsal 14, anal 8 in *M. limi*). Lateral line 35.

Coloration :—dark brown, a series of whitish lengthwise stripes along the rows of scales ; a black bar at base of caudal ; no traces of vertical bars ; blackish bands forward, downward, and backward from eye ; a dark vertebral band. *M. limi* is more mottled, not striped, and always shows pale vertical cross-bars. Specimens examined from Tarboro', N. C., and from points in New Jersey and New York. The smaller number of branchiostegals (four instead of five or six) is the only character known to separate *Melanura* from *Umbra*.

ESOCIDÆ.

39. ESOX NOBILIOR, *Thompson.*

? *Esox masquinongy*, MITCHILL, "Mirror, 1824, 297" (not there!).*
? *Esox estor*, RICHARDSON, Fauna Boreali-Americana, iii, 1836, p. 127; and of several authors (not of Le Sueur, Journ. Acad. Nat. Sci. i, 1818, 413).
Esox nobilior, THOMPSON, Proc. Bost. Soc. Nat. Hist. iii, 1850, 163, 173, 305; and of recent writers generally.

It is not quite clear why Dr. Mitchill's name for this species should be set aside. Günther remarks (Cat. Fishes Br. Mus. 1866, vi, 227), "Mitchill has counted seventeen anal rays, and therefore it is probable that his typical specimens belonged to this species (*E. lucius*) and not to *E. estor* (*nobilior*), and rejects Mitchill's name on the supposition that the number of rays in the Muskallunge is 20 or 21. But, in point of fact, the number of anal rays is 16 to 18, usually one less than in *E. lucius*", instead of 3 or 4 more. Moreover, Mitchill's specimen was about 4 feet in length and weighed 30 pounds, a size unusual for the Pike, although specimens even larger are occasionally taken. Mitchill supposed that the fish in his possession was the Muskallunge; he described it, and named it on that supposition.

The following description was taken from a specimen about 3 feet long from Ecorse, Mich. (No. 10607, National Museum), and from three smaller specimens from Lake Huron:—

Depth 6 in length; head $3\frac{2}{3}$; general form of *E. lucius*, the head perhaps a trifle larger proportionally, 10 inches long in the larger specimen; eye about midway in head. Interorbital space transversely concave, with a prominent middle ridge; maxillary reaching to opposite middle of orbit.

Scaly part of cheeks about as wide as eye, beginning on a level with the eye and running backward, its lower edge nearly parallel with the profile. Scaly region of opercles similar. The amount of squamation is variable within narrow limits. Eight rows of scales on cheeks and about the same number on opercles. Scales on lateral line 150.

Fin-radii:—B. 18–17; 17–17; 18–19; 17–17, in four specimens. D. III, 17; III, 17; III, 17. Anal, II, 15; III, 14; III, 15. V. 12.

Color dark gray; sides with round dark spots of a grayish-black hue, nearly the color of the back, on a ground-color of grayish silvery;

* A search through the files of the Mirror for Mitchill's description has proved unsuccessful: it is not on the page cited by Dekay.

belly white; fins black, spotted as in *E. lucius*. Nearly every writer who has mentioned the Muskallunge has confounded it more or less with *E. lucius*. Günther's statement, "body with large rounded whitish spots," applies to *E. lucius*, and not at all to *E. nobilior*, the color in the latter species being gray, with rounded blackish spots.

I have compared European and American examples of *Esox lucius*, and am unable to find any difference whatever.

DORYSOMATIDÆ.

40. DORYSOMA CEPEDIANA, (*Le S.*) *Gill.*

Subsp. HETERURA, (*Raf.*) *Jordan.*

Comparison of specimens of *Dorysoma* from the Wabash River with others from Chesapeake Bay have convinced me that all properly belong to one species, but that our inland form may be recognized as a subspecies, for which the name *heterura** may be retained. Var. *heterura* differs chiefly in form; the back is much less arched, the axis of the body in specimens of about a foot in length being about half nearer the dorsal than the ventral outline. In *cepediana*, the axis of the body is usually about midway. The greater arch of the back in *cepediana* brings the beginning of the dorsal fin nearer snout than base of caudal; in *heterura*, the dorsal is about midway. The dorsal filament is usually longer in *heterura*, commonly longer than head; in *cepediana*, it is usually shorter than head. The less elevated nape renders the head of *heterura* rather more slender.

The name *Dorysoma* may as well be spelled correctly in accordance with its etymology.

CYPRINIDÆ.

GENERA OF AMERICAN CYPRINIDÆ.

The following is a semi-artificial key to the genera of American *Cyprinidæ* which I am at present able to recognize.

Algoma Grd. I refer to *Hybognathus*, as one species which I have examined, *A. amara* has the alimentary canal elongate, and no characters

* *Clupea heterurus*, RAF., Am. Monthly Mag. Sept. 1818, 354, = *Dorosoma notata*, RAF., Ich. Oh. 1820, = *Chatoëssus ellipticus*, KIRT., 1838.

have been brought forward to distinguish *Algoma*. *Cliola* Grd. seems to be equivalent to *Episema* Cope & Jordan, the dentition and position of the dorsal being the same in both. *Notropis* Raf. is revived in place of *Alburnellus*, *Notropis atherinoides* being evidently *Alburnus rubellus* Ag., or some closely related species. *Sarcidium* I unite with *Phenacobius* without hesitation, on examination of the types of each. *Photogenis* Cope I retain for the present, rather from the fact of the utter dissimilarity of the species with those of *Nototropis* than from ability to show any good distinctive characters. It is perhaps questionable whether the development of the peculiar satin-white pigment, which is found in the fins of the males in spring in every species of *Photogenis* and *Cyprinella* known in life, and in no species of any other group (except *Codoma*, a very near affine of *Cyprinella*), may not be a true generic character.

In the genera proposed by Girard, I consider the species first mentioned as the intended type, as I believe it is a known fact that Girard himself so considered it. Some species referred to certain genera will be found not to agree with the characters here given. Several such species need a reëxamination. It may be premised that the present arrangement is to be considered merely temporary, as a step from the present condition of chaos toward solid ground.

*. Dorsal fin without a strong developed spine; ventral fins not decurrent on the abdomen; dentary bones slender, arched, and widely separated except at their symphysis; opercular and mandibular bones without externally visible cavernous chambers; pharyngeal teeth well developed:

†. Air-bladder suspended in the abdominal cavity and surrounded by many convolutions of the long alimentary canal (*Campostominæ*):

a. Teeth in the principal row 4–4, with oblique grinding surface and no hook; mouth inferior; lips sheathed; upper lip protractile; alimentary canal six to nine times length of body; sexual differences very great; males strongly tuberculate,

CAMPOSTOMA, 1.

††. Air-bladder contiguous to the roof of the abdominal cavity and above the alimentary canal (*Leuciscinæ*):

‡. Rudimentary dorsal ray separated from first developed ray by membrane; head short, mouth small, inferior; upper jaw protractile; teeth 4–4, with grinding surface, not strongly hooked; males with the head tuberculate:

b. Alimentary canal elongate, two or three times length of body; teeth scarcely hooked; jaws normal:

c Lateral line incomplete ..... PIMEPHALES, 2.

cc. Lateral line complete ..... HYBORHYNCHUS, 3.

bb. Alimentary canal short, about as long as body; teeth hooked; jaws with spoon-shaped bony expansions, somewhat as in *Tetrodon*,

COCHLOGNATHUS, 4.

‡‡. Rudimentary dorsal ray attached:

d. Teeth not molar, in one or two rows:

e. Maxillary without barbel:

f. Teeth in the principal row 4–4:

g. Alimentary canal elongate, about four times length of body; teeth one-rowed, cultriform, with oblique grinding surface and little or no hook; premaxillary projectile; lips attenuate, without sheath; scales large:

h. Lateral line almost wanting; mouth oblique; dorsal in front of ventrals ..... COLISCUS, 5.

hh. Lateral line complete; mouth horizontal; dorsal over ventrals:

—. Teeth elongate with narrow grinding surface and no hook; body elongate ..... HYBOGNATHUS, 6.

— —. Teeth short, with rather broad grinding surface and slight hook; body short and rather stout; size small..... DIONDA, 7.

gg. Alimentary canal short, about as long as body; teeth raptatorial, usually strongly hooked:

i. Teeth with grinding surface developed, not crenate:

j. Dorsal fin beginning above ventrals (*i. e.*, above some part of base of ventrals); anal basis short:

—. Scales small, much longer than deep, with much of the surface exposed; body stout, compressed; teeth one-rowed, little hooked, the uppermost standing out above the surface of the bone; size large..... (Subgenus?) ALGANSEA,* 8.

— —. Scales large, about as long as deep, the usual surface exposed; teeth one- or two-rowed, pretty strongly hooked; size usually quite small..... (Subgenus?) HYBOPSIS, 9.

— — —. Scales large, much deeper than long on the sides, the exposed surfaces very narrow; teeth one or two-rowed, strongly hooked; size moderate or large..... LUXILUS, 10.

jj. Dorsal fin beginning entirely behind ventrals, between ventrals and anal; anal basis elongate..... LYTHRURUS, 11.

ii. Teeth with the edges crenate; dorsal fin beginning over middle or last rays of ventrals; scales closely and smoothly imbricated; teeth one-rowed (*Moniana*) or two-rowed (*Cyprinella*), CYPRINELLA, 12.

iii. Teeth with edges entire and without grinding surface:

k. Lips thin, normal; lateral line complete:

l. Species of small size and weak organization, with the mouth little cleft:

m. Scales comparatively thick, closely and smoothly imbricated, so that the exposed surfaces are higher than long; dorsal fin beginning opposite between first and last ray of ventrals, rarely slightly posterior; mouth subinferior, somewhat oblique; males in spring developing a satin-white pigment in the tips of the vertical fins and in the skin of the abdomen; snout tuberculate; colors brilliant, pigmented, (Subgenus?) PHOTOGENIS, 13.

mm. Scales thin, much exposed; no white satiny pigment (except in *Codoma?*):

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* In *A. tincella*, the type of *Algansea* (*Leuciscus tincella* C. T. V., Hist. Nat. des Poissons xvii, 323), the teeth are said to be 4–4. In some species referred to *Algansea*, they are 5–5. These I refer for the present to *Myloleucus*, from the type of which genus they differ in having but one row of teeth.

n. Dorsal fin beginning entirely behind ventrals:

o. Body short and thick; the head almost globular; the mouth small, inferior; anal basis short..(Subgenus?) CODOMA, 14.

oo. Body elongate, with the mouth oblique, terminal, and the head more or less pointed; anal basis somewhat elongate, NOTOTROPIS, 15.

nn. Dorsal fin beginning above some part of ventrals; aspect of *Nototropis* ..... CLIOLA, 16.

ll. Species of large size, with the body much elongated, subcylindrical; the head elongated, and the mouth deeply cleft, *Esox*-like; scales not large; pharyngeal bones long and slender, the teeth slightly hooked (sometimes 4-5) (voracious species of large size and strong organization, aspect of *Gila*), PTYCHOCHILUS, 17.

kk. Lips thin; lateral line incomplete or wanting.... PROTOPORUS, 18.

kkk. Lips thick, fleshy, enlarged behind; mouth small, inferior; dorsal fin beginning slightly anterior to ventrals; teeth one-rowed; lateral line complete..... PHENACOBIUS, 19.

ff. Teeth in the principal row 4-5 or 5-5 (or 4-4 in some species referred to *Hemitremia*):

p. Lateral line incomplete:

q. Dorsal over ventrals; scales large; teeth with grinding surface; alimentary canal short..... HEMITREMIA, 19,

qq. Dorsal behind ventrals; scales small:

r. Teeth with grinding surface, one-rowed; alimentary canal long, CHROSOMUS, 20.

rr. Teeth without grinding surface, two-rowed; alimentary canal short..... PHOXINUS, 21.

pp. Lateral line complete:

s. Lips normal, without cartilaginous or bony sheath:

t. Anal basis not elongate—of 10 or fewer rays:

u. Teeth raptatorial, entire, without grinding surface:

v. Dorsal entirely behind ventrals; mouth large; scales small; body elongate; western species of large size with flattened head, arched back, and slender caudal peduncle (*Gila*) or eastern species of slender form and small size (*Clinostomus*) or western species of large size, intermediate in form and with the exposed surfaces of the scales broad (*Tigoma*), GILA, 22.

vv. Dorsal over ventrals; mouth smaller; body stout and heavy, SIBOMA, 23.

uu. Teeth not crenate, raptatorial, with grinding surface:

w. Dorsal over ventrals; body rather stout..... MYLOLEUCUS, 24.

ww. Dorsal entirely behind ventrals; body more elongate, compressed ..... CHEONDA,* 25.

tt. Anal basis elongate, of 11 to 25 rays; body much compressed; dorsal fin entirely behind ventrals; lateral line decurved, complete:

x. Teeth one-rowed, not serrate, sharp-pointed, with masticatory surface, little hooked; base of caudal with many accessory rays; body elongate, large..... LAVINIA, 26.

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*To this genus I refer at present *Tigoma pulchra*, *T. nigrescens*, and *T. gibbosa* of Girard. *Cheonda* differs from *Myloleucus* only in the more backward position of the dorsal and from *Gila* (*Tigoma*) in the presence of grinding surfaces on the teeth.

xx. Teeth one-rowed, with grinding surface, and the edges crenate-serrate; belly sub-carinate; alimentary canal elongate, NOTEMIGONUS, 27.

xxx. Teeth two-rowed, entire, without grinding surface; alimentary canal not elongate..... RICHARDSONIUS, 28.

ss. Both jaws with a hard or cartilaginous brown horny plate, large and conspicuous; mouth inferior (*Chondrostomatinæ*):

—. Teeth 5–4, club-shaped, entire, terminating in a hook, with the inner (grinding) surface obliquely cut; anal fin elongate; dorsal fin over ventrals; caudal fin with the accessory rudimentary rays very largely developed; alimentary canal elongate (?)..... ACROCHILUS, 29.

fff. Teeth usually 6–6, compressed, lanceolate, erect, very slightly bent inward, one-rowed; body elongate; jaws even; scales small; dorsal over ventrals; basal caudal rays largely developed; lower jaw sharp-edged, with a knob at the symphysis; no pseudobranchiæ; intestinal canal elongate; size large... ORTHODON, 30.

ffff. Teeth in the principal row 3–3, without grinding surface; isthmus very wide; dorsal behind ventrals..... TIAROGA, 31.

ee. Maxillary provided with a small barbel:

y. Premaxillaries not projectile, the skin of the lip and front continuous; teeth in the principal row 4–4, without grinding surface; scales small; dorsal behind ventrals; barbel terminal: RHINICHTHYS, 32.

yy. Premaxillaries projectile, a groove separating the upper lip from the forehead:

z. Teeth without grinding surface:

a. Teeth in the principal row 4–4; barbels terminal:

b. Dorsal behind ventrals; scales small:

c. Lateral line incomplete..... APOCOPE, 33.

cc. Lateral line complete..... (Subgenus?) ERITREMA, 34.

bb. Dorsal fin over ventrals; lateral line complete..... NOCOMIS, 35.

aa. Teeth in the principal row 4–5; barbels lateral:

d. Dorsal fin over ventrals; scales large, equal, (Subgenus?) LEUCOSOMUS, 36.

dd. Dorsal fin beginning over last rays of ventrals; scales smaller, crowded forward..... SEMOTILUS, 37.

zz. Teeth with developed grinding surface:

e. Dorsal fin behind ventrals; scales small..... AGOSIA, 38.

ee. Dorsal fin directly over ventrals; scales large:

f. Head compressed, rounded above..... POGONICHTHYS, 39.

ff. Head broad, much depressed, nearly flat or concave above, resembling the head of a *Cyprinodont*..... PLATYGOBIO, 40.

dd. Teeth molar, of the grinding type, without grooves or ridges, in three rows, the outer deciduous, 2 or 3, 2, 5—4, 2, 2 or 3; two or three of the teeth blunt and much enlarged; body elongate; head tapering:

—. Angle of mouth with a barbel; upper jaw freely protractile; dorsal over ventrals..... MYLOCHILUS, 41.

——. No barbel; upper jaw not protractile; dorsal beginning behind ventrals..... MYLOPHARODON, 42.

**. Opercular and mandibular bones with external cavernous chambers; air-bladder normal; dentary bones not united; fins without spines (*Cœlophori*):

g. Teeth hooked, without grinding surface, 4–4 in the principal row; lips normal; no barbel; intestines short; dorsal over ventrals; mouth small.....ERICYMBA, 43.

***. Dentary bones straight and flat, united throughout their length; mandible much contracted, incurved, tongue-like, a lobe on each side of it at base; air-bladder normal; bones of head not cavernous; fins without spines (*Exoglossinæ*):

h. Teeth hooked, without grinding surface, 4–4 in the principal row; dorsal slightly behind beginning of ventrals; no barbel; premaxillaries not projectile.....EXOGLOSSUM, 44.

****. Dorsal fin with a strong spine composed of two, the posterior received into a longitudinal groove of the anterior; inner border of the ventral fins adherent to the body (*Plagopterinæ*):

i. Body with small scales; teeth hooked, without grinding surface, the principal row 4–4; no barbels; dorsal behind ventrals.LEPIDOMEDA, 45.

ii. Body entirely naked; teeth hooked, without grinding surface, the principal row 4–4; no barbels; dorsal behind ventrals.....MEDA, 46.

iii. Body entirely naked; teeth hooked, without grinding surface, the principal row 5–4; a barbel at the extremity of the maxillary; dorsal behind ventrals.....PLAGOPTERUS, 47.

*****. Pharyngeal teeth quite rudimental, replaced by a somewhat uneven ridge of the bone (*Graodontinæ*):

j. Dorsal fin short, without spinous ray, opposite ventrals; anal fin short; mouth small, without barbel, the upper jaw somewhat longer; alimentary canal short; scales of moderate size; lateral line complete.....GRAODUS, 48.

41. LUXILUS SELENE, *sp. nov.*

A handsome and striking species allied to *L. cornutus*, but showing a tendency toward *Hybopsis*. Head short and stout, rounded above, $4\frac{1}{2}$ in length, depth about the same; body much more elongate than in *cornutus*, and the head proportionally shorter; mouth oblique, terminal, lower jaw included; eye very large, 3 in head, wider than snout and than interorbital space; snout blunt, quite short.

Fin-rays:—Dorsal I, 8. Anal I, 7. Dorsal fin about midway of body, over ventrals; dorsal very high; pectorals reaching two-thirds of the distance to ventrals, the latter to vent. Scales large, the exposed surfaces much less narrowed than in *cornutus*, 4–40–3, the lateral line little decurved.

Color bright steel-blue above, with a very distinct silvery band, which overlies a plumbeous shade; cheeks and belly silvery, a small, round, black caudal spot, a dark vertebral line; iris white; fins unmarked.

Teeth with marked masticatory surface, 2, 4–4, 2.

Length of specimen 4 inches.

Many specimens in United States National Museum; collected near Bayfield, Wis., by J. W. Milner.

This species seems to be distinct from all the numerous varieties of *L. cornutus* which I have examined.

42. LUXILUS ROSEUS, *sp. nov.*

Another handsome species, related to the last, but still more *Hybopsis*-like.

Body short, thick, and stout, much as in *Hyborhynchus notatus;* head $3\frac{7}{8}$ in length, depth $4\frac{1}{2}$; head rather short, thick, bluntly rounded; mouth moderate, slightly oblique; jaws about equal, the lower shutting within the upper in closed mouth; eye large, nearly 3 in head, about equal to snout, a little less than the broad interorbital space; scales large, 5–38–5, 15 before the dorsal fin, those along the sides with the exposed surfaces somewhat narrowed, but not very decidedly so, the arrangement being about midway between that observed in *L. cornutus* and that of the colored species of *Hybopsis*, such as *H. chrosomus*, *H. rubricroceus*, &c.

Fin-rays:—Dorsal I, 8. Anal I, 7. Dorsal fin high, inserted directly over ventrals, midway between snout and caudal; pectorals not reaching ventrals the latter to vent.

Color olivaceous above; scales dark-edged, a broad plumbeous lateral band passing through eye; lips black, a dark caudal spot, a dark vertebral line; anal region dusted with black points; cheeks and belly silvery; dorsal, anal, caudal, and most of pectorals rosy red; iris, top of head, and tip of snout also red; no tubercles on the type-specimens, which are probably immature, being about $2\frac{1}{2}$ inches in length.

Teeth 2, 4–4, 2, with developed grinding surfaces.

This small species forms a transition between *Luxilus* and *Hybopsis*.

Habitat.—Notalbany River, near Tickfaw, La.; collected December, 1876, by Dr. T. H. Bean. The types are now in the United States National Museum.

43. CYPRINELLA CALLIURA, *sp. nov.*

Body elongated, compressed, elevated in the middle, the profile before dorsal curved, and the snout projecting, forming a decided angle. Head convex above, densely tuberculate; muzzle rather pointed, overhanging the oblique mouth. Eye 4 in head, $1\frac{1}{3}$ in muzzle, $1\frac{2}{3}$ in interorbital width. Head $4\frac{2}{5}$ in length; depth $3\frac{3}{4}$ to 4.

Fin-rays:—D. I, 8; A. I, 8; V, 8. Dorsal fin inserted slightly behind ventrals; pectorals scarcely reaching $\frac{2}{3}$ to ventrals, the latter to vent.

Scales moderately elevated, 6–44–3; lateral line strongly decurved, forming an abrupt flexure just before the ventrals,—a peculiarity usually well marked and characteristic.

Teeth 1, 4–4, 1, strongly crenate.

Color in spirits pale; sides silvery; a pretty distinct black blotch on last rays of dorsal, as in *C. analostana;* a large, distinct, black caudal spot, ovate in form, half larger than eye, and extending up on the middle rays of caudal; the coloration therefore nearly that of *Photogenis stigmaturus.*

Length $4\frac{1}{2}$ inches.

Types, No. 6865, United States National Museum, from Black Warrior River, Alabama. Collector, Prof. Winchell. Many specimens. Other specimens from Tangipahoa River, Louisiana, are also in the collection.

The species seems to resemble *C. cercostigma* Cope most, having a similar coloration; but that species is said to possess the teeth 2, 4, and to have somewhat different proportions. Several other similarly colored species of *Photogenis* and *Cyprinella* inhabit our southwestern waters.

44. PHOTOGENIS GRANDIPINNIS, *sp. nov.*

Body short, much compressed; back elevated; the form generally that of a young *Notemigonus.* Depth 4 in length. Head short, $4\frac{1}{4}$ in length, pointed, flattened above; mouth large, very oblique, the jaws just equal; eye large, 3 in head, about equal to snout and to interorbital space.

Fin-rays:—Dorsal I, 8; anal I, 10 or 11. Dorsal fin entirely posterior to ventrals, midway between eye and base of caudal, the fin greatly elevated, the longest ray being a little longer than head; anal fin also greatly elevated, reaching to within one eye's diameter of base of caudal; in smaller specimens less elevated, but in all very large, larger than in any other Cyprinoid known to me.

Scales with the exposed edges very narrow, 6–35–3; 16 large scales before dorsal; lateral line much decurved.

Color disappearing in alcohol; dorsal fin with the large black blotch, found in all the species of this group, unusually large and distinct, spreading forward on the anterior rays; a distinct black caudal spot, smaller than eye and deeper than long, running up on the middle rays; sides shining plumbeous; a very distinct bright silvery band from upper half

of eye straight to upper half of caudal, passing around the nose; below this sharply dusky; the opercles, lower half of eye, and lips in the dark band.

Teeth 1, 4–4, 1, hooked and sharp-edged.

Types, No. 9296, United States National Museum, from Georgia. Collector, Hugh M. Neisler; exact locality not specified. Numerous specimens in poor condition, showing no trace of tubercles.

Length $2\frac{1}{2}$ inches.

This small, handsome species is related to *P. pyrrhomelas* and *P. xænurus*, but needs no special comparison with either. The small size, the coloration, and immense development of the dorsal and anal fins distinguish it completely.

45. SEMOTILUS THOREAUIANUS, *sp. nov.*

Body short and rather stout, rather abruptly narrowed behind dorsal; depth $3\frac{3}{4}$ to $4\frac{1}{2}$ in length. Head short and thick, $3\frac{3}{4}$ in length, almost round in the larger specimen. Mouth large, oblique, the jaws about equal. Barbel lateral, better developed than in *S. corporalis*. Eye small, $4\frac{1}{2}$ to 5 in head, $1\frac{1}{3}$ in snout, about 2 in interorbital space, cheeks swollen; snout in a small male specimen 3 inches long, with a bilobed tubercle on each side.

Fin-rays:—Dorsal I, 8; anal I, 7. Dorsal entirely behind ventrals, its last ray over the first of anal; caudal peduncle slender; fins all short; pectorals not reaching nearly to ventrals, the latter not to vent.

Scales larger than in *S. corporalis*, not much crowded forward, 5–48–9; lateral line much decurved.

Coloration of *S. corporalis*, the black dorsal spot distinct.

Types, No. 9296, United States National Museum, from "Georgia". Collector, Hugh M. Neisler. Two specimens, the longest $3\frac{3}{4}$ inches long.

This species differs from *Semotilus corporalis* in its large scales, more backward dorsal, short head, and small size. The number of scales in the lateral line will probably always distinguish it.

This species is named in honor of the late Henry David Thoreau, of Concord, Mass., an excellent ichthyologist, one of the first to say a good word for the study of Cyprinidæ.*

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* I am the wiser in respect to all knowledge, and the better qualified for all fortunes, for knowing that there is a minnow in the brook. Methinks I have need even of his sympathy and to be his fellow in a degree. * *

I would know even the number of their fin-rays, and how many scales compose the lateral line.—(Thoreau, Essay on Nat. Hist. Mass. 1842. <Excursions, ed. 1863, p. 56.)

46. NOCOMIS MILNERI, *sp. nov.*

Form somewhat of *Semotilus corporalis*, but more terete and elongate; depth $4\frac{1}{2}$ in length. Head about the same, flattish above, with a broad snout, which projects over the large, oblique mouth; barbel very apparent. Eye large, equal to snout, $3\frac{2}{3}$ in head, $1\frac{1}{2}$ in interorbital space; dorsal beginning over last rays of ventrals, I, 8; anal I, 8.

Scales quite small, crowded forward, as in *Semotilus corporalis*, 11–68–7, or thereabouts.

Colors of *Semotilus corporalis*, but the fins unspotted; a faint black band passing around snout through eye, somewhat silvery below.

Teeth 2, 4–4, 2, without grinding surface; length 4 to 6 inches.

Types, No. 130, United States National Museum. Collected in Lake Superior, by J. W. Milner, of the United States Fish Commission, for whom the species is named.

This species may be known from *N. prosthemius* Cope by the larger scales and different mouth. Specimens of the latter are in the National Museum, from Evanston, Ill. *Gobio plumbeus* Ag., I do not know; the present species appears to be different.

47. CLIOLA ARIOMMA, (*Cope*) *Jordan.*

Photogenis ariommus, Cope, Trans. Am. Phila. Soc. 1866, 378.

This species is a true *Cliola* as I have defined that genus. The colored species referred by Prof. Cope and myself to *Episema*, viz, *E. callisema* and *E. pyrrhomelas*, are to be placed in *Photogenis* as defined in this paper. Their natural affinities are entirely with the latter group.

48. HYBOGNATHUS REGIUS, *Girard.*

Proc. Acad. Nat. Sci. Phila. 1856, 209.

This species, which has been for some time wrongly referred to *Hybopsis*, is a true *Hybognathus*, having the long intestines and cultriform pharyngeal teeth characteristic of the former genus. This fact was pointed out to me by Dr. T. H. Bean, who is now doing some very useful work in the way of verification of ascribed characters. *Hybognathus osmerinus* Cope is, so far as I can see on comparison of typical specimens, identical with *H. argyritis* Grd. *H. regius* is larger and deeper-bodied; *H. nuchalis* smaller.

49. NOTEMIGONUS CHRYSOLEUCUS, (*Mitchill*) *Jordan.*

In the Annals of the Lyceum of Natural History of New York for the present year, I have described as new a species of the genus *Notemigonus* from the Ocmulgee River, Georgia, under the name of *Notemigonus ischanus*, the description being drawn from a large number of young specimens.

I have lately had the opportunity of examining a number of fine adult individuals of this species from the same river. Prof. Cope has also obtained specimens from the St. John's River in Florida.

This species differs from the common *Notemigonus* "*americanus*" of the North and West chiefly in the following respects: (*a*) in the much greater size of the anal fin, the number of rays ranging from I, 15, to I, 17; (*b*) in the greater compression of the body, which at the same time is also more elongate; (*c*) in the larger eye; (*d*) in the rather more pointed head; and (*e*) in the coloration, the sides of the body in adult males being more or less rosy, and the lower fins, especially the ventrals, orange, verging on blood-red at their tips.

Linnæus's original description of his *Cyprinus americanus* is as follows (Systema Naturæ, ed. x, 1758, p. 321):

Americanus 4. C. pinna ani radiis . . . , cirris plurimis.
Catesb. car. 2. *p.* 12. *t.* 12.
Alburnus americanus.
Habitat in America.

In the twelfth edition, 1766, p. 530, the following is substituted:

Americanus 23. C. pinna ani radiis xviii. B. 3. D. 9. P. 16. V. 9. A. 18. C. 27.
Habitat in Carolina. D. Garden.
Corpus rutili, cæruleo-argenteum. Linea lateralis admodum arcuata versus abdomen. Cauda bifida.

From this latter description, it is evident that the fish which Linnæus had in mind was the southern *Notemigonus ischanus*, rather than the northern so-called *americanus*, which, by the way, is not certainly known to occur in Carolina.

Wherefore the southern species, *Notemigonus ischanus* Jordan, should be known as *Notemigonus americanus*, and the species of the Northern States, Great Lake Region, and Mississippi Valley as *Notemigonus chrysoleucus*, the name of *Cyprinus chrysoleucus* Mitchill being the oldest tenable name applied to it so far as known to the writer.

Leuciscus boscii Cuv. & Val. is probably identical with *Notemigonus*

americanus. Prof. Cope states that it is "probably a *Lavinia*", but he has not yet given us the grounds for his opinion. The figure of Cuvier and Valenciennes certainly bears little resemblance to *Lavinia*.

50. PLATYGOBIO GRACILIS, (*Richardson*) *Gill & Jordan*.

Cyprinus (*Leuciscus*) *gracilis*, RICHARDSON (1836), Fauna Boreali-Americana, iii, p. 120 (*Leuciscus gracilis* of copyists).

Leucosomus gracilis, HECKEL (1843), Fische Syriens, p. 52 (= Russeger's Reisen, p. 1042).

Pogonichthys communis, GIRARD (1856), Proc. Acad. Nat. Sci. Phila. p. 188, and elsewhere.

Platygobio communis, GILL (1876), Ichthyology, Capt. Simpson's Expl. p. 408, and and in previous papers.

Leucosomus communis, GÜNTHER (1867), Cat. Fishes Brit. Mus. vii, p. —.

Comparison of various specimens of *Platygobio communis*, from Milk River, Montana, and elsewhere, with Richardson's description and figure of *Leuciscus gracilis*, leaves no doubt of the identity of the two species.

CATOSTOMIDÆ.

51. MYXOSTOMA PŒCILURA, *sp. nov*.

Form and general characters of *Myxostoma duquesnii*: Body rather elongate, somewhat elevated forward, moderately compressed; the greatest depth $4\frac{1}{3}$ in length; eye medium, $4\frac{1}{2}$ in length; mouth moderate; the lips plicate, rather full and subtruncate behind, as in *M. aureola*, *duquesnii*, etc.

Dorsal fin medium, of 13 developed rays; anal high, reaching when depressed considerably beyond base of caudal in one specimen, falling short in the other; pectoral fins rather long; ventrals with ten rays.

Caudal fin peculiar, strongly forked, the lower lobe in both the types being considerably longer and stronger than the upper lobe.

Scales large, 5–43–4.

Coloration of the body usual; of the fins quite unlike any other member of the genus.

Dorsal fin (in the type-specimens preserved in alcohol) chiefly red, with traces of a blackish bar about half-way up; pectorals chiefly red, whitish in front, with a large, elongate, diffuse black blotch near the middle; ventrals reddish, blackish toward their base; anal faintly reddish; the membrane black.

Upper lobe of the caudal fin red; lower lobe chiefly jet-black, except the last two developed rays and their membranes, which are abruptly

white. This produces a peculiar feature of coloration singular in this family, resembling in some slight degree that of the Cyprinodont genus *Xiphophorus*.

Types: Two specimens, numbered 16928 in the United States National Museum; collected by Mr. Fred. Mather in the Tangipahoa River, in Louisiana. The larger specimen is 10 inches long.

HYODONTIDÆ.

52. HYODON SELENOPS, *Jordan & Bean, sp. nov.*

Three well-marked species of the genus *Hyodon* inhabit the fresh waters of the United States, viz: *Hyodon chrysopsis* Richardson, of the water-basins of the Saskatchewan and Upper Missouri; *Hyodon tergisus* Le Sueur, the common "Moon-Eye" of the Great Lake region and Upper Mississippi; and an undescribed species for which the name of *Hyodon selenops* is suggested, inhabiting the waters of the Southern States. The various synonyms, *Hyodon clodalus* Le Sueur, *Abramis smithii* Rich., *Hyodon amphiodon*, *alosoides*, *heterurus*, and *vernalis* Raf., evidently belong to the common *Hyodon tergisus*, so that the proper nomenclature of these species is a simple matter.

Hyodon selenops is distinguished from the others by the more elongate body, which is less compressed than usual, and there is less difference between the curve of the back and that of the belly. The belly anterior to the ventral fins is transversely rounded, or even almost flattened instead of being obtusely carinated as in *H. tergisus*, or sharply carinated as in *H. chrysopsis*.

So strongly do *H. selenops* and *H. chrysopsis* differ in this respect that they would be considered as belonging to different genera were not the intermediate type *H. tergisus* still extant. Prof. Gill considers that, in the interests of conciseness of expression, the modifications of structure in the group should be expressed by at least subgeneric appellations, and in this I concur with him. Prof. Gill and myself, therefore, propose the new subgeneric term *Elattonistius* (ἐλάττον, smaller; ιστιος, banner—*i. e.*, dorsal fin) for the *Hyodon chrysopsis*, and assign the characters given in the annexed synopsis. The scales are much less closely imbricated in *H. selenops*, and the number of series is, therefore, fewer. The dorsal fin is comparatively large, and nearly as long as high in front as in *H. tergisus*, and the pectoral fins are short, as in the latter species. But the most striking difference is in the size of the eye, which is exceed-

ingly large, forming nearly half the length of the side of the head in the smaller specimen, and about two-fifths in the larger.

The type of *H. selenops* is No. 19844 in the United States National Museum, from Chattanooga, Tenn.; length 8 inches. Another is from Montgomery, Ala.; and I have seen still others from the Cumberland River.

The following analysis of the species of *Hyodon* is drawn up from numerous specimens of *H. chrysopsis* taken by Dr. Elliott Coues, naturalist of the northern boundary survey, in Quaking Ash River; from specimens of *H. tergisus* from Ohio, and from the types of *H. selenops*. It will be noticed that the characters of *H. tergisus* are exactly intermediate, corresponding with the geographical range of the species. *H. chrysopsis* and *H. selenops* are, therefore, geographical races or varieties which have become so strongly differentiated from the common type that we are able to characterize them as species:

*. Dorsal fin reduced, and with only about nine fully developed rays; abdomen sharply carinated (*Elattonistius*):

‡. Dorsal fin very small, of about nine *developed* rays (besides the two or three rudiments), the length of its longest rays half greater than the length of the base of the fin; body deep, closely compressed; the belly strongly carinated both before and behind ventrals; eye moderate (about 3½ in head); scales rather closely imbricated, 5–58–8; pectoral fins falcate nearly as long as the head, nearly or quite reaching ventrals; anal with 30 or 31 developed rays; head 4⅛ in length; depth 3¼ ..... CHRYSOPSIS.

**. Dorsal fin moderate and with eleven or twelve fully developed rays; abdomen more or less obtuse (*Hyodon*):

†. Dorsal fin larger, of about 12 developed rays; its longest rays scarcely longer than the base of the fin; form of body intermediate; the belly in front of ventrals obtusely carinated; eye large, about 3 in head; scales medium, 5–58–8; pectoral fins decidedly shorter than head, not reaching nearly to ventrals; anal rays 28 or 29; head 4⅛ in length, the depth about 3 ..... TERGISUS.

†† Dorsal fin moderate, of 11 or 12 developed rays, nearly as long as high in front; body elongate, not greatly compressed; the belly in front of ventrals transversely rounded, not carinated; eye very large, about 2½ in head; scales loosly imbricated, 4–50–7; pectoral fins considerably shorter than head, not reaching nearly to ventrals; anal rays 27; head 4⅓ in length; depth about 4 ..... SELENOPS.

B.—SYNOPSIS OF THE FRESH-WATER SILURIDÆ OF THE UNITED STATES.

The nomenclature of the *Siluridæ* of our fresh waters has been for a long time in a very unsettled state, owing to the accumulation in our descriptive works of a large number of nominal species, and to the general lack of sharp characterizations in the published descriptions.

The writer has attempted to go over the subject critically, with a view to ascertaining the basis on which each species rests, and to eliminating all those whose claims to recognition are doubtful. I have accordingly considered every nominal species as invalid, unless either from the description itself or from the examination of specimens, some differences apparently permanent could be appreciated. Some species not here recognized will doubtless prove valid, but at least nine-tenths of those not admitted are simply spurious, either based on individual peculiarities of specimens, or more often on ignorance of species previously described.

This paper is based primarily on the collections in the United States National Museum. The writer has also examined most of the specimens of *Siluridæ* preserved in the Museum of the Academy of Natural Sciences at Philadelphia. Most of the species here recorded are also in the author's own collection, deposited in the Museum of Butler University at Indianapolis, Ind.

The drawings accompanying this paper were nearly all made by Mr. Ernest R. Copeland from specimens in the author's collection. Those of *Amiurus nigrilabris*, *Amiurus mispilliensis*, and *Amiurus niveiventris* were drawn by Miss Belle Sherman from Prof. Cope's types in the Museum of the Academy. A few others were drawn by Mr. Todd from specimens in the National Museum. These drawings are to be considered rather as illustrative diagrams than as pictures. They are drawn with a view to showing especially those characters which I consider to be specific in our *Siluridæ*, viz, the general outline, the position of the dorsal fin, the size, number of rays, and position of the anal fin, the form of the caudal fin, and the size and form of the pectoral spines. These features

have in all cases been drawn with considerable care and regard to accuracy.

The writer is under great obligations to Prof. Theodore Gill, of the Smithsonian Institution, for aid of various kinds, both in his work on the *Siluridæ* and in the prosecution of his ichthyological studies generally.

In the following descriptions, the "length of the body" is always measured along the sides from the snout to the middle of the *base* of the caudal fin.

All of our species of fresh water *Siluridæ* belong to the group called, by Dr. Gill, in 1862, ICTALURI. In 1864, Dr. Günther recognized the same group; but "to show his originality", as Prof. Agassiz used to say, he, without assigned reason, changed the name to *Amiurina*.

The following are the characters ascribed by Prof. Gill to the *Ictaluri* (Report on Ichthyology, Captain Simpson's Explorations across the Great Basin of Utah in 1859, p. 416).

GROUP ICHTHÆLURI.

The body is more or less elongated, compressed posteriorly, and terminating in a well-developed caudal fin. The skin is naked and unprovided with sucking cups.

The head in profile presents the appearance of a more or less elongated cone, and is covered with a skin which is generally quite thick. It is more or less flattened, and broad above, and gradually becomes narrowed to the convex snout. There is never a casque, or helmet. The supraoccipital terminates in a point.

There are eight barbels: the two maxillary, constant in the family; a pair in front of the posterior nasal apertures; and two pairs arranged in a curved line behind the lower jaw.

The nostrils form nearly a transverse parallelogram between the intermaxillaries and the eyes; the anterior are suboval or subcircular, and the posterior linear, with a raised margin, from the front of which the upper barbels originate.

The eyes are generally placed in the anterior half of the head.

The branchial apertures are ample, continued from the supero-posterior angles of the opercula to beneath the throat.

The group of *Ichthæluri* consists of four genera: *Ichthælurus*, *Amiurus*, *Pelodichthys*, and *Noturus*. All the species known to be genuine members of this group are North American, and all are included in the

following synopsis. A Chinese species, *Pimelodus cantonensis*, referred by Dr. Günther to *Amiurus*, is excluded, as its real position is perhaps uncertain. The species are most abundant in the Mississippi Valley and Great Lake Region. Some of them occur in all our waters east of the Rocky Mountains, but as yet none are known from the Pacific Slope.

ANALYSIS OF THE GENERA OF ICHTHÆLURI.

*. Adipose fin with its posterior margin free, not connected with the caudal fin:

†. Intermaxillary band of teeth convex in front, abruptly truncate behind, without lateral backward processes; branchiostegals 8 or 9 (rarely 10 or 11); ventral fins normally with 8 rays:

‡. Supraoccipital bone prolonged backward, its apex emarginate, receiving the pointed anterior end of the second interspinal, thus forming a continuous bony bridge from the snout to the base of the dorsal; branchiostegals 8 or 9; head elongate; mouth small, terminal, the upper jaw the longer; anal fin elongate, of 24 to 34 rays; caudal fin furcate; body elongate, more or less slender, silvery, covered with thin skin..... ICHTHÆLURUS.

‡‡. Supraoccipital bone free behind, not connected with the interspinal: branchiostegals normally 9 (varying from 8 to 11); head broad; mouth broad, terminal; anal fin moderate or rather long, with 15 to 27 rays; caudal fin usually truncate, but often more or less deeply emarginate or even forked; body usually more or less shortened, covered with a rather thick skin..... AMIURUS.

††. Intermaxillary band of teeth convex in front, with a lateral backward extension on each side; branchiostegals normally 12; supraoccipital bone free behind; head long, broad, and flat; mouth large, the lower jaw always the longer; anal fin short, of 12 to 14 rays; ventrals with 9 rays; caudal fin truncate, its numerous rudimentary rays recurrent above and below the caudal peduncle; number of vertebræ increased; body elongate, covered with thick skin.... PELODICHTHYS.

**. Adipose fin long and low, keel-like, adnate to the back, more or less perfectly continuous with the caudal fin; supraoccipital bone free behind; branchiostegals 9; anal fin short, with 11 to 20 rays; caudal fin rounded, with numerous rudimentary rays recurrent on the caudal peduncle; ventral rays usually 9; form various, but body usually more or less elongate, depressed in front, compressed behind, covered with a thickish but semi-transparent skin; size small, NOTURUS.

CATALOGUE OF NOMINAL SPECIES, WITH IDENTIFICATIONS.

In the following list are given, in chronological order, the names thus far proposed for our fresh-water *Siluridæ*. In the right-hand column is my identification of each species. Those species of which I have examined the original types are designated by a star (*).

Nominal species.	Date.	Identification.
Silurus catus, L.....	1758	Amiurus catus.
Silurus gyrinus, Mit	1817	Noturus gyrinus.
Silurus punctatus, Raf	1818	Ichthælurus punctatus.
Silurus olivaris, Raf.....	1818	Pelodichthys olivaris.
Noturus flavus, Raf	1818	Noturus flavus.

Nominal species.	Date.	Identification.
Pimelodus albidus, Le Sueur	1819	Amiurus albidus.
Pimelodus nebulosus, Le S	1819	Amiurus catus.
Pimelodus æneus, Le S	1819	Pelodichthys olivaris.
Pimelodus caudafurcatus, Le S	1819	Ichthælurus punctatus.
Pimelodus nigricans, Le S	1819	Amiurus nigricans.
Pimelodus natalis, Le S	1819	Amiurus natalis.
Noturus luteus, Raf	1819	Noturus flavus.
Pilodictis limosus, Raf	1819	Pelodichthys olivaris.
Silurus maculatus, Raf	1820	Ichthælurus punctatus.
Var. erythroptera, Raf	1820	Ichthælurus punctatus.
Silurus pallidus, Raf	1820	Ichthælurus punctatus.
Var. marginatus, Raf	1820	Ichthælurus punctatus.
Var. lateralis, Raf	1820	Ichthælurus punctatus.
Var. leucoptera, Raf	1820	Ichthælurus punctatus.
Silurus cerulescens, Raf	1820	Ichthælurus punctatus.
Var. melanurus, Raf	1820	Ichthælurus punctatus.
Silurus argentinus, Raf	1820	Ichthælurus punctatus.
Silurus nebulosus, Raf	1820	Pelodichthys olivaris.
Silurus viscosus, Raf	1820	Pelodichthys olivaris.
Silurus lividus, Raf	1820	Amiurus natalis lividus.
Var. fuscatus, Raf	1820	Amiurus natalis lividus.
Silurus melas, Raf	1820	Amiurus melas.
Silurus cupreus, Raf	1820	Amiurus lividus cupreus.
Silurus xanthocephalus, Raf	1820	Amiurus xanthocephalus.
Silurus limosus, Raf	1820	Pelodichthys olivaris.
Pimelodus argyrus, Raf	1820	Ichthælurus punctatus.
Pimelodus lutescens, Raf	1832	Pelodichthys olivaris.
Pimelodus insigne, Rich	1836	Noturus insignis.
Silurus (Pimelodus) cœnosus, Rich	1836	Amiurus natalis cœnosus.
Silurus (Pimelodus) nigrescens, Rich	1836	Amiurus nigricans.
Silurus (Pimelodus) borealis, Rich	1836	Amiurus borealis.
Pimelodus punctulatus, Cuv. & Val	1840	Pelodichthys olivaris.
Pimelodus furcatus, Cuv. & Val	1840	Ichthælurus furcatus.
Pimelodus furcifer, Cuv. & Val	1840	Ichthælurus punctatus.
Pimelodus lemniscatus, Le Sueur	1840	Noturus insignis.
Pimelodus vulgaris, Thompson	1842	Amiurus vulgaris.
Pimelodus pullus, De Kay	1842	Amiurus pullus.
Pimelodus atrarius, De Kay	1842	Amiurus catus.
Pimelodus felis, Agassiz	1850	Amiurus catus.
Pimelodus gracilis, Hough*	1852	Ichthælurus punctatus.
Pimelodus marmoratus, Holbrook*	1855	Amiurus marmoratus.
Pimelodus vulpes, Grd.*	1858	Ichthælurus punctatus.
Pimelodus catulus, Grd.*	1858	Amiurus melas.

Nominal species.	Date.	Identification.
Pimelodus felinus, Grd.*	1858	Amiurus natalis lividus.
Pimelodus antoniensis, Grd.*	1858	Amiurus natalis antoniensis.
Pimelodus ailurus, Grd*	1858	Amiurus vulgaris ælurus.
Pimelodus lupus, Grd*	1858	Amiurus lupus.
Pimelodus olivaceus, Grd.*	1858	Ichthælurus punctatus.
Pimelodus affinis, Grd*	1859	Ichthælurus furcatus.
Synechoglanis beadlei, Gill*	1859	Ichthælurus punctatus.
Pimelodus houghi, Grd.*	1859	Ichthælurus punctatus.
Pimelodus hoyi, Grd.*	1859	Amiurus catus.
Pimelodus confinis, Grd.*	1859	Amiurus melas.
Pimelodus cupreoides, Grd*	1859	Amiurus natalis lividus.
Pimelodus dekayi, Grd	1859	Amiurus vulgaris.
Pimelodus lynx, Grd*	1859	Amiurus albidus.
Pimelodus puma, Grd*	1859	Amiurus natalis.
Pimelodus vulpeculus, Grd.*	1859	Amiurus catus.
Pimelodus platycephalus, Grd *	1859	Amiurus platycephalus.
Pimelodus megalops, Grd*	1859	Ichthælurus punctatus
Pimelodus graciosus, Grd*	1859	Ichthælurus punctatus.
Pimelodus hammondi, Abbott	1860	Ichthælurus punctatus.
Pimelodus notatus, Abbott	1860	Ichthælurus punctatus.
Ictalurus simpsoni, Gill *	1861	Ichthælurus punctatus.
Amiurus obesus, Gill *	1861	Amiurus melas.
Noturus occidentalis, Gill *	1861	Noturus flavus.
Amiurus meridionalis, Günther	1864	Ichthælurus meridionalis.
Noturus platycephalus, Gthr	1864	Noturus flavus.
Gronias nigrilabris, Cope*	1864	Amiurus nigrilabris.
Noturus marginatus, Baird*	1869	Noturus insignis.
Ictalurus kevinskii, Stauffer	1869	Amiurus albidus.
Ictalurus macaskeyi, Stauffer	1869	Amiurus albidus.
Amiurus mispilliensis, Cope	1870	Amiurus catus (mispilliensis.)
Amiurus lophius, Cope	1870	Amiurus lophius.
Amiurus niveiventris, Cope	1870	Amiurus niveiventris.
Noturus exilis, Nelson*	1876	Noturus exilis.
Noturus leptacanthus, Jordan*	1877	Noturus leptacanthus.
Amiurus brunneus, Jordan*	1877	Amiurus brunneus.
Noturus miurus, Jordan*	1877	Noturus miurus.
Noturus eleutherus, Jordan	1877	Noturus eleutherus.
Ichthælurus robustus, Jordan*	1877	Ichthælurus robustus.
Amiurus erebennus, Jordan*	1877	Amiurus erebennus.
Amiurus natalis analis, Jordan	1877	Amiurus natalis analis.
Noturus sialis, Jordan	1877	Noturus sialis.

Genus ICHTHÆLURUS,* (*Rafinesque*) *Gill.*

Ictalurus, Rafinesque (1820), Ichthyologia Ohiensis, 61.
Elliops, Rafinesque (1820), Ichthyologia Ohiensis, 62.
Synechoglanis, Gill (1859), Annals Lyc. Nat. Hist. vii, 39.
Ictalurus, Gill (1862), Proc. Boston Soc. Nat. Hist. 41.
Ichthælurus, Cope (1869), Journ. Acad. Nat. Sci. Phila. 237.

Etymology.—$\iota\chi\theta\upsilon\varsigma$, fish; $\alpha\iota\lambda o\upsilon\rho o\varsigma$, cat.
Type.—*Silurus punctatus*, Rafinesque.

Body elongated, slender, and much compressed. The caudal peduncle is short but slender, and presents behind the anal an elongated elliptical section.

Head conical in profile, compressed, and with the sides sloping downward and outward. The supraoccipital bone is prolonged backward, and its emarginated apex receives the acuminate anterior point of the second interspinal. The skull is covered by a thin tense skin, through which the sculpture of the bones is apparent. Eyes large and almost entirely lateral. Mouth small, transverse, and terminal. The upper jaw protrudes beyond the lower. Teeth subulate and aggregated into a short, laterally truncated band on each jaw. Branchiostegal rays, 8 or 9. Dorsal fin situated over the interval between the pectoral and ventral fins, higher than long, with one long spine and usually six articulated rays. Adipose fin pedunculated over the posterior portion of the anal. Anal fin long, and provided with from 25 to 35 rays; it commences near the anus. Ventral fins each with one simple and seven branched rays. Pectoral fins each with a stout spine, retrorse-serrate within, and about nine branched rays. The serræ of the pectoral spine vary with age and circumstances, and do not in this genus give good specific characters. Caudal fin elongated and deeply forked, with the lobes equal and pointed.

The genus *Ichthælurus* is at once recognized by the forked caudal fin, its silvery or olivaceous colors, and by its compressed, elongated, and slender body, which give to it a peculiarly graceful appearance, very unlike that of the stout, obese, and large-headed *Amiuri*. The head is smaller in proportion than in *Amiurus*, more compressed, and not covered by so thick a skin; the mouth is proportionally much smaller. But the only invariable generic distinction resides in the mode of inser-

* The characters of the genera of *Siluridæ* as here given are arranged from Prof. Gill's Report on Ichthyology of Captain Simpson's Explorations Across the Great Basin of Utah, pp. 416–431, with some additions and modifications.

tion of the supraoccipital or interparietal bone into the head of the second interspinal. A firm and immovable bridge is thus formed, which gives an uninterrupted passage from the dorsal fin to the snout. The silvery coloration is also a marked distinguishing feature.

It is not generally true that the species of *Ichthælurus* reach a larger size than those of the other genera. *Amiurus nigricans* and *Pelodichthys olivaris* far exceed in size any of the species of *Ichthælurus*.

ANALYSIS OF SPECIES.*

*. Anal fin extremely elongate, its base about one-third the length of the body (without caudal); its rays 32 to 34 in number; eye small, wholly anterior, the middle of the head being entirely behind its posterior margin; head small, about 4½ in length; depth 4 in adults to 5½ in younger specimens; slope from dorsal to snout somewhat concave, especially in adults; pectoral spine 1⅓ in head; skin thin; color brightly silvery ..... FURCATUS, 1.

**. Anal fin shorter, 3½ to 4 in length; its rays 24 to 30.

†. Eye moderate-sized, anterior, the middle of the head being wholly behind it; anal rays 27 to 30; body comparatively stout and deep, compressed behind; the dorsal region elevated; depth 3½ to 4 in length; head pretty large, 4½ to 4⅓ in length, one-third longer than broad; spines moderate, strong, little more than half-head; profile from dorsal to snout more or less depressed or concave; skin rather thick; colors pale ..... ROBUSTUS, 2

††. Eye large, placed mesially, the middle of the length of the head falling within the eye; anal rays 25 to 29; head moderate, about 4 in length; depth about 5; body more elongate and less deep than in *robustus*, the head rather smaller, the eye larger, and the dorsal region less elevated; pectoral and dorsal spines long, each about 1⅔ in length of head ..... PUNCTATUS, 3.

1. ICHTHÆLURUS FURCATUS, (*Cuv. & Val.*) *Gill.*

Fork-tailed Channel Cat.

(Figs. 1 and 2.)

Pimelodus furcatus, CUV. & VAL. (1840), XV, 136.—DE KAY (1842), Fishes N. Y. 187.—STORER (1846), Synopsis, 403.

Ictalurus furcatus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN (1876), Man. Vert. 300.—JORDAN & COPELAND (1876), Check List, 159.

Amiurus furcatus, GÜNTHER (1864), Cat. Fishes, V, 103.

Pimelodus affinis, BAIRD & GIRARD (1854), Proc. Acad. Nat. Sci. Phila. 26.—GIRARD (1859), Ich. U. S. and Mex. Bound. 32.

Ictalurus affinis, GILL (1862), l. c. 43.—JORDAN & COPELAND, l. c. 159.

Amiurus affinis, GÜNTHER (1865), l. c. 103.

Habitat.—Mississippi Valley to Texas.

This species is not nearly so common nor so well known as the *punctatus*. I am unable to distinguish the type specimens of *affinis* from *furcatus*.

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* *I. meridionalis* is here omitted, the description not being sufficiently full to allow a satisfactory contrast of its characters with those of *I. robustus*.

2. ICHTHÆLURUS ROBUSTUS, *Jordan, sp. nov.*

Robust Channel Cat.

(Figs. 3 and 4.)

Ictalurus furcatus, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.

Habitat.—Ohio and Mississippi Rivers.

This is a large robust species said to be not uncommon in the Ohio and Mississippi Rivers, and which seems to have been thus far confounded with the related *I. furcatus.* From that species it differs obviously in the shorter anal fin, which has 27 to 30 rays, and forms but one-fourth of the length of the body, without the caudal. It is also a stouter fish, with a larger head and a more elevated dorsal region. From *I. punctatus* this species differs notably by the anterior position of the eyes and by the greater elevation of the dorsal region. Old specimens have the profile somewhat concave as in *I. furcatus.*

The type is a large specimen, about 18 inches long, numbered 20056 in the National Museum. The record of the locality is lost. Another specimen, figured in this paper, was sent me by Prof. S. A. Forbes, from the Ohio River at Cairo. Professor Forbes thinks it common in the Lower Ohio and Mississippi, but that it rarely ascends the Illinois and other tributary rivers.

3. ICHTHÆLURUS PUNCTATUS, (*Raf.*) *Jordan.*

Blue Cat—White Cat—Silver Cat—Channel Cat.

(Figs. 5 and 6.)

Silurus punctatus, RAF. (1818), Amer. Monthly Mag. and Critical Review, Sept. 359.

Ictalurus punctatus, JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 95; (1876), Manual of Vertebrates, 300.—JORDAN & COPELAND (1876), Check List in Bull. Buff. Soc. Nat. Hist. 159.—JORDAN (1877), Annals Lyc. Nat. Hist. N. Y. —. —NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.

Pimelodus caudafurcatus, LE SUEUR (1819), Mémoires du Muséum, v, 152.

Amiurus caudafurcatus, GÜNTHER (1864), Catalogue of Fishes, v, 102.

Silurus maculatus, RAF. (1820), Quarterly Journal of Science, Literature, and Arts, London, 48 (et var. *erythroptera*, p. 49).

Pimelodus (Ictalurus) maculatus, RAF. (1820), Ichthyologia Ohiensis, 62.

Silurus pallidus, RAF. (1820), Quart. Journ. Sci. Lit. Arts London, 49 (et var. *marginatus, lateralis, leucoptera*).

Pimelodus pallidus, RAF. (1820), Ich. Oh. 63.—KIRTLAND (1838), Report Zool. Ohio, 169, 194.

Silurus cerulescens, RAF. (1820), Quart. Journ. Sci. Lit. Arts London, 49 (et var. *melanurus*).

Pimelodus cerulescens, RAF. (1820), Ich. Ohiensis, 63.—KIRTLAND (1838), Rept. Zool. Ohio, 169, 194; (1846), Bost. Journ. Nat. Hist. iv, 332.—STORER (1846), Synopsis Fishes N. A. in Mem. Nat. Acad. Sci. 405. (All these descriptions refer more or less to *Amiurus nigricans*).

Ictalurus cærulescens, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—COPE (1865), Proc. Acad. Nat. Sci. Phila. 85; (1870), Proc. Am. Philos. Soc. 489.—JORDAN (1874), Ind. Geol. Survey, 222.—GILL (1876), Ich. Capt. Simpson's Exped. 417.

Ichthælurus cærulescens, COPE (1869), Journ. Acad. Nat. Sci. 237.

Silurus argentinus, RAF. (1820), Quart. Journ. Sci. Lit. Arts London, 50.

Pimelodus argyrus, RAF. (1820), Ichthyologia Ohiensis, 64,

Pimelodus furcifer, CUV. & VAL. (1840), XV, 139.—"HYRTL (1859), Denkschr. Akad. Wiss. Wien, 16".—"KNER, Sitzgsber. Akad. Wiss. Wien, XXVI, 421."

Ictalurus furcifer, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN (1876), Manual Vert. 300.

Pimolodus gracilis, HOUGH (1852), Fifth Ann. Rept. Reg. Univ. Condition State Cabinet Nat. Hist. Albany, 26.

Synechoglanis gracilis, GILL (1859), Trans. Lyc. Nat. Hist. 3 (reprint).

Ictalurus gracilis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—COPE (1865), Proc. Acad. Nat. Sci. Phila. 85.—JORDAN (1876), Man. Vert. 300.—JORDAN & COPELAND (1876), Check List, 159.

Pimelopus vulpes, GIRARD (1858), Proc. Acad. Nat. Sci. Phila. 170; (1859), U. S. and Mex-Bound. Surv. 33.

Ictalurus vulpes, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus olivaceus, GIRARD (1858), Pac. R. R. Survey, x, 211.

Ictalurus olivaceus, GILL (1862), l. c. 43; (1876), Rept. Ichthy. Capt. Simpson's Exp. 417.—JORDAN (1876), Man. Vert. 300.—JORDAN & COPELAND (1876), Check List, 159.

Synechoglanis beadlei, GILL (1859), Trans. Lyc. Nat. Hist. N. Y. 2 (reprint).

Ictalurus beadlei, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus houghii, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.

Pimelodus megalops, GIRARD (1859), l. c. 161 (said to have the eye very large, its diameter one-third the length of the side of the head).

Ictalurus megalops, JORDAN & COPELAND (1876), Bull. Buff. Soc. Nat. Hist. 159.

Pimelodus graciosus, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 161.

Pimelodus hammondii, ABBOTT (1860), Proc. Acad. Nat. Sci. Phila. 568.

Pimelodus notatus, ABBOTT (1860), Proc. Acad. Nat. Sci. Phila. 569.

Ictalurus simpsoni, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43; (1876), Ich. Capt. Simpson's Exp. 417.

Habitat.—Northern New York; Canada. Great Lake Region, throughout Mississippi Valley, Nebraska, Kansas, to Georgia, Florida, and Texas.

The synonymy of this species is not altogether creditable to workers in American ichthyology. It is one of our most abundant and widely diffused fishes, and one even less subject to variations than species of such wide distribution usually are. And yet, if the above synonymy is correct, we have twenty-three different specific and varietal names applied to it. It would seem as if every naturalist who had obtained a Channel Cat was sure that such a Cat-fish, so slender, so clean, and so white, must surely be unknown to science, or else he would have heard of it before. As a result of this, nearly every writer on American fresh-water fishes has one or more nominal species based on some

stage in the growth of the *Ichthælurus punctatus*, or on some real or imagined variation of it.

The specific name *cærulescens* has been the one most generally employed, although, as will be seen from the above synonymy, eight different specific and varietal names have priority over it. The oldest description is apparently that of Rafinesque under the name of *Silurus punctatus*. The specific name of *punctatus* is accordingly the one to be employed. The other Rafinesquian names evidently apply to different stages in the growth of the species. Rafinesque's *P. cærulescens*, however, as well as that of Dr. Kirtland and others, includes *Amiurus nigricans*. This error has been the source of much confusion; the great Mississippi Cat-fish having been wrongly supposed to be an *Ichthælurus*. I find nothing in the accounts given of *furcifer* and *caudafurcatus* to indicate that they were founded on species distinct from *punctatus*. *I. gracilis* Hough (=*houghii* Grd.) is said to have a less number of anal rays than has been noticed in *punctatus*. Hough's specimens were from Northern New York. I have examined specimens from Saint Lawrence County, New York, presumably referable to *gracilis*, but they have 27 anal rays, and, so far as I can see, are precisely like the ordinary *punctatus*, except that the serrations of the pectoral spine are perhaps a trifle weaker. An examination of the types of *beadlei*, *simpsoni*, *olivaceus*, and *vulpes* shows nothing of specific value. The number of anal rays is 25 to 28 in them all, as in typical *punctatus*. *Olivaceus* appears rather more slender than is usual. *Notatus* and *hammondi* are rather indifferently described, but there is nothing in the description of either to show that it does not belong here. The types of *graciosus* and *megalops* have a rather longer anal fin than usual, and differ slightly in form. I have seen other specimens like them, but am unable to recognize even a variety. Girard's statement of the size of the eye in *megalops* is exaggerated.

4. ICHTHÆLURUS MERIDIONALIS, (*Günther*) *Jordan*.

Southern Channel Cat.

(Figs. 7 and 8.)

Amiurus meridionalis, GÜNTHER (1864), Cat. Fishes Brit. Mus. v, 102; (1868), Trans. Zool. Soc. London, 473.

I infer, from the figure only, that this species belongs to *Ichthælurus* rather than to *Amiurus*. Although the distinctive characters of the two genera were made known in 1862, in the description of this species we find no allusion to those characters, and no attempt at comparison

of the species with those previously known. So far as I can judge from the figure, this species is an affine of *I. robustus*, having, like that species, the eye anterior and the number of anal rays intermediate (28 or 29), but differing in the greater slenderness of the body.

Genus AMIURUS, (*Rafinesque*) *Gill.*

Silurus et *Pimelodus* sp., Linnæus, and all writers prior to 1862.
Ameiurus, Rafinesque (1820), Ich. Ohiensis, 65 (as section under subgenus *Ictalurus* of *Pimelodus*).
Amiurus, Gill (1862), Proc. Bost. Soc. Nat. Hist. 50, and of recent writers generally.
Ameïurus, Cope (1864), Proc. Acad. Nat. Sci. Phila. 231.
Gronias, * Cope (1864), Proc. Acad. Nat. Sci. Phila. 231 (*G. nigrilabris*).

Etymology.—*a*, privitive ; *μειουρος*, curtailed, in allusion to the entire caudal fin.
Type.—*Silurus cupreus* Rafinesque.

Body moderately elongated, robust, anteriorly vertically ovate, and scarcely compressed; caudal peduncle also robust, but much compressed, and at its end evenly convex.

Head large, wide, laterally expanded, above ovate and in profile cuneiform; supraoccipital extended little posteriorly and terminating in a more or less acute point. which is entirely separate from the second interspinal buckler; the skin covering the bones is thick.

Eyes rather small, in one species covered by the skin; mouth large, terminal, transverse, the upper jaw in most species the longer; jaws often equal, the lower in one or two species distinctly projecting.

Teeth subulate, aggregated in broad bands on the intermaxillaries and dentaries; the intermaxillary band is convex in front, of equal breadth, and abruptly truncated near the insertion of the intermaxillaries; the lower dental band is anteriorly semicircular, attenuated to the angles of the mouth.

Branchiostegal membrane on each side with eight or nine rays in typical species, ten or eleven in two or three aberrant species; dorsal situated over the interval between the pectorals and ventrals, higher than long, with a pungent spinous ray dentate behind, and about six branched rays; adipose fin short, inserted over the posterior half of the anal; anal fin of moderate length, with from fifteen to twenty-six rays, the usual number being twenty or twenty-one; caudal fin short, usually truncate when spread open, slightly emarginate when not expanded,—in species related to *Ichthælurus* more or less deeply forked, in some other species rounded; when the caudal fin is forked the lobes are usually un-

* Prof. Cope thus defines this genus :—"Head broad, depressed ; supraoccipital bone posteriorly free ; branchiostegal membrane with ten rays ; anterior dorsal spine stout : posterior (adipose) fin separated from caudal ; ventrals with eight rays ; eyes rudimental, covered by the corium ; natatory bladder present."

equal; ventrals each with one simple and seven branched rays; pectoral fins each with a stout spine, which is commonly retrorse-serrate behind; these serræ vary much with age and circumstances, and do not appear in this genus to furnish good specific characters; lateral line usually incomplete.

This genus includes our common Eastern American Catfishes, and is readily recognized by the broad head covered by a thick skin, the free termination of the posterior process of the supraoccipital bone, the compressed body, and by the free adipose fin.

This genus, although undoubtedly a very natural one, is rather hard to define. Certain species (*lupus*, *niveiventris*, *nigricans*) have real affinities with the species of *Ichthælurus*, having, like them, the body elongate, the head rather narrow, the anal long, the caudal forked, and the coloration pale. The absence of the connection between the supraoccipital and the interspinal is the only technical character by which *Amiurus* may be distinguished from *Ichthælurus*.

ANALYSIS OF SPECIES.

*. Caudal fin forked; upper jaw longest; dorsal beginning nearer snout than adipose fin; colors blackish-silvery:

†. Anal fin elongate, of 23 to 28 rays:

a. Caudal fin deeply furcate; head narrow, longer than broad; anal rays 23 or 24; pectoral spines long and slender, dentate; barbels long; depth about 5 in length; width of head $4\frac{3}{4}$; body rather slender:

—. Head narrowed, its width being less than its length above; distance from snout to dorsal spine $1\frac{1}{3}$ to $1\frac{1}{4}$ in distance from dorsal spine to adipose fin; base of anal as long as head ..... LUPUS, 5.

—. Head broader, its width equal to its length above; distance to dorsal spine $1\frac{1}{6}$ in distance from spine to adipose fin; base of anal notably less than head ..... NIVEIVENTRIS, 6.

aa. Caudal fin strongly furcate; head $4\frac{1}{4}$ in length, its width 5; anal rays 25 or 26; pectoral spines dentate, short, and stout; barbels long; body rather stout, color dark, often mottled with pale; size very large ..... NIGRICANS, 7.

aaa. Caudal fin shallow-furcate; pectoral spine not serrate; head broad, as wide as long ..... BOREALIS, 8.

††. Anal fin short and rather low, of 19 to 22 rays; adipose fin very large; humera process strongly rugose; colors pale, more or less silvery:

b. Head narrower, longer than wide, its width 4 to 6 times in length; mouth narrow; upper jaw much projecting; eye large, 3 to 5 in interorbital width; barbels long, except nasal barbel; lateral line almost complete; caudal fin more deeply forked; anal fin $4\frac{1}{2}$ to 5 in length; dorsal about midway between adipose fin and snout ..... ALBIDUS, 9.

bb. Head very broad, as wide as long, its width $3\frac{3}{4}$ in length of body; eye 5 to 6 in interorbital width; caudal not deeply forked; anal fin $5\frac{1}{2}$ to 6 in length; mouth wider than in any other species; jaws nearly equal; dorsal much nearer adipose fin than snout; colors pale, somewhat silvery, especially on head ..... LOPHIUS, 10.

**. Caudal fin not forked, rounded or usually somewhat emarginate, nearly truncate when spread open:

‡. Body moderately elongate, depth one-fifth or more of length; branchiostegals normally 9 or 10:

c. Anal fin very long, its base one-fourth or more of length of body, of 24 to 26 rays; dorsal spine normally nearer snout than adipose fin:

—. Head and body elongated; the dorsal region considerably elevated; the head quite long and narrowed forwards; much longer than broad; its width in front of eye only about half its length; mouth rather narrow, with equal jaws; barbels long; adipose fin large; spines strong; dorsal fin very high; anal fin long and deep; caudal fin short; color dark .....EREBENNUS, 11.

— — Head wide and flattish, not much longer than broad; rounded in front; the mouth very wide; the dorsal region not much elevated; body more or less stout and thick; branchiostegals 8 or 9, jaws equal or upper jaw longest .....NATALIS, 12.

w. Dorsal considerably nearer snout than adipose fin:

x. Jaws equal; spines very short; anal rays 25; colors yellowish-brown, *Lividus*, b.

xx. Upper jaw distinctly longest:

y. Anal rays 24 or 25, its rays less than half head, its base 3¼ in length of body; the nape not swollen:

z. Colors pale; yellowish-brown .....*Cupreus*, c.

zz. Colors dark; black or greenish .....*Cœnosus*, d.

yy. Anal rays 26; base of anal 3½ in length, its rays short, less than half length of head; spines weak; head 3½ to 3¾ in length; distance to dorsal spine 2⅔ to 2¾; the nape more or less swollen and elevated .....*Antoniensis*, e.

yyy. Anal rays 27, its base elongate, 3⅓ in length, its longest rays more than half head; spines strong; head short, 4 in length, the distance to dorsal nearly 3; nape not swollen .....*Analis*, f.

ww. Dorsal rather nearer adipose fin than snout; the posterior part of the body being much thicker and proportionally shortened; the caudal fin short; dorsal and ventral outlines nearly parallel; jaws about equal .....*Natalis*, a.

cc. Anal fin moderate, of 19 to 22 rays; branchiostegals normally 8 or 9:

d. Lower jaw distinctly longest; anal rays 20:

e. Body moderately elongate, depth 4½ to 5 in length; head 3½ to 4; barbel long; mouth wide; head longer than broad, rather narrowed forward; profile rather steep, pretty evenly convex; dorsal region more or less elevated; dorsal spine nearer snout than adipose fin; lower jaw strongly projecting; color blackish (varying in subspecies *ælurus* to head blunter and flatter above; dorsal spine rather nearer adipose fin) .....VULGARIS, 13.

dd. Jaws equal, or upper jaw projecting beyond lower:

f. Eyes distinct, well developed:

g. Head moderately broad, a nearly even slope from the tip of the snout to the elevated base of the dorsal:

—. Body sharply mottled with brown, greenish, and whitish; the coloration therefore singular among Catfishes; jaws equal or nearly so; depth about 4 in length; slope of profile very steep; dorsal fin high; the spine more than half length of head; dorsal spine nearer adipose fin than snout; barbels long; branchiostegals 10; head 3¼ in length .....MARMORATUS, 14.

—. Body nearly uniform in color above, or slightly mottled or clouded:

h. Body rather elongate; depth 4 to 4½ in length; head broader than in the next, the front less steep, but the slope from snout to dorsal more uniform; body less rapidly narrowed behind; anal fin longer; its base 4½ in body, the rays usually 21 or 22; dorsal usually rather nearer adipose fin than snout; the upper jaw more elongate; color dark yellowish-brown, varying to dusky or even to black, sometimes more or less clouded ....CATUS, 15.

hh. Body very short, stout, and deep, the depth 3½ to 4 in length; head moderate, somewhat contracted forward; the front steeply elevated, the body thick across the shoulders, rather rapidly narrowed behind; anal fin short and deep, of 18 to 20 rays, its base nearly 5 in length of body; dorsal nearer adipose fin than snout; jaws nearly equal; size small; color almost black; form varying to extremely short and thick, especially behind, with short caudal fin ..... MELAS, 16.

gg. Head very broad, the slope from snout to base of dorsal quite uneven, there being a more or less decided angle at occiput; head about as broad as long, its length about 4 in body; dorsal spine nearer adipose fin than snout, its rays usually 19 (rarely 18 or 20); body short and stout; mouth very broad; color rather pale, chiefly uniform yellowish-brown, varying to dark brown or pale yellow; head sometimes yellow (*Raf.*); belly yellow; size small .....XANTHOCEPHALUS, 17.

ff. Eyes more or less rudimentary and concealed beneath the skin; jaws equal; muzzle flat; dorsal spine midway between snout and middle of adipose fin; barbels short; caudal slightly emarginate; anal with 18 rays; color blackish above; jaws and fins black; sides varied with yellowish; belly pale; branchiostegals 10 .....NIGRILABRIS, 18.

ccc. Anal fin few-rayed (rays 15 to 17):

i. Upper jaw distinctly longest:

j. Body short and stout; depth about 4 in length; head flattened, nearly as broad as long; dorsal nearer adipose fin than snout; mouth large; spines moderately serrate; colors very dark, almost black .....PULLUS, 19.

jj. Body slender, elongate, the depth about 5½ in length; head roundish, rather long, about 4 in length, the width 4½; mouth small; the upper jaw more projecting than in any other of the species known; profile convex, not steep; dorsal fin very high, ⅔ length of head, well forward, its spine nearer snout than adipose fin; anal fin short and high, its base 5 in length of body; pectoral spine serrated; color pale olive-brown; a blackish horizontal bar at base of dorsal.....BRUNNEUS, 20.

‡‡. Body excessively slender, elongate, as in *Pelodichthys*, the depth being 6 to 8 times in length of body; head broad and flat, nearly as wide as long; anal fin with 20 rays; the base of the fin 4½ to 5 in body; jaws equal; branchiostegals 11; mouth very wide; dorsal spine nearer snout than adipose fin; coloration ordinary, a blackish horizontal bar at base of dorsal,

PLATYCEPHALUS, 21

5. AMIURUS LUPUS, (*Girard*) *Günther.*

Texas Cat.

(Figs. 9 and 10.)

Pimelodus lupus, GIRARD (1858), U. S. Pac. R. R. Expl. x, 211.
Amiurus lupus, GÜNTHER (1864), Cat. Fishes Brit. Mus. v., 101.

Habitat.—Streams of Texas.

This species strongly resembles *Ichthælurus punctatus*, but differs in the shorter body, wider mouth, and darker colors, as well as in the generic character of the free supraoccipital. In this species, however, there intervenes scarcely more than the diameter of a pin's head between the supraoccipital and the interspinal, in specimens 8 inches long; so nearly connected are they that I was at first disposed to consider this species as an *Ichthælurus*. Numerous specimens of *A. lupus* are in the museum from Texas.

6. AMIURUS NIVEIVENTRIS, *Cope.*

White-bellied Cat.

(Figs. 11 and 12.)

Amiurus niveiventris, COPE (1870), Proc. Am. Philos. Soc. 486; JORDAN & COPELAND (1876), Check List, 159.

Habitat.—Neuse River, North Carolina.

This species seems to be very close to *A. lupus*, but appears to differ in the broader head and in some other features. I have seen no specimens of it.

7. AMIURUS NIGRICANS, (*Le Sueur*) *Gill.*

Great Fork-tailed Cat—Mississippi Cat.—Florida Cat.

(Figs. 13 and 14.)

Pimelodus nigricans, LE SUEUR (1819), Mémoires du Muséum d'Hist. Nat. v, 153.—CUV. & VAL. (1840), XV, 133.—DE KAY (1842), Fishes N. Y. 180.—STORER (1846), Synopsis, 403.—"HYRTL (1859), Denkschrift Akad. Wiss. Wien, xvi, 16."
Amiurus nigricans, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—JORDAN (1876), Man. Vert. 318.—JORDAN & COPELAND (1876), Check List, 159 (not of GÜNTHER (1864) nor of COPE (1870) = *A. cœnosus*).
Silurus (*Pimelodus*) *nigrescens*, RICHARDSON (1836), Fauna Bor.-Am. Fishes, 134.
Pimelodus sp. incog., THOMPSON (1842), History Vermont, 139.
Pimelodus coerulescens, in part of RAFINESQUE, KIRKLAND, and others; the big "Channel Cats" all belong to this species.

Habitat.—Great Lakes and Mississippi River, ascending all the larger tributaries, larger rivers of the South Atlantic and Gulf States generally.

This species is the "Great Fork-tailed Cat" of the Lakes and the "Great Mississippi Cat" of the Mississippi and Ohio Rivers. I have seen and identified specimens of thirty to forty pounds weight, and have seen specimens which I suppose were of this species which weighed nearly a hundred pounds. I have heard of Catfish weighing two or three hundred pounds, but have never seen them, and presume they were "weighed by guess". This species undoubtedly attains the largest size of any of our representatives of the family. Specimens of this species of a large size are in the United States National Museum, from St. John's River, Florida. They appear to have a rather steeper front than the northern ones, but are otherwise similar.

As indicated above, the "*A. nigricans*" of Dr. Günther is probably the *cœnosus*, as the present species has the caudal fin strongly forked.

8. AMIURUS BOREALIS, (*Richardson*) *Gill.*

The Mathemeg *or* **Land Cod.**

Pimelodus borealis, RICHARDSON (1836), Fauna Boreali-Americana, Fishes, 135.—CUV. & VAL. (1840), XV, 130.—STORER (1846), Synopsis, 402.

Amiurus borealis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—GÜNTHER (1864), Cat. Fishes, V, 100.—COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN & COPELAND, Check List, 159.

Habitat.—British America.

I do not know this species, and it may not really have a forked caudal fin. It is not improbable that its relations are with *Amiurus cœnosus* rather than with *A. nigricans*.

9. AMIURUS ALBIDUS, (*Le Sueur*) *Gill.*

Eastern Fork-tailed Cat—"Channel Cat" of the Potomac.

(Figs. 15 and 16.)

Pimelodus albidus, LE SUEUR (1819), Mém. du Mus. d'Histoire Nat. v, 148.—CUV. & VAL. (1840), XV, 131.

Amiurus albidus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Pimelodus nebulosus, CUV. & VAL. (1840), XV, 132 (in part; not of Le Sueur).

Amiurus nebulosus, GÜNTHER (1864), Cat. Fishes, V, 101.

Pimelodus lynx, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.

Amiurus lynx, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.—UHLER & LUGGER (1876), Fishes Maryland, 152.—JORDAN (1876), Man. Vert. 300.—JORDAN & COPELAND (1876), Check List, 160.

Ictalurus macaskeyi, STAUFFER (1869), Mombert's History Lancaster Co. Pa. 578.

Ictalurus kevinskii, STAUFFER (1869), Mombert's History Lancaster Co. Pa. 578.

Habitat.—Atlantic streams, Pennsylvania to North Carolina.

The *Pimelodus albidus* of Le Sueur* seems to me rather to have been

* Le Sueur says: "Tête large, aplatie; * * couleur d'un blanc cendrée * * * caudale très légèrement echancrée," characters evidently belonging to the *lynx* rather than to the *catus*. This is the more plain, as in describing the distinctly fork-tailed

based on this species than on an albino of *catus*, as supposed by Prof. Cope. I have therefore substituted the appropriate name *albidus* for the unmeaning *lynx*. This is an extremely variable species. Old specimens bear a strong resemblance to the next species, while the young are quite slender.

10. AMIURUS LOPHIUS, *Cope*.

Big-mouthed Cat.

(Figs. 17 and 18.)

Amiurus lophius, COPE (1870), Proc. Am. Philos. Soc. 486.—JORDAN (1876), Manual Vert. 301.—JORDAN & COPELAND (1876), Check List, 160.

Habitat.—Streams tributary to Chesapeake Bay. *A. lophius* is a common fish in the Washington markets.

The synonymy of this species requires no special remark.

11. AMIURUS EREBENNUS, (*Jordan*) sp. nov.

Goode's Cat.

(Figs. 19 and 20.)

Habitat.—St. John's River, Florida.

This species is related to *A. nigricans* and others of the fork-tailed group, but has the truncate caudal fin of *A. lividus*.

Body rather elongate, compressed, the depth about $4\frac{1}{3}$ in length; dorsal region rather elevated, the head quite long and narrowed forward, 4 times in length of body. The head is more narrowed than in any of the other species except *A. lupus*. The width of the head in front of the eye is but little more than half its length. The width of the mouth is about half the length of the head. The greatest width of the head is contained about $1\frac{1}{3}$ times in its length. The dorsal fin is slightly nearer the snout than the adipose fin.

The dorsal fin is unusually high, its spine is long, as in the species of *Ichthœlurus*. The pectoral spine is very strong and it is about half as long as the head. The anal fin is long and deep. It is nearly one-fourth the length of the body, and is composed of 24 rays. The adipose fin is large. The caudal fin is rather short and is truncate behind.

The jaws are equal. The supraoccipital bone is but little free behind. The branchial apertures are rather more restricted than usual.

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nigricans, Le Sueur says, "caudale légèrement echancrée en croissant." It seems that Prof. Gill had some time since independently reached a similar conclusion, and that the "*Amiurus lynx*" has been for some time correctly known as *A. albidus* by the members of the Fish Commission.

Color very dark. The type-specimen is quite black, both body and fins; the belly is pale, but the lower barbels as well as the upper ones are black.

The type was collected in the St. John's River, Florida, by Mr. G. Brown Goode. It is a little more than a foot long.

This species is intermediate between *A. lupus* and *A. lividus*, having the narrowed head, high dorsal, and small mouth of the first, with the short, truncate candal fin of the second.

12. AMIURUS NATALIS, (*Le Sueur*) *Gill.*

Catfish—Yellow Cat.

a. Subspecies NATALIS.

(Figs. 21 and 22.)

Pimelodus natalis, LE SUEUR (1819), Mém. du Muséum, v, 154—STORER (1846), Synopsis, 405.

Amiurus natalis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44—GÜNTHER (1864), Cat. Fishes Brit. Mus. v, 101.

Pimelodus puma, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.

Habitat.—Great Lakes to North Carolina and south.

b. Subspecies LIVIDUS, *Raf.*

(Figs. 23 and 24.)

Silurus lividus, RAFINESQUE (1820), Quart. Journ. Sci. Lit. Arts, London, 48 (et var. *fuscatus*).

Pimelodus lividus, RAFINESQUE (1820), Ich. Ohiensis, 65.

Amiurus lividus, JORDAN (1876), Man. Vert. 302.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus felinus, GIRARD (1858), U. S. Pac. R. R. Expl. x, 209.

Amiurus felinus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus catus, GRD. (1859), Proc. Phila. Acad. Nat. Sci. 160 (not of De Kay and most authors).

Amiurus catus, COPE (1870), Proc. Am. Philos. Soc. 484.—JORDAN & COPELAND, Check List, 159.

Pimelodus cupreoides, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.

Amiurus cupreoides, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Habitat.—Ohio Valley to Arkansas. North Carolina and south.

c. Subspecies CŒNOSUS, (*Richardson*) *Gill.*

(Figs. 25 and 26.)

Silurus (*Pimelodus*) *cœnosus*, RICHARDSON (1836), Fauna Bor.-Amer. Fishes, 132.—CUV. & VAL. (1840), xv, 129.—DE KAY (1842), Fishes N. Y. 186.—STORER (1846), Synopsis, 402.

Amiurus cœnosus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), l. c. 485. JORDAN (1876), Man. Vert. 303.—JORDAN & COPELAND, Check List, 159.

Habitat.—Maine to Great Lakes and northward.

d. Subspecies CUPREUS, (*Raf.*) *Gill.*

(Figs. 27 and 28.)

Silurus cupreus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, London, 51.
Pimelodus (*Ameiurus*) *cupreus*, RAFINESQUE (1820), Ich. Oh. 65.
Pimelodus cupreus, KIRTLAND (1838), Rept. Zoöl. Ohio, 169, 194; (1846), Bost. Journ. Nat. Hist. iv, 333.—DE KAY (1842), Fishes N. Y. 187.—STORER (1846), Synopsis, 404.—GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.
Amiurus cupreus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Phil. Soc. 485.—JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 96; (1876), Man. Vert. 303.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN (1877), Annals Lyceum Nat. Hist. N. Y. —.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 45.
Ameürus cupreus, COPE (1865), Proc. Acad. Nat. Sci. Phila. 276.

Habitat.—Ohio Valley, Mississippi Valley, and south.

e. Subspecies ANTONIENSIS, (*Grd.*) *Gill.*

(Figs. 29 and 30.)

Pimelodus antoniensis, GIRARD (1859), Pac. R. R. Expl. x, 291.
Amiurus antoniensis, GILL (1862), l. c. 44.—COPE (1870), l. c. 485.

Habitat.—Georgia to Texas.

f. Subspecies ANALIS, *Jordan.*

(Figs. 31 and 32.)

Habitat.—Arkansas River.

I have hitherto followed Girard in identifying this species with *Silurus catus* of Linnæus, but a glance at the original description is sufficient to show the error of such an identification. The first name in order of time which seems to have been given to this species is that of *Pimelodus natalis* Le Sueur, but the best of the early descriptions is that of Rafinesque as *Pimelodus lividus.*

The original description of *cupreus* is incorrect in ascribing 15 anal rays instead of 25. This is probably a misprint. The form or subspecies here indicated as *cupreus* is the one most widely diffused. The type of Girard's *catus* differs only from specimens labelled (by him?) *cupreus* in having the jaws equal. The form called *cœnosus* seems to differ chiefly in coloration; this species, like most others, being of a much darker color in the Northern Lakes.

A. antoniensis Grd. is also slightly different in form. The specimens obtained by me in the Etowah River, Georgia, I refer to *antoniensis.* They are short in body, with a swollen nape and a rather longer anal fin.

Specimens from Little Red River, Arkansas, collected by Prof. H. S.

Reynolds, with an extremely long anal fin and some peculiarities of form, I have termed var. *analis*.

The description of *Pimelodus natalis* Le Sueur appears to have been based on an individual with the caudal peduncle swollen and elevated.

It appears that most of the species have what may be termed "*natalis*" forms, *i. e.*, individuals with the post dorsal region shortened and thickened, with the adipose fin enlarged, and with the caudal fin very short; owing to the encroachment of the flesh on its rays. These forms often appear more distinct from the normal type than do any two allied species. The names *puma* and *natalis* seem to have been based on the *natalis* type of this species. *Catulus* and *confinis* are the *natalis* form of *melas*, and so on. Whether these peculiar forms are distinct races or aberrant individuals, or stages in the life of an individual, or what they are, I have not now sufficient evidence to enable me to decide. I can only say that I do not at present consider them distinct *species*.

13. AMIURUS VULGARIS, (*Thompson*) *Nelson*.

Long-jawed Catfish.

a. Subspecies VULGARIS.

(Figs. 33 and 34.)

Pimelodus vulgaris, THOMPSON (1842), History of Vermont 138.
Amiurus vulgaris, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.
Pimelodus dekayi, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.
Amiurus dekayi, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN (1876), Man. Vert. 302.

Habitat.—Lake Champlain and Great Lake region.

b. Subspecies ÆLURUS, (*Girard*) *Gill*.

(Fig. 35.)

Pimelodus ailurus, GIRARD (1858), U. S. Pac. R. R. Surv. Fishes, 210.
Amiurus ailurus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.
Amiurus ælurus, COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN (1876), Man. Vert. 302.—JORDAN & COPELAND (1877), Check List, 159.

Habitat.—Upper Mississippi River, Missouri River and their tributaries, also in Red River of the North.

Girard's statement that his *dekayi* is the same as De Kay's *Pimelodus catus* is certainly incorrect, if any reliance is to be placed on descriptions. That Thompson's *vulgaris* is the same as *dekayi* I have no doubt. *Amiurus ælurus*, of which I have examined the types as well as numer-

ous specimens from the Red River of the North, from the Mississippi River at Saint Louis, and from the Illinois River, differs somewhat in proportions; but I think it specifically identical with *A. vulgaris* from Lake Erie.

14. AMIURUS MARMORATUS, (*Holbrook*) *Jordan.*

Marbled Catfish.

(Figs. 36 and 37.)

Pimelodus marmoratus, HOLBROOK (1855), Journ. Acad. Nat. Sci. Phila. 54.

Habitat.—Georgia to Florida.

This beautiful and singular species seems to have been overlooked by all writers since the original description. The characters given in the preceding analysis are taken from a specimen sent by Dr. Holbrook to the United States National Museum. It differs from *catus* chiefly in the coloration. I have been informed that similarly colored Catfishes occur in Pennsylvania, and I have seen a crayon sketch of one such by Mr. J. H. Richard.

15. AMIURUS MELAS, (*Rafinesque*) *Jordan & Copeland.*

Small Black Catfish.

(Figs 38 and 39.)

Silurus melas, RAFINESQUE (1820), Quart. Journ. Sci. Lit. Arts, London, 51.
Pimelodus melas, RAFINESQUE (1820), Ichthyologia Ohiensis, 66.
Amiurus melas, JORDAN & COPELAND (1876), Check List, 159.
Pimelodus catulus, GIRARD (1858), U. S. Pac. R. R. Surv. 208.
Amiurus catulus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN & COPELAND (1876), Check List, 159.
Pimelodus confinis, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.
Amiurus confinis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 486.—JORDAN (1876), Man. Vert. 301.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.
Amiurus obesus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—JORDAN & COPELAND (1876), Check List, 159.—GILL (1876), Ich. Capt. Simpson's Explorations, 420.
Amiurus nebulosus, COPE & YARROW (1876), Zoöl. Lieut. Wheeler's Surv. West of 100th Meridian, v, 640 (excl. syn.).
Amiurus pullus, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50 (not *P. pullus* De K.).

This species occurs abundantly throughout the Mississippi Valley, replacing the allied species *catus*. Prof. Cope considers it a variety of *catus;* but the short deep body and small anal fin thus far have served to distinguish it. The coloration of the anal fin is somewhat characteristic. The membrane is unusually black and contrasts with the pale rays.

Girard's types of *confinis* and *catulus* appear to be the shortened or

natalis form of this species. There is certainly nothing in the emargination of the caudal fin in which *confinis* and *hoyi* differ from the rest of the species with the caudal fin truncate, as has been supposed by Prof. Cope, on the strength of Girard's description.

The only good description of this species is that of Prof. Gill, under the name of *Amiurus obesus*, in the report of Captain Simpson's Explorations. I have no doubt of the identity of Rafinesque's *melas* with the *obesus*. The *obesus* occurs in considerable abundance about the Falls of the Ohio, and Rafinesque's description is reasonably accurate.

16. AMIURUS CATUS, (*L.*) *Gill.*

Bullhead—Hornpout—Catfish.

(Figs. 40 and 41.)

?*Bagre fecundæ species Marcgr. affinis*, CATESBY (1750), Fishes etc. Carolina, 23, tab. xxiii (a most wretched figure, absolutely unidentifiable).

Silurus catus, LINN. (1758), Syst. Nat. x, p. 305; (1766), xii, p. 504.—BLOCH. SCHN. (1801), 387.—MITCHILL (1818), Journal Lit. & Philos. Soc. N. Y. i, 433.

Pimelodus catus, CUV. & VAL. (1840), xv, 124.—DE KAY (1842), Fishes N. Y. 182.—STORER (1846), Synopsis, 402.

Amiurus catus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—GÜNTHER (1864), Cat. Fishes, v, 99 (excl. syn. pars).—UHLER & LUGGER (1876), Fishes of Maryland, 152.

Pimelodus nebulosus, LE SUEUR (1819), Mém. de Muséum, v, 149.—STORER (1838), Rept. Fishes Mass. 102.

Amiurus nebulosus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.

Pimelodus atrarius, DE KAY (1842), Fishes N. Y. 185.—STORER (1846), Synopsis, 404; (1855), Fishes of Mass. 279.

Amiurus atrarius, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—JORDAN (1876), Man. Vert. 30.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 46.

Pimelodus felis, AGASSIZ (1850), Lake Superior, 281.

Amiurus felis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Pimelodus hoyi, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.

Amiurus hoyi, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 486.—JORDAN (1876), Man. Vert. 301.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus vulpeculus, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.

Amiurus vulpeculus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Variety? MISPILLIENSIS.

Amiurus mispilliensis, COPE (1870), Proc. Am. Philos. Soc. 486.—JORDAN & COPELAND (1876), Check List, 159.

Habitat.—Great Lake Region and Upper Mississippi to Arkansas and northward; also in streams of the Atlantic States from Maine south to Carolina.

I have restored the name of *catus** to this species, following in this respect Valenciennes and the older American authors rather than Girard, who transferred the name to an entirely different species. The fact that Linnæus counted twenty anal rays renders it unlikely that he had a specimen of *lividus*, a species with twenty-five anal rays before him. As it is not possible to say with certainty what species he did have, we must adopt Valenciennes's identification of it until it is shown that it is probably erroneous. The following is Linnæus's description (Systema Naturæ, xii, 504):—

Catus 12. S. pinna dorsali postica adiposa, ani radiis 20. Cirris 8. B. 5, D $\frac{1}{6}$, O. P $\frac{1}{11}$ V. 8, A. 20. C. 17.

Catesb. car. 2. *p.* 23. *t.* 23. Bagre 2. Marcgr. affinis.

Marcgr. bras. 173. Bagre species, 2.

Habitat in America, Asia.

Ex—Asia vidi pinnis ventr. radiis 6.

The species termed *atrarius*, *nebulosus*, and *catus* by the earlier authors are evidently identical.

There is nothing in the long description of *Pimelodus felis* to indicate that it is distinct from the common Lake Bullhead. In the elaborate enumeration of characters, individual and generic, given by Prof. Agassiz, nearly all that is specific seems to be lost.

On examination of the type-specimens of *Pimelodus hoyi* Grd., and *P. vulpeculus*, Girard, I am unable to see that they differ at all from this species. The caudal fin is not more emarginate than is usual in *catus*.

Amiurus mispilliensis Cope appears to differ in some respects; but these are probably individual peculiarities, as but one specimen seems to be known.

The best figure of this species is that given by Dr. Storer under the name of *Pimelodus atrarius*.

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*In the twelfth edition of the Systema Naturæ (p. 503), Linnæus describes a *Silurus felis*, which has been considered a species of *Amiurus*. An examination of Linnæus's description has satisfied Prof. Gill and myself that *S. felis* was most probably based on *Arius milberti* C. & V. This latter species should then stand as *Ariopsis felis* (L.) Gill & Jordan.

The following is the original description:

Felis. 10. S. pinna dorsali postica adiposa, ani radis 23 cirris 6, cauda bifida. B. 5, D $\frac{1}{6}$, 0. P. $\frac{1}{6}$ V. 6, A. 23, C. 31.

Habitat in Carolina. *D. Garden.*

Cirri *sub labio inferiore* 4, *supra sinus oris utrinque* 1. Dorsum *cærulescens.* P. ventrales analisque *rubescentes.* Cauda *bifida.* *Affinis S. Cato.*

17. AMIURUS XANTHOCEPHALUS, (*Rafinesque*) *Gill.*

Small Yellow Catfish.

(Figs. 42 and 43.)

Silurus xanthocephalus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, London, 51.
Pimelodus xanthocephalus, RAF. (1820), Ich. Ohiensis, 66.—KIRTLAND (1838), Rept. Zoöl. Ohio, 169, 194.—STORER (1846), Synopsis, 405.
Amiurus xanthocephalus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—JORDAN & COPELAND (1876), Check List, 159.—JORDAN (1877), Ann. Lyc. Nat. Hist. N.Y. —.
Pimelodus catus, KIRTLAND Bost. Journ. Nat. Hist. v. 330. (excl. syn.).
Amiurus albidus, JORDAN (1876), Man. Vert. 302 (not *Pimelodus albidus* Le Sueur).—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.
Amiurus nebulosus, JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 45.

Habitat.—Ohio Valley.

Rafinesque's description of this species is rather indifferent. Later writers seem to have overlooked the species altogether, or to have confounded it with *A. catus*. It is certainly quite distinct from *A. catus*, and apparently from all the others here mentioned. The peculiar profile, wide head, as well as the short and small anal fin, are characteristic. These points are fairly shown in Dr. Kirtland's otherwise bad figure of his *Pimelodus catus*.

18. AMIURUS NIGRILABRIS, (*Cope*) *Gill & Jordan.*

Blind Catfish.

(Figs. 44 and 45.)

Gronias nigrilabris, COPE (1864), Proc. Acad. Nat. Sci. Phila. 231.—JORDAN (1876), Man. Vert. 304.—JORDAN & COPELAND (1876), Check List, 160.
Amiurus nigrilabris, GILL, MSS.

Habitat.—Cave streams tributary to the Conestoga River in Eastern Pennsylvania.

The concealed condition of the eyes in this species is not considered by Prof. Gill as a character of sufficient importance to warrant its generic separation.

A. nigrilabris is apparently descended from *A. pullus* or some similar species, its eyes being modified by its subterranean life.

19. AMIURUS PULLUS, (*De Kay*) *Gill.*

Black Bullhead of New York.

(Figs. 46 and 47.)

Pimelodus pullus, DE KAY (1842), Fishes N. Y. 184.—STORER, Synopsis (1846), 404.
Amiurus pullus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN (1876), Man. Vert. 301.—JORDAN & COPELAND (1876), Check List, 159.

Habitat.—Western New York to Northern New England.

This species resembles *A. catus*, but is distinguishable by the short anal fin. From *A. melas* the broader head and some other peculiarities separate it. It is possible, however, that it is a variety of the latter species.

20. AMIURUS BRUNNEUS, *Jordan.*

Small Brown Cat.

(Figs. 48 and 49.)

Amiurus brunneus, JORDAN (1876), Annals Lyc. Nat. His. N. Y. —.

Habitat.—Ocmulgee River, Georgia.

This species is one of the most strongly marked of the genus. It bears some resemblance to the species of *Noturus*.

21. AMIURUS PLATYCEPHALUS, (*Girard*) *Gill.*

Flat-headed Cat.

(Figs. 50 and 51.)

Pimelodus platycephalus, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 161.
Amiurus platycephalus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Phil. Soc. 485.—JORDAN & COPELAND (1876), Check List, 159.

Habitat.—North Carolina to Georgia.

This species has the form of *Pelodichthys*, as well as the increased number of branchiostegals. The dorsal spine is, however, well developed, and the anal fin has the usual number of rays, although only 17 were counted by Prof. Cope. The lower jaw does not project, and the dentition is of the pattern usual in *Amiurus*.

GENUS PELODICHTHYS, (*Rafinesque*) *Gill & Jordan.*

Glanis, RAFINESQUE (1818), Am. Monthly Mag. & Crit. Review, 447 (named but not characterized).
Pilodictis, RAFINESQUE (1819), Prodrome de Soixante-dix Nouv. Genres &c. in Journal de Physique de Chymie et d'Histoire Naturelle Paris, 422.

Leptops, RAFINESQUE (1820), Ichthyologia Ohiensis, 64.
Opladelus, RAFINESQUE (1820), Ichthyologia Ohiensis, 64.
Ilictis, RAFINESQUE (1820), Ichthyologia Ohiensis, 66.
Pylodictis, RAFINESQUE (1820), Ichthyologia Ohiensis, 67.
Hopladelus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 45, and of most late authors.
Pelodichthys, GILL & JORDAN, MSS.—JORDAN (1876), Ann. Lyc. Nat. Hist. N. Y. —.
Pimelodus sp., KIRTLAND, CUV. & VAL. et Auct.

ETYMOLOGY.—$\pi\eta\lambda o\varsigma$, mud; $\iota\chi\theta\upsilon\varsigma$, fish.
TYPE.—*Pilodictis limosus* Raf. = *Silurus olivaris* Raf.

Body much elongated, very slender, much depressed, anteriorly broader than high. Head large, very wide and depressed, latterly expanded, above broadly ovate, and in profile cuneiform. Skin very thick, entirely concealing the skull. Supraoccipital bone entirely free from the head of the second interspinal. Eyes small. Mouth very large, anterior and transverse. The lower jaw always projects beyond the upper. Teeth in broad villiform bands on the intermaxillaries and dentaries. The intermaxillary band is convex anteriorly, and proceeds to the insertion of the maxillaries, where it is abruptly angularly deflected, and proceeds backward as an elongated triangular extension. The band at the symphysis is slightly divided and anteriorly separated by a small triangular extension of the labial membrane. The lower dental is anteriorly semicircular and attenuated to the corners of the mouth. There are about twelve branchiostegal rays on each side.

The dorsal fin is situated over the posterior half of the interval between the pectorals and ventrals, and has a spine and about seven branched rays. The spine is rather small, and more or less enveloped in the thick skin.

The adipose fin is large, and has an elongated base resting over the posterior half of the anal; it is very obese and inclines rapidly backward; it is rather less free posteriorly than in *Amiurus*.

The anal fin is small; it commences far behind the anus, is a little longer than high, and is composed of about thirteen rays.

The caudal fin is oblong, subtruncated, placed on a vertical basis, and with numerous accessory simple rays, recurrent above and beneath the caudal peduncle.

The pectorals have a broad, compressed spine, serrated or dentated on its external and internal margins, and with the prolonged fleshy integument obliquely striated.

The ventrals are rounded and have nine rays, one simple and eight branched.

The anus is situated behind the ventrals, some distance behind their bases, and much in advance of the anal fin.

Coloration: brown or yellowish, more or less marbled or spotted.

The genus *Pelodichthys* is at first sight recognized by the long body, flat in front; the depressed and broad oblong head with the projecting lower jaw, by the posterior extension of the upper bands of teeth, by the partly concealed dorsal spine, the small size of the anal fin, and the recurrence of the caudal fin. But one species is definitely known. The various nominal species described by Rafinesque and Valenciennes, I think, were all based on the common *olivaris*.

Those who hold that the mere naming of a genus, without explanation or attempt at characterization, gives validity to such name, will call this genus *Glanis* instead of *Pelodichthys*.

ANALYSIS OF SPECIES.

*Body very long, slender, depressed forwards, closely compressed behind, the head extremely flat, the lower jaw longest; barbel short; dorsal spine small, half the height of the fin, enveloped in thick skin; pectoral spine very strong, flattened, serrate behind; caudal somewhat emarginate; anal short, its base about 7 in body, of 12 to 15 rays; premaxillary band of teeth with a large distinct backward process on each side; coloration mottled brown and yellowish, whitish below; size large,

OLIVARIS, 22.

22. PELODICHTHYS OLIVARIS, (*Rafinesque*) *Gill & Jordan.*

Mud Catfish.

(Figs. 52 and 53.)

Silurus olivaris, RAFINESQUE (1818), Am. Monthly Mag. iii, Sept. 355.

Hopladelus olivaris, GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—COPE (1869), Journ. Acad. Nat. Sci. Phila. 237.—JORDAN (1876), Man. Vert. 303.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—GILL (1876), Ich. Capt. Simpson's Expl. 426.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 46.

Pelodichthys olivaris, JORDAN (1877), Ann. Lyc. Nat. Hist. N. Y. —.

Glanis limosus, RAF. (1818), Am. Monthly Mag. iii, 447, and iv, 107 (name only).

Pilodictis limosus, RAF. (1819), Journal de Physique, 422.

Pylodictis limosus, RAF. (1820), Ich. Ohiensis, 67.

Silurus nebulosus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, London, 50.

Pimelodus nebulosus, RAF. (1820), Ich. Oh. 64.

Silurus viscosus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, 50.

Pimelodus viscosus, RAF. (1820), Ich. Oh. 66.

Silurus limosus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, 51.

Pimelodus limosus, RAF. (1820), Ich. Oh. 67.—KIRTLAND (1846), Bost. Journ. Nat. Hist. iv, 335.—STORER (1846), Synopsis, 404.

Pimelodus punctulatus, CUV. & VAL. (1840), xv, 134.—DE KAY (1842), Fishes N. Y. 187.—STORER (1846), Synopsis, 403.—GÜNTHER (1864), Cat. Fishes, v, —.

Pimelodus æneus, CUV. & VAL. (1840), xv, 135.—DE KAY (1842), l. c.—STORER (1846), l. c. 403.

Habitat.—Ohio Valley to Iowa and South.

GENUS NOTURUS, *Rafinesque.*

Noturus, RAF. (1818), Am. Monthly Mag. and Crit. Rev. iv, Nov. 41, and of most subsequent authors.

Schilbeodes, BLEEKER (1858), "Ichthyologiæ Archipelagi Indici Prodromus, vol. i. Siluri (Acta Societarum Indo-Nederlandicæ, vol. iv.) 258, (*S. gyrinus* Mit.)." (Also written *Schilbeoides;* I do not know which is the original orthography.)

ETYMLOOGY.—*νωτος*, back; *ουρα*, tail ("means tail over the back", *Raf.*).

TYPE.—*Noturus flavus* Raf.

Body more or less elongate, anteriorly subcylindrical, thence more or less compressed.

Head above ovate and depressed, with a slight longitudinal furrow, branching into a transverse depression on the nape. Skin very thick, entirely concealing the bones. Supraoccipital entirely free from the head of the second interspinal. Eyes small or of moderate size. Mouth anterior, rather large, and transverse. Upper jaw usually more or less projecting beyond the lower. Teeth subulate, closely aggregated in a broad band in each jaw, which in the lower one is interrupted by a linear interval and in the upper one is continuous. The band in the upper jaw is either abruptly truncated at each end (subgenus *Schilbeodes*) or prolonged backward by a continuation from the postero-external angle (subgenus *Noturus*). The lower band is, as usual, attenuated toward the corners of the mouth. Branchiostegal membrane with nine rays on each side.

Dorsal fin situated over the posterior half of the interval between the pectoral and ventral fins, with a very pungent, short, edentulous spine and seven branched rays.

Adipose fin long and low, connected with the accessory rays of the caudal fin, and not forming a separate fin, never free behind; the membrane sometimes high and continuous, sometimes notched, in one species to the base.

Caudal fin very obliquely truncated or rounded, and inserted on an equally obliquely rounded base. The rays rapidly decrease in length inferiorly, and there are numerous rudimentary ones both above the caudal peduncle, where the anterior is united to the adipose fin, and forms a continuous keel (interrupted in one species), and below, where they advance considerably forward.

The anal fin is comparatively short, and rapidly increases in height for the first half of its length. It has from 12 to 20 rays.

The ventrals are rounded, and each has one simple and eight branched rays.

Pectoral fins with a sharp spine, either smooth, grooved, or dentate behind, the size and armature of the spine affording good specific characters.

The anus is situated some distance in advance of the anal fin.

The lateral line is complete.

The *Noturi* may be known at once by the peculiarities of the adipose and caudal fins. The genus is rather less homogeneous than any of the others.

Two subgeneric sections are recognizable:—

Noturus.—Size large; intermaxillary band of teeth with a backward process; pectoral spine nearly smooth within, sharply retrorse-serrate externally; a keel between dorsal and adipose fins.

Schilbeodes.—Size moderate or small; intermaxillary band of teeth without backward process; pectoral spine more nearly smooth externally, grooved or else serrate within; back not distinctly keeled.

ANALYSIS OF SPECIES.

*. Premaxillary band of teeth with a strong backward process on each side (*Noturus*):

a. Body elongate; head depressed, broad, and flat, nearly as broad as long; middle region of body subcylindrical; tail compressed; head about $4\frac{1}{4}$ in length; width of head $5\frac{1}{8}$; depth $5\frac{2}{3}$ in length; distance to dorsal about 3 in length; barbels, short; a strong keel on back behind dorsal, leading to adipose fin; adipose fin deeply notched; dorsal spine very short, pectoral spine retrorsely serrate in front, slightly rough or nearly entire behind; its length three times in distance from snout to dorsal; anal rays about 16; color nearly uniform yellowish-brown, in northern specimens blackish above, slightly mottled; fins yellow-edged; size very large, reaches a length of more than a foot ..... FLAVUS, 23.

**. Premaxillary band of teeth without lateral backward processes (*Schilbeodes*):

†. Pectoral spine dentate-serrate behind, more or less roughened in front; adipose fin notched:

b. Pectoral spines shortish, nearly straight, about one-third length of head; the serratures weak, less than half the diameter of the spine; body elongated its depth $5\frac{1}{2}$ to 7 in length; the head very much depressed; anal 14 to 17; colors nearly uniform, somewhat mottled; fins more or less dark-edged.

c. Pectoral spine retrorse-serrate without, weakly serrate within; head very broad, flat, and thin; upper jaw projecting; head about $4\frac{1}{4}$ in length, depth 6; dorsal fin one-fourth higher than long; distance from snout to dorsal about $2\frac{3}{4}$ in length; length of pectoral spine $2\frac{3}{4}$ in same distance; dorsal much nearer anal than snout; anal rays 16 to 20; size large (reaches the length of nearly a foot); colors rather dark; dorsal and caudal fins black-margined ..... INSIGNIS, 24.

cc. Pectoral spine slightly retrorse-serrate without, with about six small straigh teeth within, which are not one-third the diameter of the spine in length; head small, not very broad, but thin and depressed; its width $5\frac{1}{2}$ to 6 in length of body; jaws nearly equal; head $4\frac{1}{4}$ in length, depth $5\frac{3}{8}$ to $6\frac{1}{2}$; dorsal scarcely higher than long; distance from snout to dorsal about $3\frac{1}{8}$ in length; pectoral spine $3\frac{1}{2}$ to 4 in this distance; dorsal spine low, nearer snout than anal; anal rays 14 or 15; size small; color pale ..... EXILIS, 25.

bb. Pectoral spines extremely strong, more than half the length of head, curved; their posterior serræ strong, spine-like, hooked backward, each about as long as the diameter of the spines:

d. Adipose fin connected with the caudal fin; distance from snout to dorsal about $2\frac{2}{3}$ in length; pectoral spine $2\frac{1}{3}$ in this distance; dorsal fin higher than long; body not very elongate nor much depressed; the dorsal region often. somewhat elevated; the depth usually $4\frac{1}{2}$ to 5 in length; head $3\frac{3}{4}$ to 4; dorsal nearer anal than tip of snout; anal 12 or 13 rays; pectoral spine curved and sharply serrate without, with six strong recurved pectinations within each as long as the diameter of the spine; body much mottled, black and grayish; top of head, tip of dorsal, middle of adipose fin, and edge of caudal definitely black; body with four broad cross-blotches, one before dorsal, one behind it, one on middle of adipose fin, and one small one behind it; size small.....MIURUS, 26.

dd. Adipose fin entirely free from caudal fin, separated from it by a space nearly equal to the diameter of the eye; spines as in *miurus* but rather weaker; head $3\frac{1}{2}$ in length; depth $5\frac{1}{3}$; distance to dorsal $2\frac{3}{4}$ in length; pectoral spine $2\frac{1}{3}$ in distance to dorsal; width of head $4\frac{1}{3}$ in length; body moderately elongated; head broad and flat, much like that of a *Pelodichthys;* anal fin with but eleven rays; color mottled gray, faintly and irregularly spotted with darker.....ELEUTHERUS, 27.

††. Pectoral spine entire or grooved behind, never retrorse-serrate; adipose fin continuous, not notched:

e. Head small and narrow, longer than broad, with small eye; its length about 4 in body, its width $5\frac{1}{2}$; upper jaw much projecting; spines very short and slender, that of the dorsal not one-third the height of the fin, and all less than one-fourth the length of head; body slender, but not elongate; distance to dorsal $2\frac{3}{8}$ in length; pectoral spine 5 in this distance, slightly retrorse-serrate without, grooved within; depth $5\frac{1}{2}$ in length; dorsal nearer anal than snout; anal 14; color mottled, rather pale ...LEPTACANTHUS, 28.

ee. Head short, broad, and deep.

f. Head shorter, narrower, and smaller in every way, than in the next, the body more elongate, more compressed but less deep, the width $4\frac{1}{2}$ in length of body; length of head $4\frac{1}{4}$; depth of body $5\frac{1}{2}$; snout to dorsal one third of length; pectoral spine $2\frac{1}{3}$ in distance to dorsal; jaws nearly equal; anal rays 15 or 16; lower barbels pale; coloration yellowish brown, with a lateral dark streak and two dorsal ones.....GYRINUS, 29.

ff. Head $3\frac{1}{2}$ to 4 in length, larger than in any of the other species; width of head $3\frac{3}{4}$ in length; distance from snout to dorsal $2\frac{3}{4}$ in length; body comparatively short and thick, the depth 4 to 5 in length; spines stout and rather long, that of the pectoral fin straight, about half the length of head; $2\frac{1}{3}$ in distance to dorsal fin; entirely free from serratures outside, grooved within; dorsal higher than long, nearer anal than snout; anal high, of 13 rays; adipose fin high, continuous, without any notch at all; caudal fin arising very near anal; barbels short; the lower dark; color nearly uniform yellowish brown, never blotched; a narrow black lateral streak, which is usually conspicuous.....SIALIS, 30.

25. NOTURUS FLAVUS, *Rafinesque.*

Yellow Stone Cat—Common Stone Cat.

(Figs. 54 and 55.)

Noturus flavus, RAF. (1818), Am. Monthly Mag. and Critical Review, p. 41; (1820), Ich. Oh. 68.—KIRTLAND (1838), Rept. Zoöl. Ohio, 169, 195; (1846). Bost. Journ. Nat. Hist. iv, 336.—STORER (1846), Synopsis, 406.—GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—COPE (1864), Proc. Acad. Nat. Sci. Phila. 277; (1869), Journ. Acad. Nat. Sci. Phila. 237.—GÜNTHER (1864), Cat. Fishes, v, 104.—UHLER & LUGGER (1876), Fishes Maryland, 151.—JORDAN (1877), Ann. Lyc. Nat. Hist. N. Y.—

Noturus luteus, RAF. (1819), Journ. de Physique, 421.

Noturus occidentalis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 45; 1876), Capt. ? Simpson's Rept. 423.—JORDAN & COPELAND (1876), Check List, 160.

Noturus platycephalus, GÜNTHER (1864), Catalogue Fishes, v, 104.—JORDAN & COPELAND (1876), Check List, 160.

Habitat.—Vermont and Canada to Virginia, Ohio Valley and Missouri Region.

It is not quite certain which species served as the type of Rafinesque's "*flavus*". Three distinct species occur about the Falls of the Ohio, *flavus*, *sialis*, and *miurus*. Of these, "*flavus*" is the most abundant in the immediate neighborhood of the river, the others preferring clearer water than is found in most of the streams near the falls. Rafinesque speaks of his *flavus* as being entirely yellowish, and as reaching the length of a foot. *Miurus* is never yellowish; and neither *miurus* nor *sialis*, so far as I know, reach a length of more than six inches. Moreover, the *flavus* of Kirtland, Cope, and of most writers, is the species now under consideration.

N. occidentalis Gill I also consider the same. There is nothing in the description to indicate difference, and, on examination of specimens supposed to be the original types of *occidentalis*, I am unable to find any distinctive characters whatever. Like *Ichthælurus punctatus* and *Amiurus lividus*, the *Noturus flavus* is a species of wide geographical range, and its occurrence in Nebraska is not surprising.

N. platycephalus Günther is evidently the same as *flavus*. *N. occidentalis* Günther is based on specimens of *Noturus marginatus*, sent by the Smithsonian Institution to the British Museum, Prof. Gill informs me.

I have examined specimens, which I refer to *flavus*, from Saint Lawrence River, New York, from Lake Champlain, from the Potomac River, from the Ohio River in West Virginia, in Ohio, and in Indiana, from the Miami, White, and Wabash Rivers, from the Missouri River, from Lake Michigan, and from Platte River.

24. NOTURUS INSIGNIS, *(Richardson) Gill & Jordan.*

Margined Stone Cat.

(Figs. 56 and 57.)

Pimelodon livrée, LE SUEUR (1819), Mém. du Mus. v, 155.

Pimelodus insigne, RICHARDSON (1836), Fauna Boreali-Americana, iii, 132 (name only, based on Le Sueur's description).

Pimelodus lemniscatus, CUV. & VAL. (1840), xv, 144.—STORER (1846), Synopsis, 405.

Noturus lemniscatus, GIRARD (1859), Proc. Acad. Nat. Sci. 158.—GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—GÜNTHER (1864), Cat. Fishes, v, 104.—JORDAN (1876), Man. Vert. 303.—JORDAN & COPELAND (1876), Check List, 160.

Noturus occidentalis, GÜNTHER (1864), Cat. Fishes, v, 105 (not of Gill).

Noturus marginatus, BAIRD, MSS.—COPE (1869), Journ. Acad. Nat. Sci. Phila. 237.—COPE (1870), Proc. Am. Philos. Soc. 484.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1876), Ann. Lyc. Nat. Hist. N. Y. —.

Habitat.—Pennsylvania to South Carolina. This species was first noted by Le Sueur under the name of *Pimelodon livrée*, but for some reason that author neglected to give it a classical name. The name of *insigne* was supplied by Richardson, and that of *lemniscatus* by Cuvier and Valenciennes. The description of the coloration is such as to leave no possible doubt of the identity of this species with Le Sueur's.

No satisfactory description of this common fish has yet been published. It is well distinguished from *miurus* and *exilis* by the characters given above in the analysis of species.

25. NOTURUS EXILIS, *Nelson.*

Slender Stone Cat.

(Figs. 58 and 59.)

Noturus exilis, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 51.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Ann. Lyc. Nat. Hist. N. Y. —.

Habitat.—Wisconsin and Illinois to Missouri and Kansas.

The synonymy of this species needs no remark. Its relations are entirely with *marginatus*, from which species it is undoubtedly distinct. Specimens from Wisconsin are much less elongate than Nelson's original types. I do not, however, consider them specifically distinct.

26. NOTURUS MIURUS, *Jordan.*

Variegated Stone Cat.

(Figs. 60 and 61.)

Noturus miurus, JORDAN, MSS.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Ann. Lyc. Nat. Hist. 46 (name only).—JORDAN (1877), Ann. Lyc. Nat. Hist. N. Y. —.

Noturus marginatus, JORDAN (1876), Man. Vert. 303.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50 (not of Baird).

Habitat.—Great Lakes and Ohio Valley to Wisconsin and Louisiana.

This species, although a very abundant one in the Mississippi Valley, seems to have been entirely overlooked by our writers on Ichthyology; the great development and serration of the pectoral spines will always serve to distinguish it from all of the preceding. I have seen specimens from Louisiana as well as from various localities in the Ohio Valley and from Lake Michigan.

27. NOTURUS ELEUTHERUS, *Jordan.**

Free-finned Stone Cat.

(Figs. 62 and 63.)

Noturus eleutherus, JORDAN (1877), Ann. Lyc. Nat. Hist. —.

Habitat—French Broad River, Tennessee; Tar River, North Carolina.

This fish is not a variety of *miurus;* it is either a distinct species or a very remarkable monstrosity. I think now that the former is the case, and I have designated it by the above name, in allusion to the adipose fin being free from the caudal. The type-specimen from the French Broad River very strongly resembles a young *Pelodichthys*, but has the upper jaw longer. The adipose fin is, as usual, decurrent, but it is entirely separate from the beginning of the caudal.

**Noturus eleutherus*, JORDAN.—Since the first pa t of this paper was printed, I have been able to examine a large number of fine specimens collected by Mr. J. W. Milner, of the United States Fish Commission, in the Tar River near Tarboro', N C. These specimens show the following charaters:—

Body stout, broad forward, tapering behind. Head large, flattish, $4\frac{1}{3}$ in length of body, without caudal; depth of body $5\frac{1}{3}$ in length; width of head $4\frac{1}{3}$ in length of body. Mouth large, the upper jaw much projecting; barbels rather long. Adipose fin rather high, so deeply notched that the continuity of the fin is broken for a distance nearly equal to the diameter of the eye. A strong keel on the back in front of the adipose fin. Caudal fin rounded. Distance from snout to dorsal 3 in length of body. Pectoral spine in this distance 2 times; in head $1\frac{1}{5}$. Dorsal spine $\frac{2}{3}$ the height of the fin, $3\frac{1}{4}$ times in distance from snout to dorsal, $2\frac{1}{2}$ in length of head. Pectinations of pectoral spine very strong, recurved, nearly as long as the diameter of the spine. Front of pectoral spine with small teeth turned forward. Fin-radii: D. 1, 7; A. 12; P. 1, 8; V. 9. Color much as in *N. miurus*, extensively variegated. Snout, cheeks, and occipital region black. A black bar across front of dorsal, one behind dorsal, and another across middle of adipose fin; base of caudal fin black. One or two narrow horizontal black bars across dorsal and anal near their tips. Caudal vaguely barred, largely black, its tip white. Length of specimens $4\frac{3}{4}$ inches.

This is one of the most striking of our *Siluridæ*. Its relations are with *N. miurus* but the nearly free adipose fin will always serve to distinguish it. I have seen no pecimens of *miurus* so large and sto ut as these of *eleutherus*.

28. NOTURUS LEPTACANTHUS, *Jordan.*

Weak-spined Stone Cat.

(Figs. 64 and 65.)

Noturus leptacanthus, JORDAN (1876), MSS.—JORDAN & COPELAND, Check List, 160 (name only).—JORDAN (1877), Ann. Lyc. Nat. Hist. —.

Habitat.—Etowah River, Georgia.

But a single specimen of this species is known; it is, however, totally distinct from all the rest; its relations are chiefly with *gyrinus.*

29. NOTURUS GYRINUS, (*Mitchill*) *Rafinesque.*

Tadpole Stone Cat.

(Fig. 66 and 67.)

Silurus gyrinus, MITCHILL (1818), Am. Monthly Mag. March, 322.—DE KAY (1842), Fishes N. Y. 186.

Noturus gyrinus, RAF. (1819), Journ. de Physique, 421; (1820), Ich. Oh. 68.—GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—COPE (1869), Journ. Acad. Nat. Sci. Phila. 237.—JORDAN (1876), Man. Vert. 303.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Ann. Lyc. Nat. Hist. —.

Schilbeodes gyrinus, BLEEKER (1858), l. c.

Habitat.—Southern New York to Pennsylvania.

I have examined specimens of this species from Orange, Rockland, and Chemung Counties, New York. It resembles the next, but is in every way slenderer and weaker.

30. NOTURUS SIALIS, *Jordan*, sp. nov.

Chubby Stone Cat.

(Figs. 68 and 69.)

Noturus flavus, JORDAN (1876), Man. Vert. 303 (in part).—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 46.

Habitat.—Entire Mississippi Valley, Great Lake Region, and in Red River of the North.

Comparison of eastern and western specimens referred to *gyrinus* show surprising differences of form, and as these differences appear to be constant in a great number of specimens examined from widely separated localities, I have decided to separate the western form as a distinct species.

The eastern form, or *gyrinus*, has the head shorter and every way smaller, and the body proper more elongate, more compressed, almost ribbon-shaped, and the spines rather weaker. The coloration is the

same in both, yellowish-brown, with a lateral dark streak and two more dorsal ones. The lower barbels are usually dark in *sialis*, pale in *gyrinus*. The outline drawings of the two which accompany this paper shows the differences better than they can be expressed in words.

Noturus gyrinus is apparently a starved representative of *Noturus sialis* as *N. exilis* is of *N. insignis*, but in the latter case the "starved" form is the western one.