

A PRELIMINARY KEY TO  
THE FISHES OF KANSAS

A THESIS  
SUBMITTED TO THE DEPARTMENT OF  
EDUCATION AND THE GRADUATE COUNCIL OF THE KANSAS STATE  
TEACHERS COLLEGE OF EMPORIA IN PARTIAL FULFILLMENT OF  
THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF SCIENCE

By  
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## INTRODUCTION

It has been the purpose of this study to provide a means whereby the identification of the fish common to the waters of Kansas might be facilitated. It has also been the purpose of the study to provide descriptive accounts of each fish included for those who wish further details about the specimen in hand. The study includes ninety-nine species of true fishes and three species of lampreys, a group which lies below the true fishes. Further study of the fishes of Kansas by collecting and examining specimens in detail is bound to yield fruitful results and extend the present list. The trout have not been included since it is likely that very few of them exist in the state and that their introduction has been unsuccessful.

Considering the present knowledge of the fish fauna of Kansas, the study is essentially preliminary to further and more detailed study. To the writer's knowledge, scientific study of the fish fauna of the state has not been undertaken, with the exception of those studies which overlap Kansas in studies of broader areas. The literature in the field is not especially abundant and is for the most part technical in nature. Although giving greater accuracy, the technical nature of these works is a burden to the average reader.

The present study is based on a "Preliminary List of Kansas Fishes"<sup>1</sup> submitted to the Kansas Academy of Science in their seventeenth annual meeting November 25, 1884, by I. D. Graham, chairman of the Commission on Ichthyology of that body. Before being submitted, the paper passed through the hands of Professor David S. Jordan, then President of Indiana State University. This list has been checked with the list as found in Jordan's and Evermann's four volume work on The Fishes of North and Middle America<sup>2</sup>. In some cases additions have been made which were not reported in the original list, but were reported from Kansas in the latter volumes with the localities given. Descriptions have come largely from the latter volumes, in some cases being checked when the specimens were available. Some of the technical nature of these descriptions has been retained in order that the more careful observer might more carefully check the specimen in hand. Other descriptive material has

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<sup>1</sup> I. D. Graham, "Preliminary List of Kansas Fishes", Transactions of the Sixteenth and Seventeenth Annual Meetings of the Kansas Academy of Science, vol. IX, (1883-1884), pp. 69-78. Kansas Publishing House, T. D. Thacher, State Printer, Topeka, 1885.

<sup>2</sup> David Starr Jordan and Barton Warren Evermann, "Fishes of North and Middle America", Bulletin 47 of the United States National Museum, Washington, Government Printing Office; part I, 1896; parts II and III, 1898; part IV, 1900. (Out of print.)

been obtained from books by Jordan and Evermann,<sup>3</sup> Jordan,<sup>4</sup> Goode,<sup>5</sup> and Bean.<sup>6</sup> Various descriptive material and records of distribution have been found in some of the bulletins and reports of the State Department of Fish and Game of Kansas.<sup>7</sup> The nomenclature of the present work has been checked with the check list of Jordan, Evermann, and Clark.<sup>8</sup> For the most part, characteristics used in the keys are technical in nature, and yet selected so that they are readily observable

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<sup>3</sup> David Starr Jordan and Barton W. Evermann, American Food and Game Fishes (London: Hutchinson and Co., 1908), p. 573.

<sup>4</sup> David Starr Jordan, A Guide to the Study of Fishes (New York: Henry Holt and Co., 1905), vol. II, p. 599.

. . . ., A Manual to the Vertebrate Animals of the Northern United States (Chicago: A. C. McClurg and Co., 1910), tenth edition, p. 397.

<sup>5</sup> G. Brown Goode, American Fishes (Boston: Estes and Lauriat, publishers, 1887), p. 492.

<sup>6</sup> Tarleton H. Bean, Catalogue of the Fishes of New York, New York State Museum; Bulletin 80, zoology 9 (Albany: University of the State of New York, Bulletin 278, Feb., 1903), p. 784.

<sup>7</sup> Kansas Fish and Game Department, Ponds, Pond Fish, and Pond Fish Culture, Bulletin No. 1, June 1914; Barbed Trout of Kansas, Bulletin No. 8, June 30, 1925; Kansas Fish and Game, Biennial No. 6, 1926.

<sup>8</sup> David Starr Jordan, Barton W. Evermann, and Howard Clark, Check List of Fishes and Fish-like Vertebrates of North and Middle America North of Northern Boundary of Venezuela and Colombia, Dec. 1935, part 2, Report of the U. S. Commissioner of Fisheries for 1928 (Washington: Govt. Printing Office, 1930), p. 674.

and distinguishable. Characteristics of less technical nature often cannot be trusted. These have been used only when the technical characteristics would be of such a nature that the average person would find them little usable.

The study has been so organized that if the family, to which the fish belongs, is not known the family key may first be used. This will give directions to the family where the key to that family, which will identify the specimen is to be found, as well as descriptions of the species. The family key will not have to be used if the family is known. By locating the family in the table of contents, reference is given directly to the family and its descriptions. Genera descriptions are included wherever practical in helping to describe the species.

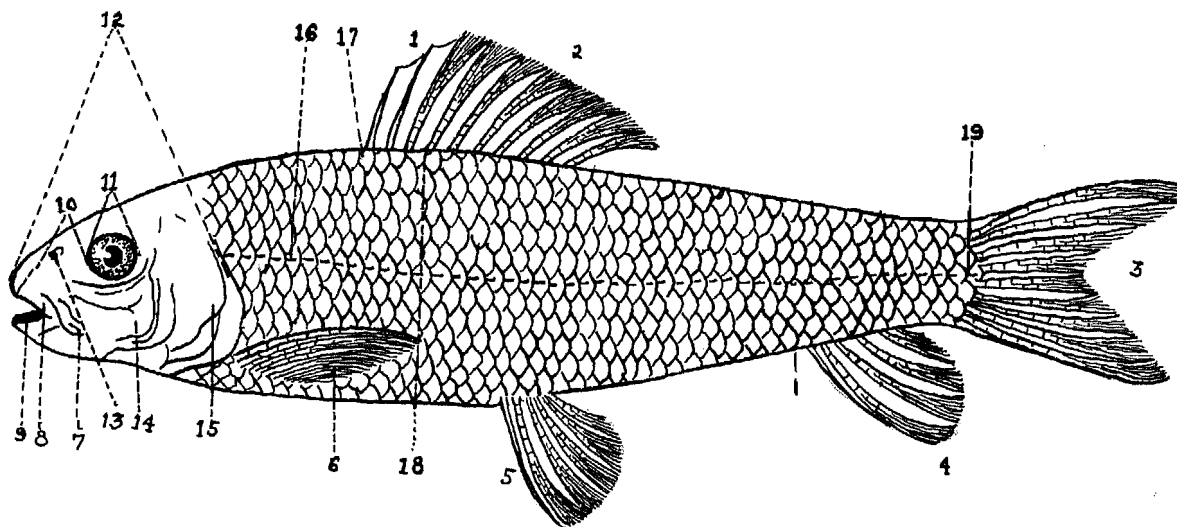
## HOW TO USE THE KEYS

The keys in this study are arranged on the "alternative" basis. This means that either the one or the other of two contrasted statements will be true. The alternative statements are placed together so that they may be readily contrasted.

With fish in hand, the family to which it belongs must first be determined. Often it can readily be determined that a certain specimen is a catfish, gar, sucker, sunfish, or an eel; and it is then not necessary to use the family key. Instead, the particular family can be located in the table of contents. If the family is not known, the first step is to read the first statement in the family key. Choose the true statement of the two given and proceed to the number following that statement. Here again will be found two statements. Choose the true one and proceed as before. Proceed in this manner until a statement is reached which is not followed by a number but by a family name. The number after the family name indicates the page where the key and description of the family begins. The keys found under the various families may be used to determine the species of the fish. They are used in the same way that the key to the families is used. Following the key will be found descriptions of the species given in the key. The descriptions are arranged in the order that the

species appear in the key. A description of the genus, to which the fish belongs precedes the description of the species wherever genera descriptions help in identifying the fish.

For example, if the specimen in hand is Ictalurus furcatus, the blue channel cat or chuckle-headed cat, to determine the family the first alternative statements in the family key are read. Since the statement "ventral fins present" is true, proceeds to the number following this true statement which is two. Here it is found that the back does have a fleshy fin-like projection behind the rayed dorsal fin and number three is indicated. The first statement here is true, in that there are barbels about the mouth and nostrils; the body is scaleless; and there is a single spine in each pectoral fin and in the dorsal fin. At the end of these statements is the family name, Ameiuridae, with page five following it. On page five is the key to the species in this family. The first statement under number one is true, in that the adipose fin has its posterior margin free. Proceeding to the number indicated, which is two, it is found that the head is slender and cone-shaped with the tail deeply forked rather than the head being broad and flat with the tail not forked. Proceeding to number three, which is indicated at the end of the above statement, it is found that the anal fin base is long with thirty-two to thirty-five rays, etc. At the end of these statements is found the



**FIGURE OF A FISH SHOWING THE PARTS USUALLY REFERRED  
TO IN DESCRIPTIONS OF FISHES**

- |  |  |
|--|--|
| <b>1. Spinous portion of dorsal fin.</b> | <b>12. Head.</b>   |
| <b>2. Soft portion of dorsal fin.</b>    | <b>13. Nostril.</b>  |
| <b>3. Caudal (tail) fin.</b>             | <b>14. Cheek.</b>  |
| <b>4. Anal fin.</b>                      | <b>15. Gill cover or opercle.</b>  |
| <b>5. Ventral fin.</b>                   | <b>16. Lateral line.</b>   |
| <b>6. Pectoral fin.</b>                  | <b>17. Series of scales counted between dorsal fin downward to lateral line.</b> |
| <b>7. Maxillary.</b>                     | <b>18. Depth.</b>  |
| <b>8. Premaxillary.</b>                  | <b>19. End of the last caudal vertebrae.</b>                                     |
| <b>9. Mandible or lower jaw.</b>         |  |
| <b>10. Snout.</b>                        |  |
| <b>11. Eye.</b>                          |  |



name Ictalurus furcatus, the blue channel cat or chuckle-headed cat. If further details are desired, the characteristics of the genus Ictalurus are found on page eight, and the description of the species furcatus follows this.

In studying a fish, there are some parts of the anatomy which one should know. In the accompanying drawing, important parts of the external anatomy are indicated. The parts are more or less common to all fishes. In describing a fish, certain comparative measurements are made. The length of the head and the greatest depth of the body is compared with the length of the body. The length of the body is measured from the tip of the snout to the end of the last caudal vertebrae, or to the base of the tail fin. The horizontal diameter of the eye, length of the snout, the length of fins, spines or rays, are compared with the length of the head. Scales in the lateral line are counted, and the rows between the insertion of the dorsal fin and the lateral line are counted. Usually the oblique series between the lateral line downward and backward to the origin of the anal, or the vent, are counted. The measurements are intended to apply to the average of mature fish. Young fishes are usually more slender with the head and eye larger, and the mouth usually smaller. Fin formulas are not shortened, but are written out.

For the most part, most of our fishes and especially the food and game fishes, are easy to identify. However,

some groups are extremely hard to identify. The Cyprinidae, or minnow family, is especially difficult in this respect.

Jordan and Evermann state in regard to the minnows:<sup>1</sup>

. . . . . excessively abundant where found, both in individuals and species, and, from their great uniformity in size, form, and coloration, constituting one of the most difficult groups in natural history in which to distinguish genera and species. Our genera are mostly very closely related, and are separated by characters which, although reasonably constant, are often of slight structural importance. The spring or breeding dress of the male fishes is often peculiar. The top of the head, and often the fins or various portions of the body, are covered with small tubercles, outgrowths from the epidermis. The fins and lower parts of the body in the spring males are often charged with bright pigment, the prevailing color of which is red, although in some genera it is satin-white, yellowish, or black.

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<sup>1</sup> David Starr Jordan and Barton W. Evermann, "Fishes of North and Middle America", Bulletin 47 of the United States National Museum, Washington, Government Printing Office; part I, 1896, p. 200.

## KEY TO FAMILIES OF KANSAS FISHES

1. Ventral fins present . . . . . 2
- Ventral fins absent . . . . . 17
2. Back with a peculiar, fleshy, fin-like pro-  
jection behind the single rayed dorsal  
fin . . . . . 3
- Back without the fleshy fin-like projection  
as described above . . . . . 4
3. Four to eight long barbels about the mouth and  
nostrils; body scaleless; a single spine  
in each of the pectoral fins and in the  
dorsal fin . . . . . Ameiuridae, 5
- Head without barbels; body scaly; dorsal, anal,  
and ventrals each with a small but dis-  
tinct spine . . . . . Percepsidae, 15
4. Back with a single dorsal fin made up of rays  
and not preceded by a series of free  
spines . . . . . 5
- Back with a single dorsal fin, preceded by a  
series of free spines . . . . . Gasterosteidae, 16
- Back with two dorsal fins, separate, deeply  
notched, or confluent, the anterior  
of spines only, the posterior chiefly  
of soft rays . . . . . 18

5. Vertebrae evidently extending into upper lobe  
     of tail fin . . . . . 6  
 Vertebrae not extending into upper lobe of tail  
     fin . . . . . 8
6. Body scaleless; snout spatulate; mouth wide; no  
     barbels . . . . . Polyodontidae, 16  
 Body with five series of bony shields; mouth  
     inferior, and preceded by barbels .  
     . . . . . Acipenseridae, 17  
 Body scaly . . . . . 7
7. Scales smooth edged; concentrically striated;  
     broad bony plate over foreneck; dorsal  
     fin many rayed . . . . . Amiidae, 19  
 Scales covered by enamel; no plate over fore-  
     neck; ventral fins short; snout long  
     and toothed . . . . . Lepisosteidae, 20
8. Anal fins long having from eighteen to thirty-  
     one soft rays; tail fin forked . . . . . 9  
 Anal fins short having from seven to thirteen  
     soft rays; tail fin forked . . . . . 11  
 Anal fins short having from eleven to thirteen  
     soft rays; tail not forked; head more or  
     less scaly; no lateral line . . . . .  
     . . . . . Cyprinodontidae, 21
9. Lateral line absent . . . . . 10  
 Lateral line present, distinct; mouth large,

- teeth present, all pointed . . . Hiodontidae, 24
10. Dorsal fin having sixteen rays; anal fin  
eighteen rays; mouth moderate, terminal,  
no teeth; back part of upper jaw of  
three pieces . . . . . Clupeidae, 26
- Dorsal fin with twelve rays, the last ray  
almost as long as head; anal fin long  
and low having thirty-one rays; mouth  
small, inferior . . . . . Dorosomatidae, 26
11. Dorsal fin with less than ten rays; lips  
usually not capable of being drawn  
forward; upper jaw formed by premax-  
illaries alone . . . . . Cyprinidae, 27
- Dorsal fin with ten to thirty-five rays; lips  
usually not capable of being drawn for-  
ward; upper jaw formed by maxillaries  
along . . . . . Catostomidae, 53
12. Lateral line not extending onto rays of tail . . . 13
- Lateral line extending to tip of middle rays  
of tail; dorsal fin not divided, of ten  
spines and thirty rays; anal with two  
spines and seven rays . . . . . Sciaenidae, 70
13. Anal spines present . . . . . 14
- Anal spines absent, anal fin with twelve rays;  
ventral fins with one spine and four  
rays . . . . . Cottidae, 71

14. Anal spines one or two . . . . . 15  
 Anal spines three to eight . . . . . 16
15. Anal rays eleven to fourteen, usually two anal  
 spines; ventrals with one spine and five  
 rays . . . . Percidae and Etheostomidae, 72  
 Anal rays twenty-three, one anal spine; dorsal  
 fin divided, the first of four spines,  
 the second of one spine and eleven rays  
 . . . . Atherinidae, 89
16. Dorsal fin divided, the first of ten spines,  
 the second of one spine and fourteen  
 rays; anal fins of three spines and  
 about twelve rays . . . . Meretidae, 89  
 Dorsal fin not divided, but confluent, of six  
 to eleven spines (usually ten) and  
 nine to eighteen rays . . Centrarchidae, 90
17. Distinct lateral line; long eel-like body,  
 brownish in color; mouth terminal and  
 not suctorial; single gill opening  
 present . . . . . Anguillidae, 101  
 No lateral line; gray or silvery eel-like body;  
 mouth circular and suctorial; seven gill  
 openings . . . . . Petromyzontidae, 102

Family AMBIURIDAE

(The Catfishes)

1. Fleshy fin-like projection back of dorsal fin
  - with its back margin free . . . . . 2
  - Fleshy fin-like projection back of dorsal fin
    - keel-like, attached to the back . . . . . 9
2. Head slender and cone-shaped; the tail deeply
  - forked; mouth small . . . . . 3
  - Head broad and flat; tail fin not forked, except
    - Haustor lacustris . . . . . 4
3. Anal fin very long; its base nearly one-third the
  - length of the body; anal rays thirty-two
  - to thirty-five; humeral spine not reaching
  - middle of pectoral spine . . . . .
  - Ictalurus furcatus (Le Sueur.)
  - (Chuckle-headed Cat)
  - Anal fin shorter, its rays twenty-five to twenty-
  - nine; humeral spine long and slender, more
  - than one-half the length of the pectoral
  - spine . . . . .
  - Ictalurus punctatus (Rafinesque)
  - (Channel Cat; White Cat)
4. Teeth on upper jaw with no backward extension at
  - the back angle . . . . . 5
  - Teeth on upper jaw with a backward extension at

the angle; lower jaw projecting; dorsal  
spine weak; pectorals with broad flat spines  
notched on both sides . . . . .

Opladelus olivaris (Rafinesque)  
(Mud Cat; Yellow Cat)

5. Tail fin not forked; coloration brownish or  
yellowish, not silvery . . . . . 6

Tail fin forked; coloration grayish or silvery;  
eyes wholly in front of middle point of  
head . . . . .

Haustor lacustris (Walbaum)  
(Great Forked-tailed Cat)

6. Anal fin moderate or short, of fifteen to twenty-  
two rays, its base four to five times in  
length of body . . . . . 7

Anal fin long, of twenty-two to twenty-seven rays,  
counting rudiments, its base more than one-  
fourth length of body; the head not much  
longer than broad . . . . .

Ameiurus natalis (Le Sueur)  
(Yellow Cat)

7. Lower jaw not projecting . . . . . 8  
Lower jaw projecting; anal rays twenty . . .

Ameiurus vulgaris (Thompson)  
(Common Cat)

8. Pectoral spines long, two to two and one-half in



length of head; anal rays more than  
twenty . . . . .

Amelurus nebulosus (Le Sueur)  
(Common Bullhead; Horned Pout)

Pectoral spines short, two and one-half to three  
times in length of head; anal rays seven-  
teen to nineteen counting rudiments . .

Amelurus melas (Rafinesque)  
(Black Bullhead; Small Cat)

9. Band of teeth in upper jaw not extending backward  
at angle of jaw; no keel back of dorsal  
fin . . . . . 10

Band of teeth in upper jaw with backward ex-  
tension at back angle; a strong keel be-  
hind dorsal fin leading to the fleshy fin  
behind . . . . .

Noturus flavus (Rafinesque)  
(Stone Cat)

10. Pectoral spine more or less distinctly notched  
behind; fleshy fin-like projection behind  
dorsal with deep or moderate notch between  
it and tail fin . . . . . 11

Pectoral spine entire or grooved behind, never  
notched; fleshy fin behind dorsal high and  
not separated from the tail fin; a narrow

black lateral band . . . . .

Schilbeodes gyrimus (Mitchell)

11. Pectoral spine with length of back notches less than one-half diameter of spine; pectoral spine short, contained about three times in length of head; color yellowish-brown, the ventral fins edged with black . . . .

Rabida exilis (Nelson)

Pectoral spine with its back notches strong, almost as long as diameter of spine; the long curved spine contained in head one and two-thirds times; color mottled, with four saddle-like blotches . . . . .

Rabida miura (Jordan)

ICTALURUS (Rafinesque)

(Channel Cat)

Body elongate, slender, flattened side-wise toward the back part. Head slender and cone-shaped. Mouth small, terminal, the upper jaw longer. Teeth in a short band on each jaw. Dorsal fin high, with one long spine, and usually six rays. Fleshy fin-like projection over the back portion of the anal fin. Anal fin long, of twenty-five to thirty-five rays. Ventral fins each with one simple and seven branched rays. Pectoral fins each with a stout spine, with curved teeth within, and about nine rays. Tail fin elongate, deeply forked, the lobes pointed, and the upper the longer. Coloration pale or silvery. Probably only two species in Kansas. Active fishes frequenting river channels and ripples in large streams. Fishes valued for their excellent food and game qualities.

Ictalurus furcatus (Le Sueur)

(Chuckle-headed Cat; Blue Cat)

Head small, its length contained in length of body about four times to four and one-half times in adult. Anal fin with extremely long base, nearly one-third length of body; its rays thirty-two to thirty-five in number. Eye small, the middle of the head being behind its back margin. Slope from dorsal fin to snout nearly straight or somewhat concave in adult. Skin thin. Pectoral spine rather long; humeral spine shortish, not reaching middle of pectoral spine. Color silvery, plain, or somewhat spotted.

Ictalurus punctatus (Rafinesque)

(Channel Cat; Spotted Cat)

Head small, narrow, rather convex above; its length contained in length of body about four times. Anal fin with twenty-five to thirty rays. Eye large, the middle point in the length of the head being near its posterior margin. Slope from dorsal fin to snout rather arched. Pectoral spine long and strongly notched behind; humeral spine long and slender, more than one-half the length of the pectoral spine. Barbels long, the one from the back part of the upper jaw reaching more or less past the gill opening. Color light olivaceous above, the sides pale or silvery; almost always with small irregular, round, dark spots. Fins often with dark edges.

OPIADELUS (Rafinesque)

(Mud Cats)

Body elongate, slender, and much flattened forward. Head large and wide. Mouth very large, terminal, the lower jaw always projecting beyond the upper. Teeth in broad velvety bands on each jaw in front, toward the back angle abruptly deflected, proceeding backward. The dorsal fin over the back half of the interval between ventrals and pectorals, with one spine and seven rays; spine rather small and covered with skin. Fleshy fin back of dorsal fin large, its elongated base over back half of anal fin. Anal fin small, of about thirteen rays; commencing far behind the anal opening. Pectoral fins with a broad spine, notched on both margins, and with a

prolonged fleshy projection. Tail fin oblong. Color yellowish or greenish; whitish below. One species. A large fish living in the muddy bottoms of deep rivers.

Opladelus olivaris (Rafinesque)

(Mud Cat; Yellow Cat)

Head extremely flat. Anal fin short, its base about one-sixth the length of the body, its rays twelve to fifteen. Barbels short. Humeral spine short. Color yellowish, much mottled with greenish and brown; whitish below.

HAUSTOR (Jordan and Evermann)

Haustor lacustris (Walbaum)

(Great Fork-tailed Cat; Mississippi Cat)

Head broader, lower, and more flat than in Ictalurus punctatus; its length contained in length of body about four times; its greatest width five-sixths its length. Space between eyes somewhat more than one-half the length of the head. Upper surface of the head quite flat; so that the eyes are much nearer the upper surface of the head than the lower. Top of the head covered with rather thicker skin than in I. punctatus, so that the bones are nearly concealed. Anal fin with about twenty-eight rays, its base as long as the head. Eye moderate, wholly in front of the middle point of head. Pectoral spine stout; humeral spine very short and covered by skin, a little more than one-third the length of the pectoral spine. Barbels long, all black; the one at rear of mouth longer than head. Tail fin deeply forked, the upper lobe rather longer and narrower than the lower. Color olivaceous becoming darker with age; sides pale, without dark spots; anal fin often with a dusky edge. One of the largest of the catfishes.

AMEIURUS (Rafinesque)

(Horned Pout)

Body moderately elongate, robust forward, the portion between dorsal fin and tail fin much flattened sidewise.

Head large, wide; the skin covering the bones is thick. Mouth large; teeth in broad bands on both jaws in front, band of upper jaw convex in front and without backward extension at the back angle. Dorsal fin between the pectorals and ventrals, higher than long, with one spine and six branched rays. Fleshy fin-like projection short, inserted over the back part of the anal fin. Anal fin varying with fifteen to thirty rays. Ventrals each with one simple and seven branched rays. Pectorals each with a stout spine, commonly notched behind. Species variable and not easily distinguished. Numerous; swarming in ponds, creeks, and sluggish streams.

Ameiurus natalis (Le Sueur)

(Yellow Cat)

Head short and broad. Body more or less short and chubby. Body rather elongate. Mouth wide, the jaws equal. Anal rays twenty-five. Color yellowish brown. Spines very short (variety lividus). Mouth wide; about twenty-four or twenty-five rays in anal fin, the fin low, its base about three and one-half times in length of body; color pale, yellowish brown (variety cupreus). Other varieties may be present in Kansas.

Ameiurus vulgaris (Thompson)

(Common Cat)

Head longer than broad, rather narrow forward. Profile rather steep, evenly convex, back region more or less elevated. Length of head contained in length of body three and one-half to four times. Body moderately elongate; its depth four and one-half to five times in length of body. Anal fin with twenty rays. Barbels long. Mouth wide. Lower jaw more or less distinctly projecting, in other respects scarcely distinct from Ameiurus nebulosus, with which it may intergrade. Color dark reddish brown or blackish.

Ameiurus nebulosus (Le Sueur)

(Common Bullhead; Horned Pout)

Body rather elongate, its depth four to four and one-half times in length. Anal fin with twenty-one or twenty-two rays, the length of its base contained in the length of the body four times. Upper jaw usually distinctly longer than the lower jaw. Dorsal fin inserted rather

nearer the fleshy fin behind than end of snout. The pectoral spine long, with humeral spine more than one-half the length of the pectoral spine. Color dark yellowish brown, sometimes yellow, clouded, sometimes nearly black.

Amaurus melas (Rafinesque)

(Black Bullhead; Small Cat)

Head broad behind, steeply elevated and contracted forward. Body stout, short and deep, the depth contained in length of body three and one-half to four and one-fourth times. Anal fin short and deep, of seventeen to nineteen rays, its base nearly five times in length of body. Jaws nearly equal. Barbels longer than head. Pectoral spines small, about two and one-half to three times in length of head. Resembles A. nebulosus, but has shorter and deeper anal fin, the pectoral spines especially shorter; a smaller species. Color almost black, often varying to yellowish and brown; anal rays white, in marked contrast with the dusky membranes of the fin.

NOTURUS (Rafinesque)

(Stone Cats)

Body moderately elongate, robust except in tail part, which is flattened sidewise. Head flat and broad. The mouth terminal, broad. Teeth in velvety bands on front of both jaws; teeth of upper jaw prolonged backward into an elongate, triangular extension, similar to Opladelus. Fleshy fin-like projection back of dorsal fin closely attached to back, as in Schilbeodes. Represented by one species inhabiting rivers and channels.

Noturus flavus (Rafinesque)

(Stone Cat)

Head broad and flat, nearly as broad as long; length of head contained in length of body about four and one-fourth times; width of head contained in length of head about five and one-third times. Body in middle almost cylindrical, its depth contained five and two-thirds in length. Mouth terminal, its width equal to width of head back of eyes and to length of barbel at back part of the

mouth on upper jaw. Teeth in upper jaw in velvety bands, the width of band equal to one-third length of head, the backward prolongation is little longer than the eye. A strong keel on back behind dorsal fin, leading to fleshy fin behind; fleshy fin deeply notched; the very low fleshy fin beginning over origin of anal fin and continuing into the tail fin. Dorsal spine very short. Dorsal fin with one spine and six rays. Pectoral with one spine and nine rays, the spine notched in front, slightly rough or smooth in back, its length three in distance from snout to dorsal fin; humeral spine very short and sharp. Anal fin with about sixteen rays, its base is contained five times in length and the longest ray equals one-half the length of the head. Color nearly uniform yellowish brown, sometimes blackish above, the fins with yellow edges.

### SCHILBEODES (Bleeker)

#### (Tadpole Cats)

Body moderately elongate, rounded forward, flattened sidewise backward. Head flat; skin very thick concealing bones of head. Mouth terminal, rather large; the upper jaw more or less projecting. Awl-shaped teeth in broad bands in the jaws, the band in the upper jaw abruptly cut off at each end and not prolonged into a backward extension as in Oplodelus and Noturus. Dorsal fin over the back half of the space between pectorals and ventrals, of one short spine and seven rays. Anal fin short with twelve to twenty-three rays. Ventrals rounded. Lateral line complete. Pectoral spine varying in length. Small catfishes especially liking small rock brooks.

### Schilbeodes gyrinus (Mitchell)

#### (Tadpole Stonecat)

Head short, broad and flat, its width nearly equal to its length, which is one-fourth of the total without the tail fin. Body comparatively short and thick, its length four to six inches; its depth four to five times in length. Width of mouth equal to two-thirds the length of head. Width of band of teeth at back of jaw equal to one-third length of head, no backward extension. Jaws nearly equal. Spines stout and rather long; that of the pectoral fin straight, not notched, grooved behind, two and one-third times in the distance from snout to dorsal

fin. Dorsal fin higher than long with one spine and six rays, inserted nearer anal fin than snout. Anal fin with thirteen rays, its base contained in length of body five times. Pectoral fin with one spine and eight rays, the spine one-half as long as the head; humeral spine one-third as long as the head. Color nearly uniform yellowish brown, sometimes blackish, without cross blotches; a narrow dark lateral streak and one or more streaks on back.

RABIDA (Jordan and Evermann)

Rabida exilis (Nelson)

(Slim Stonecat)

Head small, not very broad, but thin and flat; its width five to six in length of body; its length four in length of body. Depth of body five to six and one-half in length of body. Jaws nearly equal; teeth as in S. gyrinus. Pectoral spine small, about three times in the length of head, slightly notched without, with about six small straight teeth within, which are not one-half the diameter of the spine in length. Dorsal scarcely higher than long, dorsal spine low as near snout as anal fin. Anal fin with fourteen to seventeen rays. Pectoral spine three and one-half to four times in distance from snout to dorsal fin, humeral spine obscure. Color yellowish brown, mottled, the fins somewhat margined with black.

Rabida miura (Jordan)

(Variegated Stonecat)

Head contained in length of body about four times. Body not much flattened nor elongate. Depth of body four and one-half to five times in length. Lower jaw slightly included in upper jaw. Pectoral fin with one spine and eight rays, the spine somewhat curved and finely notched without, with six strong recurved teeth within each nearly as long as the diameter of the spine; humeral spine short. Dorsal fin with its spine three-fifths as long as head, highest ray of dorsal equal to height of dorsal spine. Anal fin with thirteen to fifteen rays, longest anal ray one-half as long as head. Fleshy fin back of dorsal fin with a deep notch, but connected with tail fin, its length about equal to head. Color black and grayish,



much mottled; top of head, tip of dorsal fin, middle of fleshy fin, and edge of tail definitely blackish, back of head dark; body with four broad cross blotches, one before dorsal fin, one behind it, one on middle of the fleshy fin, and one behind it.

Family PERCOPSIDAE

(The Sand Rollers)

PERCOPSIS (Agassiz)

(Perch Fish)

Body slender, rather transparent, covered with thin scales. Head moderate, cone-shaped, and pointed. The head scaleless. Body covered rough-edged scales. Dorsal fin with two slender spines. Anal fin with one spine. Scales roughest toward the tail. A singularly interesting group of archaic fishes since it shows the combination of true fin spines, rough-edged scales, and mouth of the Percoids with the fleshy (adipose) fin, abdominal ventrals, and a scaleless head.

Percopsis omiscomaycus (Walbaum)

(Sand Roller; Trout Perch)

Head slender and cone-shaped, its length contained in length of body about four times. Body rather slender, the portion between the fleshy fin and tail fin long and slender. Mouth small, almost inferior, back part of the upper jaw not nearly reaching the large eye. Body scaly, about fifty scales in the lateral line. Dorsal fin with two slender spines and nine rays. Anal fin with one spine and seven rays. Ventral fins with one spine and eight rays. Teeth very small, present on lower jaws and front of upper jaw only. A small fleshy fin-like protuberance behind the dorsal fin. Pectorals narrow, placed rather higher than usual. Tail fin long and forked. The color pale olivaceous, a silvery stripe along the lateral line, becoming obsolete in front, upper parts with round dusky spots made up of fine dark points.

Family GASTEROSTEIDAE

(The Sticklebacks)

EUCALIA (Jordan)

Body rather spindle-shaped, not mailed. Mouth moderate, the lower jaw prominent. Teeth sharp, even, in a narrow band in each jaw. Front of upper jaw capable of being drawn forward. One species in this genus.

Eucalia inconstans (Kirtland)

(Brook Stickleback)

Head contained in length of body three and one-half times. Body moderately elongate, the skin entirely smooth. Dorsal fin with one spine and ten rays, preceded by four free spines. Anal fin with one spine and ten rays. Ventral spines short and sharp, notched. Space in front of pectorals small. Coloration; males in spring jet-black, tinged with red forward, females and young olivaceous, mottled, and dotted with black.

Family POLYODONTIDAE

(The Paddle-fishes)

POLYODON (Lacepede)

(Paddle-fish)

Body spindle-shaped, very little flattened sidewise. Mouth broad, terminal, but overhung by the spatulate snout which is broad and prolonged. No barbels. Nostrils double at base of blade. Lateral line continuous, its lower margin with short branches. Dorsal fin well back and of soft rays only. Anal similar, rather farther back. Tail with vertebrae evidently running into the upper lobe. Pectorals moderate, placed low. Ventrals abdominal and many rayed. Two species known, one in China; Polyodon spathula in the United States. Singular fishes living in mud-bottomed streams where they stir the mud with the spatulate snout, feeding upon organisms there.

Polyodon spathula (Walbaum)

(Spoon-billed Cat; Duck-billed Cat)

Body spindle-shaped, tapering more abruptly forward, covered with smooth skin, except the rhombic plates on the sides of the tail. Gill covers very long and extending back to a point, nearly reaching the ventral fins. Snout long and spatulate-shaped, its length one-third to one-fourth the total length of the body, longer in the young. Dorsal fin back of ventrals of fifty to sixty soft rays only. Anal mostly behind the dorsal fin and larger, of fifty to sixty-five rays. Pinnal rays slender. Head with gill cover flap more than one-half length of body.

Family ACIPENSERIDAE

(The Sturgeons)

1. Snout almost cone-shaped; a small opening in the head over the eye; the tail not flattened sidewise nor mailed . . . . .

Acipenser fulvescens (Rafinesque)  
(Lake or Rock Sturgeon)

Snout broad, flattened and shovel shaped; small opening in head as described above not present; tail flattened sidewise and mailed

Scaphirhynchus platyrhynchus (Rafinesque)  
(Shovel-nose Sturgeon)

ACIPENSER (Linnaeus)

(Sturgeons)

Snout almost cone-shaped, more or less flattened below the level of the forehead. A small opening over the eye. Portion of body between dorsal fin and tail fin

moderately long, deeper than broad, the rows of bony bucklers distinct to the base of the tail fin. Tail fin not produced into a filament. Tail fin with the vertebrae evidently running into the upper lobe. The species are migratory. This genus probably represented by one species in Kansas.

Acipenser fulvescens (Rafinesque)

(Lake Sturgeon; Rock Sturgeon)

Body rather long. Snout slender and long in the young, becoming quite blunt with age, when it is considerably shorter than the rest of the head, body with five series of bony shields, which are large and rough, with strongly hooked spines, becoming smoother with age. The shields on back eleven to sixteen; side shields thirty to thirty-eight; belly shields eight to eleven. Last back shield about one-half the length of the next to last. Dorsal fin with thirty-five rays. Anal fin with twenty-six rays, its base two-thirds length of dorsal fin. The color is dark olive above, sides paler or reddish, often with irregular blackish spots. Size large.

SCAPHIRHYNCHUS (Heckel)

(Shovel-nose Sturgeons)

Snout broad, flattened, and shovel shaped. No opening in head over eye. Portion of body between dorsal fin and tail fin very long, strongly flattened, broader than deep. Rows of bony bucklers running together below the dorsal fin, forming a complete coat of mail on the tail. Upper lobe of tail produced in a filament beyond the tail fin, this longest in the young. Tail fin with the vertebrae evidently running into the upper lobe. Only one species in America of this genus.

Scaphirhynchus platyrhynchus (Rafinesque)

(Shovel-nose Sturgeon; White Sturgeon)

Body elongate, tapering into a slender, flat tail, which extends beyond the tail fin, often lost in the adult. Bony shields with spine behind the middle, sharply keeled, the series running together below the dorsal fin obliterating the smaller plates between. Shields on back fifteen to twenty; side shields forty-one to forty-six;

belly shields eleven to thirteen. A spine in front of eye, and one at back edge of the "Shovel"; snout in the young with a few spines. Dorsal fin with thirty-two rays. Both dorsal and anal fins small. Anal fin with twenty rays. Base of anal little more than one-half the length of dorsal and entirely behind it. Color pale olive.

Family AMIIDAE

(The Bowfins)

AMIA (Linnaeus)

(Bowfins)

Body oblong, flattened sidewise behind, cylindrical forward. Head almost cone-shaped, bluntish forward, its superficial bones corrugated, very rough, scarcely covered with skin. Cleft of mouth extending beyond the small eye. Lower jaw broad, U-shaped with a bony plate, its back margin free. Jaws with an outer series of conical teeth, behind which in the lower jaw is a series of rasp-like teeth. Nostrils well separated, the forward one with a short barbel. Scales of moderate size, concentrically striated, edges bordered by membrane. Dorsal fin long and low, its insertion in front of the middle line of the body, opposite the end of the pectoral. Tail convex behind, the vertebrae evidently extending into the upper lobe, more evident in the young. Anal fin short and low. Pectoral and ventral fins short and rounded, the ventrals nearer anal than pectoral. Plates on top of head. Gill cover with a broad dermal border. A single species known among living fishes.

Amia calva (Linnaeus)

(Mud Fish; Dog Fish)

Head contained in length of body about three and three-fourths times. Depth of the body four to four and one-half times in length. Lateral line directed slightly upward at either end. Dorsal fin nearly uniform, its rays almost all of equal length. Dorsal with about forty-eight rays. Ventral fins with seven rays. Sixty-five to seventy scales in lateral line. Color dark olive or blackish above, paler below; sides with traces of dark

line markings; lower jaw and bony plate over foreneck with round blackish spots; fins mostly dark, sometimes mottled. Males with a round black spot surrounded by a orange or yellowish shade at the base of the tail fin. This spot lacking in the female.

### Family LEPISOSTEIDAE

(The Gar Pikes)

1. Beak long and slender; the snout more than twice the length of the rest of the head . .

Lepisosteus osseus (Linnaeus)  
(Long-nosed Gar; Gar Pike)

Beak shorter and broader, little longer than the rest of the head . . . . .

Cylindrosteus platostomus (Rafinesque)  
(Short-nosed Gar)

### LEPISOSTEUS (Lacépède)

(Gar Pikes)

Body elongate, almost cylindrical, covered with hard, rhombic, enamel covered scales or plates, which are closely overlapping in oblique series running downward and backward. Both jaws elongate, the upper jaw projecting beyond the lower. Lower jaw composed of many plates. Both jaws with an outer series of teeth, followed by one or two series of larger teeth, besides which on the jaws and roof of mouth are small rasp-like teeth. Nostril near the end of the upper jaw. Dorsal fin short, high. Tail with vertebrae evidently extending into upper lobe; in the young produced in a filament beyond the tail fin.

Lepisosteus osseus (Linnaeus)

(Long-nosed Gar; Common Gar Pike)

Snout a little more than twice the length of the rest

line markings; lower jaw and bony plate over foreneck with round blackish spots; fins mostly dark, sometimes mottled. Males with a round black spot surrounded by a orange or yellowish shade at the base of the tail fin. This spot lacking in the female.

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Lepisosteus osseus (Linnaeus)

(Long-nosed Gar; Common Gar Pike)

Snout a little more than twice the length of the rest

of the head, its length fifteen to twenty times the least width. Length of head contained three times in length of body. Depth of body contained twelve times in length. Dorsal fin with eight rays. Anal fin with nine rays. Ventral fins with six rays. Pectoral fins with ten rays. Color olivaceous, pale, and rather silvery below; vertical fins and back part of the body with round black spots, which are more distinct in young; the very young with a blackish lateral band.

CYLINDROSTEUS (Rafinesque)

(Short-nosed Gar)

Cylindrosteus platostomus (Rafinesque)

(Short-nosed Gar)

Snout about one-third longer than the rest of the head, its length five or six times its least width. The length of head contained three and one-half times in length. Depth of body contained in length about eight times. Dorsal fin with eight rays. Anal fin with eight rays. Ventral fins with six rays. About fifty-six scales in the lateral line. A smaller fish than the preceding, and probably less abundant. Colors of L. caesus. More more variable than the preceding.

Family CYPRINODONTIDAE

(The Killifishes)

1. Dorsal fin inserted before the origin of the anal fin; many vertical crossbars either dark or silvery; scales rather small, forty-five to sixty in lateral line . . . . . 2
- Dorsal fin inserted definitely back of the anal fin; a broad, dark lateral band running



from the tip of the snout, through eye, to  
base of tail; dorsal fin with nine rays;  
scales large . . . . .

Zygonectes notatus (Rafinesque)  
(Top Minnow)

2. Scales moderate in size, forty-eight in the lat-  
eral line; dorsal rays thirteen; anal rays  
ten; male with twenty silvery vertical  
bars, female with fifteen to twenty dark  
bars; fins nearly plain . . . . .

Zygonectes diaphanus (Le Sueur)  
(Transparent Minnow)

Scales very small, sixty in the lateral line; dor-  
sal rays fourteen or fifteen; anal rays  
thirteen or fourteen; sides with fourteen  
to eighteen dusky bars extending from back  
to belly; female with half bars often in-  
serted; fins yellowish . . . . .

Plancterus zebra (Girard)  
(Zebra Minnow)

ZYGONECTES (Agassiz)

(Killifishes)

Body rather elongate, flattened sidewise behind. The  
mouth with the lower jaw projecting. Jaws each with two  
or more series of pointed teeth, forming a narrow band.  
Lateral line wanting. Tail fin not forked. Variable,  
species hard to determine definitely.

Zygonectes notatus (Rafinesque)

(Top Minnow)

Head rather elongate, low, and flattened, the snout somewhat projecting, lower jaw scarcely projecting; width between the eyes broad, about one-half the length of the head; length of head contained in body about four times. Body rather slender, flattened sidewise behind. Eye large, its length contained about three times in head. Dorsal fin with nine rays. Anal fin with eleven rays. Thirty-four scales in lateral line. Coloration brownish olive, with a broad, dark, purplish-black lateral band running from tip of snout through eye to base of tail; darker in males than in females; young have the edges of the band notched. A few series of black dots along the sides of the back; dorsal, anal, and tail fin dotted with black. Top of head with a conspicuous translucent spot in life. Concentric striations on the scales marked. Recognizable in the water by the translucent spot on the head.

Zygonectes diaphanus (Le Sueur)

(Transparent Minnow)

Head moderate, rather flat above. Body rather slender. Fins not large; dorsal and anal rather low. Head contained in length of body three and two-fifths times. Depth of body contained in length five times. Dorsal fin with twelve rays. Anal fin with ten rays. Forty-eight scales in lateral line. Male with twenty silvery vertical bars, narrower than the dark interspaces. Female with fifteen to twenty vertical bars, shorter than the silvery interspaces; shorter than the silvery bands of the male and dark. Dark spaces distinct and somewhat irregular in position, the back always spotted. The dark bands sometimes replaced by about sixteen shining silvery bands which are narrower than the dark interspaces. Fins plain. Young always with black bars.

Plancterus (Garman)Plancterus zebra (Girard)

(Zebra Minnow)

Head narrow and long, the snout moderately elongate.

Width of space between the eyes two and two-thirds in length of the head. Length of head contained in length of body three and one-half to three and one-fourth times. Body slender, the outlines scarcely arched. The depth of the body contained four and one half times in length. Teeth in both jaws, with external series much enlarged. Dorsal fin with fourteen or fifteen rays. Anal fin with thirteen or fourteen rays. Scales small, sixty in the lateral line. Dorsal fin long and rather low, the base longer and the rays higher in males than in females; base of dorsal in males six to six and one-half in total length; origin of anal opposite that of dorsal in males, behind it in females. In males, the margins of the scales are rough. Color greenish above, the sides and below silvery white, the sides tinged with sulphur yellow; the greater part of each scale on back rendered dusky by black points; sides with fourteen to eighteen dusky bars from back to belly; these bars variable in width, seemingly narrower in females, in which half bars are frequently inserted between the others; the interspaces are as wide as the bars, or usually wider. Fins yellowish, without distinct markings, in the males all dusky. Length of adult about three inches.

### Family HIODONTIDAE

(The Moon-Eyes)

1. Belly in front of ventral fins with a ridge  
along the middle line; dorsal fin with  
nine developed rays . . . . .

Hiodon alosoides (Rafinesque)  
(Gold-eye)

- Belly in front of ventrals without a ridge  
along the middle line; ridge along the  
middle line back of ventrals; dorsal  
fin with eleven or twelve rays . . .

Hiodon tergisus (Le Sueur)  
(Moon Eye)

Family CLUPEIDAE

(The Herrings)

POMOLOBUS (Rafinesque)

(Alewives)

Body oblong, more or less flattened sidewise. Mouth moderate, terminal, the jaws about equal or the lower jaw projecting. Teeth feeble. A fleshy eyelid present. Scales thin, smooth edged, rounded toward back. Dorsal fin rather short, beginning in front of the ventrals, its posterior ray not produced into a filament. Belly sidewise flattened, strongly notched before and behind the ventrals. One species in Kansas, others may be present.

Pomolobus chrysocleris (Rafinesque)

(Skipjack; Blue Herring)

Head rather slender and pointed, its upper profile straight. Length of head contained in body three and three-fourths times. Body elliptical, highest near the middle, much flattened sidewise. Lower jaw strongly projecting, its tip entering the profile. Moderate-sized teeth often present. Eye large, well covered by fleshy eye-lid. Portion of body between dorsal fin and tail slender. Tail fin widely forked. Dorsal fin with sixteen rays. Anal fin with eighteen rays. Fifty-two scales in lateral line. Thirty-three lobbed scales along belly giving the appearance of notches. Gill covers with radiating and branching striations. Colors brilliant blue above; sides silvery, with golden reflections; no dark spots behind gill cover.

Family DORSOMIDAE

(The Gizzard Shads)

DORSOMA (Rafinesque)

(Gizzard Shad)

Body short and deep, strongly flattened sidewise,

covered with thin, smooth-edged scales. Belly flattened to an edge and notched. Head scaleless, short, rather small. Mouth small, inferior, overlapped by the blunt snout; no teeth. Back part of upper jaw not extending to opposite middle of eye. Fleeshy eyelid present. No lateral line. Dorsal fin about midway of the body, usually behind ventrals. Anal very long and low. Tail forked. A single species in our waters. Mud-eating fishes. The family is very close to Clupeidae.

*Dorosoma cepedianum* (Le Sueur)

(Gizzard Shad; Hickory Shad)

Head contained in length of body four and one-third times. Body deep, flattened sidewise, the back elevated in adults. Depth of body two and one-half times in the length. Dorsal fin with twelve rays. Anal fin with thirty-two rays. Dorsal fin about in middle of body, slightly behind ventrals, its filamentous ray about as long as head. Tail fin widely forked, the lower lobe the longer. Fifty-six scales in the lateral line; the scales rather small. Color silvery; bluish above; young with a round dark spot at the shoulders; tips of ventrals and edge of anal often dusky.

Family CYPRINIDAE

(The Carps)

1. Dorsal fin elongate of two to three spines and  
eighteen to twenty rays; anal fin with free  
spines; spines short and notched behind . . . 2
- Dorsal fin short, without developed spines; no  
anal spines . . . . . 3
2. Four long fleshy projections around the mouth;  
dorsal fin with three spines; anal fin  
with three spines and five rays . . .

*Cyprinus carpio* (Linnaeus)  
(Common Carp)

No fleshy projections around the mouth; dorsal  
fin with two spines; anal fin with two  
spines and seven rays . . . . .

Carassius auratus (Linnaeus)  
(Gold Fish)

3. Fleshy projection present at the angle of the  
mouth, except very young of Semotilus  
atromaculatus . . . . . 4

Fleshy projection not present at angle of the  
mouth . . . . . 10

4. Dorsal fin inserted over or well forward of the  
ventral fins; five or six rows of scales  
between insertion of dorsal fin and the  
lateral line . . . . . 5

Dorsal fin inserted back of ventral fins; nine  
rows of scales between dorsal fin and the  
lateral line; young with a small black spot  
on tail fin and a dusky band on sides;  
always a black spot at base of dorsal fin,  
which is bordered with red in the male .

Semotilus atromaculatus (Mitchell)  
(Horned Dace; Creek Chub)

5. Mouth small or moderate, inferior, the upper  
jaw below the lower level of the eye;  
snout projecting; space between eyes

not wide; color darker, more or less

spotted . . . . . 6

Mouth large, terminal, upper jaw on a level  
with lower level of eye; space between  
eyes wide and flat, nearly half the  
length of the head; fifty to sixty  
scales in lateral line; sides silvery,  
no spots . . . . .

Platygobio gracilis (Richardson)  
(Flat-headed Chub)

6. Dorsal fin inserted over the ventral fins . . . 7

Dorsal fin inserted well forward of ventrals;  
rows of scales along back covering be-  
hind dorsal fin; sides silvery; bone be-  
fore the eye silvery, broad, and conspic-  
uous; no red; no tail fin spot . . .

Erinomus storerianus (Kirtland)  
(Storer's Chub)

7. One fleshy projection on each side at angle of  
the mouth . . . . . 8

Two fleshy projections on each side at angle of  
mouth, longest barbel as long as eye;  
color silvery, everywhere sprinkled with  
black specks; fins plain . . . . .

Extrarius tetranemus (Gilbert)  
(Four-barbeled Minnow)

8. Eye small and high up, contained four or five times in length of head; head not flat above; forty-four scales in lateral line, six rows between insertion of dorsal and lateral line . . . . . 9

Eye large, contained three times in length of head; head broad and flattened above; thirty-eight scales in lateral line, five rows between insertion of dorsal and lateral line; dark band through eye and around snout . . . . .

Hybopsis winchelli (Girard)  
(Silver Chub)

9. Tail fin deeply forked; snout long and slender; lateral line straight; sides silvery, sparsely dusted with brownish specks; lower lobe of tail fin dark with a narrow border of white below . . .

Macrhybopsis galida (Girard)

Tail fin little forked; snout long and bluntish; lateral line somewhat decurved; sides with bright green and coppery reflections; a curved dusky bar back of gill cover; male in spring with crimson spots on head . .

Neocomus kentuckiensis (Rafinesque)  
(River Chub)



10. Lower lip thick or developed as a fleshy lobe  
     on each side . . . . . 11  
 Lower lip normally developed, not fleshy . . . 12

11. Dorsal fin inserted over ventrals; mouth inferior, jaws with thick lips; scales small and compressed forward; anal and dorsal fins with dusky crossbar; dusky vertical bar back of gill cover; males in spring with fins red and head covered with tubercles; iris of eye red in male

Campestris anomalum (Rafinesque)  
 (Stone Roller; Steel-backed Chub)

Dorsal fin inserted well forward of ventrals; mouth small, head blunt; pale olivaceous, a silvery lateral band and a conspicuous black spot at base of tail fin, other fins plain . . . . .

Phenacobius mirabilis (Girard)  
 (Sucker-mouth Minnow)

12. First (rudimentary) ray of dorsal fin simple or enlarged and blunt, detached from first developed ray to which it is connected with a membrane . . . . . 13  
 First (rudimentary) ray of dorsal fin closely attached to the first branched ray, as is usual among fishes . . . . . 15

13. Mouth small, rather inferior; snout very blunt and abruptly cut off; brownish above, sides darker or bluish; dorsal fin with faint spot at base or a dusky crossbar about half-way up . . . . . 14

Mouth larger, terminal; snout not so blunt; the sides more silvery with an obsolete black lateral band which terminates in a jet-black spot on tail fin; dorsal fin with a black spot on front rays . . . .

Ceratichthys vagilax (Baird and Girard)  
(Bull-head Minnow)

14. Lateral line more or less incomplete; body very short and thick; male dusky, the head jet-black with several large tubercles on the snout in spring . . . . .

Pimephales promelas (Rafinesque)  
(Fat-head; Black Head Minnow)

Lateral line complete; body moderately elongate; faint spot on dorsal fin; fins often reddish; male in spring with black on dorsal extended, head jet-black, snout with fourteen large tubercles . . .

Hyborhynchus notatus (Rafinesque)  
(Blunt-nosed Minnow)

15. Belly back of ventrals normally rounded, no keel,

the scales passing over it; basis of  
anal fin usually short, seven to eleven  
rays in anal fin . . . . . 16

Belly back of ventrals flattened to a sharp edge  
over which the scales do not pass; belly  
in front of ventrals rounded; anal basis  
elongate, twelve to fourteen rays in the  
anal fin; fins yellowish, the tops orange  
in spring males . . . . .

Notemmygonis crysoleucas (Mitchell)  
(Golden Shiner; Bream; Roach)

16. Scales very small, about eighty to eight-five  
in the lateral line; twelve to sixteen  
rows between dorsal and lateral line;  
about thirty-five scales in front of the  
dorsal fin; two black lateral bands . . . 17

Scales large, often silvery, about thirty to  
fifty in the lateral line; five to nine  
rows between dorsal fin and lateral line . 18

17. Lower black lateral band ending in a black spot  
on tail; upper black lateral band sometimes  
broken into spots; males in spring with  
belly and the interspaces between the  
lateral bands bright scarlet . . . .

Chrosomus erythrogaster (Rafinesque)  
(Red-bellied Dace)

Lower black lateral band distinct, broader,  
and not ending in a black spot; upper  
band never broken into spots; male as  
described above in the spring . . .

Chrosomus dakotensis (Everman and Cox)  
(Red-bellied Dace)

18. Dorsal fin inserted over or back of ventrals;  
sides with dark or bluish band; or with  
silvery or gilt streak, in which case  
the dorsal or tail fin shows a faint  
dusky spot; or dusky spot on each side  
of dorsal; spots on snout or at base  
of anal fin; or a violet and crimson  
crescent back of shoulders . . . . . 19

Dorsal fin inserted before ventrals; olivaceous  
above, sides silvery, fins pale and not  
spotted; lateral line decurved in front  
of dorsal fin; snout blunt, with very  
small, terminal mouth . . . . .

Hybognathus nuchalis (Agassiz)  
(Silvery Minnow)

19. Scales more or less closely overlapping, so that  
the exposed surfaces are deeper than  
long, especially along the sides of the  
body . . . . . 20

- Scales not very closely overlapping, not notably deeper than long, not especially crowded along sides of body . . . . . 23
20. Dorsal fin with a large or small black blotch on its forward rays, or dorsal fin dusky or black . . . . . 21
- Dorsal fin plain or reddish; lateral line strongly decurved; thirteen scales in front of the dorsal fin; males with belly orange, two purple and red crescents behind the shoulder, anal fin and tail blood-red; females plain greenish . . . . .
- Menidia lutrensis (Baird and Girard)  
(Red-Fin)
21. Scales more or less crowded forward, small, forty to fifty in lateral line; twenty-three to thirty before the dorsal fin; dorsal dusky or black; mouth moderate or large . . . . . 22
- Scales not crowded forward, moderately large, thirty-eight in lateral line, six rows between dorsal and lateral line; mouth small; dorsal with large black blotch in adult; snout blunt; males with silvery pigment . . . . .
- Eregala camura (Jordan and Meek)  
(Blunt-faced Minnow)

22. Dorsal fin somewhat dusky, other fins plain;  
anal fin with nine rays; sides silvery,  
a gilt line down the back and each side  
when in the water; six rows of scales  
between the dorsal fin and lateral line;  
spring males with belly and lower fins  
rosy . . . . .

Luxilus cornutus (Mitchell)  
(Shinner; Red Fin; Dace)

- Dorsal fin almost black, other fins dusky; anal  
fin with eleven rays; sides dusky; nine  
rows of scales between dorsal and lateral  
line; thirty scales before dorsal fin;  
spring males with white tubercles and  
lower fins rosy . . . . .

Lythrurus umbratilis (Girard)  
(Red Fin)

23. Lateral line more or less incomplete; a black  
band on snout or through eye and contin-  
ued on the snout . . . . . 24
- Lateral line complete, decurved forward or straight;  
dusky or silvery lateral band, or rows of  
black spots on base or above base of the  
anal fin . . . . . 25
24. Mouth very small; chin pale; lateral line wanting  
on some scales; black stripe through snout

and eye; a small spot on tail fin and a dusky spot or lateral shade along sides

Hybopsis cayuga (Meek)

Mouth moderate; chin black; lateral line extending about half the length of the body; blackish band on snout and a dusky lateral band . . . . .

Hybopsis heterodon (Cope)

25. A row or black spots at base or above base of anal fin; sides silvery; anal fin with ten or eleven rays . . . . . 26
- No black dots at base of anal fin; anal fin with seven, eight, or nine rays . . . . . 27
26. Seven series of scales above lateral line; eye large, larger than snout; snout bluntish, mouth small; a row of black dots above the base of the anal fin . . . . .

Notropis dilectus (Girard)

Five series of scales above the lateral line; eye smaller, usually shorter than snout; snout cone-shaped and rather pointed; a row of black spots along base of anal fin; male with tubercles and base of dorsal flushed

Notropis rubrifrons (Cope)  
(Red-faced Minnow)

27. Dusky or silvery lateral band ending in a black spot on tail fin or at its base . . . . 28
- Dark, silvery, or lead-colored lateral band not ending in a tail spot . . . . . 29

28. Eye very large, larger than the snout, which is short and blunt; lateral line nearly straight; eighteen scales before the dorsal fin; body elongate . . . . .

Hudsonius hudsonius (De Witt Clinton)  
(Spawn-eater; Spot-tailed Minnow)

Eye small; body stout and chubby; lateral line ducurved forward; olivaceous, a dusky lateral band ending in a small tail spot; males in spring and summer with the belly and the lower fins red or orange . . .

Codoma topoka (Gilbert)

29. Thirteen to fifteen scales before the dorsal fin, slightly crowded forward or not; five rows of scales between dorsal and lateral line; thirty-one to thirty-five scales in the lateral line; mouth small and rather inferior; seven or eight rays in anal fin . 30
- Seventeen scales before the dorsal fin; six rows between dorsal and lateral line; nine rays in the anal fin; mouth moderate and terminal;



back part of upper jaw not reaching eye;  
males in spring with sides and lower  
parts flame-red . . . . .

Cocotia zonatus (Agassiz)

30. Dorsal fin with eight or nine rays; the body  
moderately stout; head rather broad  
with rounded angles; the mouth small,  
and inferior; the sides pale, usually  
a darker band on back and a small dark  
spot before the dorsal fin . . . . .

Hybopsis blennius (Girard)  
(Straw-colored Minnow)

Dorsal fin with seven rays; scales more crowded  
and small forward; body stouter; head  
blunter; lips rather thick; silvery band  
on sides; dorsal fin with dusky shade on  
each side; dark spots on the snout . . .

Hybopsis scylla (Cope)

CYPRINUS (Arted.) Linnaeus.

(The Carps)

Body robust and flattened sidewise. Mouth moderate  
and terminal, with four long barbels. Snout blunt,  
rounded. Scales large. Lateral line continuous. Dorsal  
fin very long, with a stout spine, notched behind. Anal  
fin short, also with a spine. Large species introduced  
into America as a food fish. An abundant fish in most  
rivers, ponds, and bayous. Three varieties are recognized:  
the scale, the mirror, and the leather carps, based mainly

on the scaling of the body. The carp is normally covered with large scales. The mirror carp has a few series of very large scales. The leather carp is scaleless, olivaceous, varying into dusky and blue, the lower parts more or less suffused with yellowish.

Cyprinus carpio (Linnaeus)

(Carp)

Head small, its length contained in length of body about four times. Body stout, rather heavy forward. The greatest depth equal to one-third the length. Dorsal fin with three spines and twenty rays. The long spines are strongly notched behind. Anal fin with three spines and five rays. Ventrals with one spine and seven rays. A barbel on the upper lip and another at the angle of the mouth on each side. Thirty-eight scales in the lateral line. Color as given above.

CARASSIUS (Nilsson)

(The Golden Carp; Goldfish)

Body oblong, flattened sidewise, and elevated. The mouth terminal, without barbels. Scales large. Base of dorsal fin elongate. Anal fin short. Both fins with a spine which is notched behind. Ventral fins well forward. An introduced genus, domesticated, and degenerated into numerous varieties. It is quite often olivaceous or silvery in color rather than red. Often stocked in ponds as food for other fishes. Extremely hardy, prolific, and tenacious of life.

Carassius auratus (Linnaeus)

(Goldfish)

Head small in front of eye, being flattened on snout. Profile from snout to dorsal fin very steep. Mouth terminal and rather small. No barbels. Dorsal fin with two spines and eighteen rays. Dorsal fin very long, the spines notched behind. Anal fin with two spines and seven rays. Ventral fins with nine rays. Thirty scales in the lateral line. Scales deeper than long. Twenty-six to thirty scales in ventral line. Color olivaceous, usually orange or variegated in domestication. The variations are innumerable.

SEMOTILUS (Rafinesque)

(Fall-Fishes)

Body robust, moderately flattened sidewise, and elongate. Head large. Mouth terminal, wide, the upper jaw capable of being drawn forward. A small barbel on the maxillary just above the end; in most American minnows the barbel is at the tip. This barbel sometimes absent in the very young. Scales moderate. Lateral line continuous. Dorsal fin placed behind ventrals. Base of anal fin short. Species of large size, the largest of the chubs found in clear, swift streams.

Semotilus atromaculatus (Mitchell)

(Horned Dace; Creek Chub)

Head large and heavy, broad and rounded above; snout broad; mouth broad, oblique; back part of upper jaw barely reaching front of eye; barbel small. Body stout, the outline arched in front of the dorsal fin, the body tapering backward from that point so that the base of the dorsal is slightly tipped backward. Eye rather small. Scales small, crowded, and somewhat smaller forward; thirty scales in front of the dorsal fin. Nine scales from dorsal fin to lateral line. Dorsal fin with seven rays, the length of the dorsal base equal to the combined length of the eye and snout. The first divided ray is the longest, its length two-thirds that of the head. Dorsal fin inserted well behind the ventrals. Anal fin with eight rays, its base is little more than one-third length of head. The tail fin is not deeply forked, its middle rays being about two-thirds as long as the exterior rays. Color dusky bluish above; sides with a vague, dusky band, black in the young, disappearing in the adult; belly light yellow, tinted with red in the spring male; dorsal fin always with a conspicuous black spot at the base in front, which is bordered with red in the spring male; a black line down back; scales edged with dark specks; a dusky bar behind gill cover; young with a small black tail spot; males with tubercles in the spring.

PLATYCOBIO (Gill)

Body rather elongate, somewhat flattened sidewise. Head rather short, more or less broad and flattened above.

Mouth rather large, almost terminal, with a well-developed barbel at its angle, at the extremity of the maxillary. Scales large. Lateral line continuous. Dorsal fin inserted in front of ventrals. Size large. Males with nuptial pigments or bright colors.

Platygo bio gracilis (Richardson)

(Flat-headed Chub)

Head small and short, its upper surface very broad and flat, the width between the eyes being nearly one-half the length of the head. Length of head contained in length of body four and one-half times. Body rather elongate, somewhat flattened sidewise. Depth contained in length four and three-fourths times. Mouth rather large, slightly oblique, the upper lip on level of the lower level of the eye. Back part of upper jaw reaching the eye. Upper jaw capable of being drawn forward. Eye rather small and high up. Scales large and silvery; lateral line decurved; twenty-three scales in front of dorsal fin; fifty scales in lateral line; six rows between dorsal fin and lateral line. Fins rather large. Dorsal fin in advance of middle of the body. Dorsal with eight rays. Anal fin with eight rays. Pectorals scythe-like in shape, the upper rays elongate. Color pale; back olive, sides and below silvery; fins pale; no dark lateral band or tail spot; head white or mostly so.

ERINEMUS (Jordan)

Erinemus storerianus (Kirtland)

(Storer's Chub)

Head short, flattened sidewise, the cheeks nearly vertical. Space between eyes broad and flat, somewhat grooved. Length of head contained in length of body four and one-third times. Eye very large, high up, its length contained in length of head about three times. Body elongate, flattened sidewise, the back somewhat elevated from head to dorsal fin, thereafter rapidly declining to the long slender portion between the dorsal fin and the tail fin. Bone before the eye oblong and conspicuous, silvery. Mouth small, back part not reaching to the eye. Snout abruptly cut off, the tip thickened forming a pad. Rows of scales along back converging behind dorsal fin.

Forty-two scales in the lateral line. Five rows between the dorsal and lateral line. Fins rather higher than in H. kentuckiensis. Dorsal fin inserted well forward, over ventrals. The pectoral fins pointed. Tail fin long and deeply forked. Color translucent greenish above; sides and below brilliantly silvery; cheeks and gill covers with a bright silvery luster; fins plain; a slight lead-colored band or shade; not with a tail spot.

EXTRARIUS (Jordan)

Extrarius tetranemus (Gilbert)

(Four-barbeled Minnow)

Head very slender, its length contained in length of body four times. Body robust, its greatest depth contained in length five and one-third times. Snout two and one-half times in head, one-third of it projecting over the mouth. Eye small, contained five times in length of head. Two barbels at each angle of the mouth, the one pair taking the place of the fleshy prominence in H. gelida; longest barbel as long as eye. Dorsal fin with eight rays, over ventrals, a little nearer tip of snout than tail fin. Anal fin with eight rays. Thirty-six to thirty-eight scales in lateral line. Fins large. Color silvery, everywhere sprinkled with small black dots, rather irregular above; middle rays of each lobe of the tail fin dusky at the base.

HYBOPSIS (Agassiz)

Hybopsis winchelli (Girard)

(Silver Chub)

Head contained in length of body four times. Mouth horizontal, rather inferior, and small. Upper jaw below level of eye. Barbel evident. Back part of upper jaw not reaching eye. Eye very large, longer than snout, and longer than space between eyes which is broad and flat. Length of eye contained in length of head three times. Thirty-eight scales lateral line; five rows between the

dorsal fin and lateral line; sixteen scales before the dorsal fin. Body rather slender, its depth contained in length five times. Fins moderate. Dorsal with eight rays. Anal with seven rays. Color translucent greenish; scales somewhat dark-edged; sides with a bright silvery band which overlies dark pigment, so that a lead-colored or black band sometimes appears; a dark band through eye and around snout; males without tubercles or red coloration.

Hybopsis sayuga (Meek)

Head contained in length four and one-sixth times. Depth of body four and one-half times in length. Eye contained in head three and one-fifth times. Scales in lateral line thirty-six, fourteen before the dorsal fin. Lateral line wanting on some scales. Best separated from H. heterodon by the absence of black on the chin. Mouth very small, anterior, the back part of the upper jaw not reaching the eye. Scales above dark-edged, the outlines very sharply defined; chin not black; a black stripe through snout and eye, a dusky lateral shade and a small tail spot.

Hybopsis heterodon (Cope)

Head rather pointed; length of head contained in the length of body four times. Body moderately stout, the back elevated. Depth of body contained in length four times. Mouth oblique; lower jaw projecting; upper lip opposite front of eye. Eye contained three times in the length of the head. Thirty-six scales in lateral line; thirteen scales in front of dorsal fin. Lateral line usually imperfect. Dorsal with eight rays. Anal with eight rays. Color olivaceous; chin black; a black band on snout; sides of the body with a leaden or dusky band. Length two and one-half inches. Subject to large variations.

Hybopsis blennius (Girard)

(Straw-colored Minnow)

Head rather large, broad, with rounded angles. The mouth small, inferior, horizontal; snout very obtuse; upper jaw extending back to eye. Body slender, elongate, its greatest depth one-fifth of total length. Eye large, a little longer than snout. Dorsal fin with eight or nine rays; a little nearer to tip of snout than to base of tail, its origin about over end of pectoral, its longest

ray three-fourths as long as the head. Anal fin with seven or eight rays. Thirty-two to thirty-eight scales in lateral line; five rows between insertion of dorsal fin and lateral line; fifteen rows of scales in front of dorsal fin. Color pale olivaceous; sides usually pale; usually a darker dorsal band and a small dark blotch before dorsal fin, sometimes a lead-colored lateral stripe but no tail spot; fins all plain. Very variable. Length two to two and one-half inches.

Hybopsis scylla (Cope)

Head contained in length of body four times. Body stouter and shorter, blunter head than in H. blennius. Depth of body contained in length four and one-fourth times. Eye large, about three and one-third times in length of head, longer than snout, which is contained in the length of the head four times. Mouth small, with the cleft sometimes rather oblique; lips rather thick. Scales larger than in H. blennius, those before dorsal fin smaller and more crowded, fourteen or fifteen in number. Dorsal fin beginning nearly over ventrals. Dorsal with seven rays. Anal with seven rays. Thirty-one to thirty-three scales in lateral line. Color pale; back greenish; sides with a silvery band; no spots on fins; a dusky shade on each side of dorsal and before it; some dark dots on snout; often a faint dark lateral shade. Length two and three-fourths inches.

MACRHYBOPSIS (Cockerell and Alliston)

Macrhybopsis gelida (Girard)

Head long and slender, its length contained in the length of body four times. Body slender, not much flattened sidewise, back little arched. Mouth inferior, broad, overhung by the very long, pointed snout, which is considerably decurved. Barbel short, contained one and two-thirds times in eye. Eyes very small, high up. Space between eyes equal to width of mouth, about three times in length of head. Lateral line continuous. Forty-four scales in lateral line. Six rows of scales between dorsal fin and lateral line. Fins moderate. Origin of dorsal directly over ventrals. Dorsal fin with eight rays. Free edge of dorsal slightly concave, the forward ray little produced; its forward ray one and three-fifths in head. Anal fin with nine rays. Free edge of

anal fin slightly concave. Pectorals short, about one and one-half in head, not reaching ventrals. Ventrals barely reaching vent. Tail very long and deeply forked, the lobes as long as head, the lower slightly the longer. Color, sides silvery, pale below; scales of back each with a group of fine dark specks on the back border, these extending almost to lateral line; rest of back and upper part of sides sparsely dusted over with minute brownish specks; fins all plain, except the tail, the lower lobe of which is dark, with a narrow white border below; upper lobe slightly dark at base. This species distinguished from Macrhybopsis meeki, which may be present in Kansas, by the much longer and more pointed snout, the smaller eye, the much shorter pectoral fins, and the darker coloration of the back.

### Nocomus (Girard)

#### Nocomus kentuckiensis (Rafinesque)

(Horned Chub; River Chub)

Head large, rather broadly rounded above. The snout cone-shaped, bluntish. Length of head contained in length of body four times. Body rather robust, not much flattened sidewise. Depth of body contained in length four and one-fourth times. Mouth rather large, almost terminal, the lower jaw somewhat the shorter. Upper lip below level of eye; back part of upper jaw not reaching eye. Eye small, high up. Barbel well developed. Lateral line somewhat decurved. Forty-one scales in lateral line. Six rows between lateral line and dorsal fin. Fins moderate. Dorsal fin with eight rays; rather back in position, slightly behind insertion of ventrals. Tail fin broad, little forked. Anal fin with seven rays. Scales large, not crowded forward, eighteen scales in front of the dorsal fin. Color bluish olive; sides with bright green and coppery reflections; a curved dusky bar behind the gill cover; scales above with dark borders; belly pale, but not silvery, rosy in spring males; fins all pale orange, without black spot; males in spring with crimson spot on side of head; adults with the top of the head swollen, forming a sort of crest, this sometimes a third of an inch higher than level of the neck and is covered with large tubercles; young with a dark tail spot. Variable and widely diffused.



CAMPOSTOMA (Agassiz)

(Stone Rollers).

Body moderately elongate, little flattened sidewise. Jaws with thick lips and rudiment of a hard sheath. The front of upper jaw capable of being drawn forward. No barbel. Scales moderate. Lateral line present. Dorsal fin over ventrals. Anal fin short. No spines. Size moderate. Sexual differences very great, the males being covered with large tubercles in spring.

Campostoma anomalum (Rafinesque)

(Stone-roller; Steel-backed Chub)

Head contained in length of body four and one-third times. Body moderately stout and not flattened sidewise; portion of body between dorsal fin and tail long and steep. The greatest depth contained in length of body four to four and one-half times; depth of portion of body behind dorsal fin eight and one-half times in length. Region before the dorsal becoming swollen in the adult. Snout moderately decurved. Scales deep, rather small, and crowded forward. Fifty-three scales in lateral line. Seven series between dorsal fin and lateral line. Back part of upper jaw not reaching to opposite eye. Dorsal fin with eight rays. The dorsal base one-half and its longest rays two-thirds as long as head. Ventrals reaching nearly to vent. Tail fin moderately forked. Color brownish, with a brassy luster above, the scales more or less mottled with dark; a dusky vertical bar behind gill cover; dorsal and anal fins each with a dusky crossbar about half-way up, the rest of the fin olivaceous in females, fiery red in spring males; iris of eye red in males. Males in spring with the head and often the whole body covered with large rounded tubercles. In no other Cyprinoid are these tubercles so well developed.

PHENACOBUS (Cope)

Body elongate, little flattened sidewise. Head almost cylindrical. Mouth inferior, the lower lip enlarged as a fleshy lobe on each side toward the angle of the mouth. No barbel. Upper jaw capable of being drawn forward. Scales rather small. Lateral line complete. Dorsal fin inserted in front of ventrals. Basis of anal fin short. Small species with the aspect of young suckers.

Phenacobius mirabilis (Girard)

(Sucker-mouth Minnow)

Head short, rather blunt forward; its length contained in length of body four and one-third times. Eye large, its diameter contained four times in length of head. Mouth small, inferior, the back part of the upper jaw not reaching to eye. Body moderately slender, its depth contained four and one-half times in length. Scales small; forty-eight to fifty-two in lateral line, seven between insertion of dorsal and lateral line. Color pale olivaceous; a silvery lateral band and a conspicuous black spot at base of tail, smaller than eye; outlines of scales blended, not emphasized by dark edgings. Fins plain.

Ceratichthys (Baird and Girard)Ceratichthys vigilax (Baird and Girard)

(Bull-head Minnow)

Head broad and flat above, its length contained four and one-fourth times in length of body. Body stout, somewhat flattened sidewise, broad and flat above, with portion between dorsal fin and tail deep. Depth of body contained four and one-half times in length. Eye large, its diameter contained three and one-half times in length of head. Muzzle broad and less sharply cut off than in Hyberbrynchus notatus, mouth larger, terminal, horizontal, the back part of the upper jaw not reaching eye. Dorsal fin with eight rays; inserted above the ventrals and nearer the snout than the tail. Anal fin with seven rays. Scales crowded before the dorsal, in about twenty series. Forty-two scales in lateral line, eight rows between insertion of dorsal and lateral line. Color yellowish, rather dusky; sides silvery, with an obsolete black lateral band, which terminates in a jet-black spot; a very distinct black spot on forward rays of dorsal fin about half way up. Resembles H. notatus, but more silvery, less lead-colored, and the black spots more sharply defined. The spring males have little if any black pigment.

PIMEPHALES (Rafinesque)

(Fat-Heads)

Body rather robust, little flattened sidewise. Head short and blunt. Mouth small, inferior; upper jaw capable of being drawn forward. No barbel. Dorsal fin over ventrals, its first (rudimentary) ray separated from the rest by a membrane, not attached to it, as is usual in minnows; this character most distinct in adult. In the male the skin of the first ray is thickened. Basis of anal fin short. Scales rather small. Lateral line complete or variously incomplete. Size small. The breeding males with much black pigment and with large warts on the head.

Pimephales promelas (Rafinesque)

(Fat-head; Black-head Minnow)

Head short with a very obtuse snout, the head everywhere convex. Head contained in length of body four times. Mouth small, inferior, horizontal; the back part of the upper jaw not reaching vertical through hinder nostril. Body short, deep, and moderately thick; its depth contained four times in length. Dorsal fin with one (rudimentary) ray and seven branched rays. Base of the dorsal two-thirds as long as the head; the first ray about as long as eye, and the longest about as long as the head without snout. Anal fin with seven rays; its base equals nearly one-half the length of head, and the longest ray is as long as the dorsal base. The tail is moderately formed as to size and not deeply forked. Scales deep, closely overlapping; forty-seven to forty-three in lateral line; seven rows between insertion of dorsal and lateral line. Lateral line sometimes almost wanting. Color olivaceous, the dorsal with a large black bar across it, nearly half-way up, most distinct forward, appearing as a simple dusky shade in young. Male dusky, the head jet-black, with several large tubercles on the snout in spring; a dusky shade along sides of body between dorsal and tail fin.

HYBORHYNCHUS (Agassiz)Hyborhynchus notatus (Rafinesque)

(Blunt-nosed Minnow)

Head moderate; the muzzle blunt and convex; top of head flat. Length of head contained in length of body four and one-half times. Cheeks vertical. Mouth small, inferior, horizontal. Body rather elongate, moderately flattened sidewise; portion between dorsal and tail fin slender. Depth of body contained in length five times. Dorsal fin with one (rudimentary) ray and eight branched ones. Anal fin with seven rays. Scales moderate, deep, closely overlapping; scales in front of dorsal small and crowded, in twenty-three rows. Color olivaceous, little silvery; sides bluish; a black spot on the dorsal fin in front, near the base, less distinct than in *G. vigilax*; a dusky shade at base of tail; fins often reddish; males in spring with the black extended and the head wholly black; snout with about fourteen large tubercles. Species differing from *P. promelas* in its larger size and in having a complete lateral line, but the sexual differences are similar. Often reaches a length of four inches. Extremely variable and changing with age.

#### NOTEMYGONUS (Rafinesque)

##### Notemigonus crysoleucas (Mitchell)

(Golden Shiner; Roach; Bream)

Head short, almost cone-shaped, flattened sidewise, the profile somewhat concave. Length of head contained in length of body four and one-half times. Mouth small, oblique, the upper lip on level of upper part of pupil of eye. Body moderately elongate, strongly flattened sidewise. Depth of body contained in length three times. Eye moderate, contained in head about four times. Scales small, forty-six to fifty-five in lateral line; ten series between insertion of dorsal and lateral line. Fins medium. Dorsal fin with eight rays. Anal fin with about thirteen rays. Color clear greenish above; sides silvery, with bright reflections; slight yellowish tinge to fins, the tips of the lower fins sometimes orange in spring males.

#### CHROSOMUS (Rafinesque)

Body moderately elongate, little flattened sidewise. Jaws normal, not with a barbel. Scales very small. The lateral line short or wanting. Dorsal fin behind the

ventrals; basis of anal fin short. Size small. Colors in the spring brilliant, the pigment bright red.

Chrosomus erythrogaster (Rafinesque)

(Red-bellied Dace)

Head conical with pointed snout as long as the eye, which is one-fourth as long as the head. Length of head contained in length of body four times. Mouth terminal, moderate; the back part of the upper jaw reaching nearly to front part of eye. Body oblong, little flattened sidewise, tapering each way from the middle. Depth of the body contained in length four times. Least depth of portion between dorsal and tail contained in length of body eight and one-half times. Scales quite small, firmly attached, but not much overlapping; about eighty-five in lateral line; sixteen series between insertion of dorsal and lateral line. Lateral line varying, sometimes reaching above ventrals, but usually not extending to ventrals. Fins rather small; the dorsal and anal high and short; tail long. Dorsal fin with seven rays; the base of dorsal one-half as long as head; the longest ray equals length of head without snout. Anal fin with eight rays; base of anal two-fifths as long as the head; the longest ray equal to longest of dorsal. Color brownish olive, with a dusky line down back and often some dark spots; two black lateral bands nearly parallel, the one from the upper angle of the gill cover straight to the tail, sometimes broken into spots behind; the lower broader, extending from snout through eye, curved downward along the belly and extending to the tail where it ends in a black spot; between these bands a bright silvery area; belly below the lower band abruptly silvery; females obscurely marked. Males in spring with belly and the interspace between the lateral bands bright scarlet; bases of the vertical fins also scarlet; body somewhat covered everywhere with minute tubercles.

Chrosomus dakotensis (Evermann and Cox)

Head contained in length of body three and eight-ninths times. Body moderately stout, head heavy, the portion of the body between dorsal and tail shorter than in related species. Depth of body contained in length four and one-half times. Eye moderate, space between eyes contained three times in length of head. Mouth small and oblique; back part of upper jaw not reaching to eye; lower jaw projecting. Scales small, about eighty in lateral line; about twenty-four in a cross series.

Dorsal fin with eight rays; height of dorsal one and one-half in length of head. Anal fin with eight rays, similar to dorsal. Origin of dorsal fin behind the ventrals a distance greater than the length of the snout. Pectorals short, one and one-half times in length of head; ventrals very short, not reaching anal. Color as in C. erythrogaster, except that the back is darker and the upper dark line is continuous and not at all broken up into spots; the lower black line is distinct, broader, and does not end in a black spot.

### HYBOGNATHUS (Agassiz)

Body elongate, somewhat flattened sidewise. Mouth horizontal, the jaws sharp-edged; lower jaw with a sharp hard protuberance in front. No barbel. Upper jaw capable of being drawn forward. Scales large. The lateral line continuous. Dorsal fin inserted before the ventrals. Basis of anal fin very short. Size moderate. Sexual changes very slight, no red or black pigment distinguishing males in spring. Species not especially well known. Probably more than one species in Kansas.

### Hybognathus nuchalis (Agassiz)

(Silvery Minnow)

Head short, its upper and lower profiles tapering equally into the short and not very obtuse snout, which is as long as the eye. Length of head contained in the length of body four and one-half times. Mouth small, slightly oblique, the jaws nearly equal, or the lower slightly included; the back part of the upper jaw reaching to below the forward nostril. No barbel. Upper jaw heavy, lower jaw thin. Body elongate, comparatively slender; its depth contained in length four and one-eighth times. Scales large and silvery; thirty-eight in the lateral line; five series between insertion of dorsal and lateral line; twelve to fourteen large scales in front of dorsal fin. Lateral line decurved. Dorsal fin with eight rays; its base two-thirds as long as the head; the longest ray equals the distance from nostril to end of gill opening, and the longest anal ray is two-thirds as long as the head. Anal fin with seven rays, the last ray one-third the length of the head. Tail fin moderate in size and deeply forked, the middle rays less than one-half as long as the external rays. Color olivaceous green

above, translucent in life; sides clear silvery, with bright reflections; fins not spotted; coloration becoming dusky in specimens living in dark waters. Variety placita may be present in Kansas; the eye is contained five times in length of head, whereas in typical nuchalis this is four; snout flat and blunt, with very small mouth.

MONIANA (Girard)

Moniana lutrensis (Baird and Girard)

(Red-Fin)

Head stout and deep, its upper profile flattened, portion between head and dorsal fin elevated, so that the profile is somewhat concave. Length of head contained in length of body three and two-thirds times. Young more slender, the form rather elongate or elliptical. Mouth rather large, quite oblique, the lower jaw included. Eye small, its diameter contained in length of head four times. Body oblong, elevated, strongly flattened side-wise. Depth of body contained in length three to four times in adult. Dorsal fin with seven or eight rays. Anal fin with seven rays. Thirty-five scales in lateral line; lateral line strongly decurved; six rows of scales between insertion of dorsal fin and lateral line. Thirteen scales before dorsal fin. Colors in life brilliant, steel-blue; the lower parts silvery; the belly orange-red in males; a conspicuous violet-colored crescent behind the shoulders, followed by a crimson crescent; fins reddish, the anal and tail blood red. Female plain greenish, the fins not spotted.

EROGALA (Jordan and Brayton)

Erogala samura (Jordan and Meek)

(Blunt-faced Minnow)

Head contained in length four and one-fifth times. Body robust, the back elevated; forward profile steep, the snout bluntly decurved. Mouth small, oblique. Depth of body contained in length three and one-half times. Thirty-eight scales in lateral line. Six rows between

insertion of dorsal and lateral line. Dorsal fin with eight rays. Anal fin with nine rays. Color bluish silvery; dorsal fin in adult with a large dark blotch; males with silvery pigment. Length of adult four inches.

### LUXILUS (Rafinesque)

#### Luxilus cornutus (Mitchell)

(Shinner; Red-fin; Dace)

Head rather heavy, flattened sidewise, rounded between the eyes; its length contained in length of body four and one-fourth times. Mouth moderate, nearly horizontal, the jaws nearly equal; back part of upper jaw scarcely reaching eye; front part of upper jaw below level of eye. Eye moderate, its diameter contained in length of head four or five times. Width of head about one-half its length. The red-fin when young has the body moderately elongate, but it becomes deeper with age and much flattened sidewise. Depth of body contained in length three and one-fourth times. Scales always deeper than long on the sides, becoming extremely deep in the adult. Forty-one scales in the lateral line; six rows between insertion of dorsal fin and lateral line. Lateral line decurved. Dorsal fin with eight rays, its origin over ventrals; length of dorsal base equal to one-seventh of total length, its longest rays one-fifth of same length. Anal fin with nine rays; its base one-half, and the longest ray two-thirds as long as the head. Region in front of dorsal typically with about twenty-three scales. The pectorals barely or not reaching ventrals, the latter about to vent. Coloration dark steel-blue above, scales dusky at edges and base; a gilt line along the silvery sides, and another along back; belly silvery except in spring males, in which it is a bright rosy color; dorsal fin dusky, other fins plain; lower fins all rosy in spring males; head dark above; a dark shade behind shoulder; lower jaw and the top of head covered with small tubercles in spring males; females and young are plain olivaceous above and silvery below.



LYTHRURUS (Jordan)Lythrurus umbratilis (Girard)

(Red-fin)

Head long, cone-shaped, rather pointed. Length of head contained in length of body four times or four and one-fourth times. Body flattened sidewise, the portion between dorsal and tail long. Mouth large, moderately oblique, the back part of upper jaw extending to the eye. The lower jaw somewhat projecting. Eye moderate, about equal to muzzle. Depth of body four to four and one-half in length. Scales closely overlapping, crowded forward, about thirty scales before the dorsal. The dorsal fin with seven rays, high, inserted half-way between ventrals and anal. Anal with eleven rays. Forty to fifty-two scales in lateral line; nine rows between insertion of dorsal and lateral line. Color dark steel-blue above; pale or silvery below; a more or less evident spot at the base of dorsal fin, often wanting entirely. Males with all fins largely black and the head covered with small whitish tubercles; the belly and lower fins red in the spring. Females pale olive. The variety umbratilis has the head contained in length of body four times. Depth of body contained in length three and one-third times. Dorsal fin with eight rays. Body short, deep, and rather flattened sidewise. Male steel-blue, smutty above, a dark curved bar on shoulder region; dorsal black except at the base, the dark spot in front obscure; lower fins all rosy or dusky; females very pale olive, the black shoulder bar usually plain, the dark spot represented by dark pin points.

NOTROPIS (Rafinesque)Notropis dilectus (Girard)

Head contained in length of body four and two-thirds times. Body elongate, flattened sidewise. Snout blunt; eye large, larger than the snout, contained in length of head three times. Depth of body contained in length four and three-fourths times. Mouth oblique, rather small, the back part of upper jaw reaching eye. Scales large, thirty-eight in lateral line; seven rows between insertion of dorsal fin and the lateral line. Dorsal fin with eight

rays. Anal fin with eleven rays. Color very pale; and silvery; the snout and bases of fins rosy; a row of black dots above base of anal fin; young often finely speckled. Length three and one-half inches.

Notropis rubrifrons (Cope)

(Red-faced Minnow)

Head rather long, cone-shaped, and rather pointed. Length of head contained in length of body four times. Mouth rather large, very oblique; upper lip above the middle line of pupil of eye, back part of upper jaw reaching to eye. Eye moderate, usually shorter than the sharp snout; its diameter contained in length of head four times. Body moderately elongate, the back scarcely elevated. Thirty-nine scales in lateral line, those before the dorsal fin fifteen to seventeen in number, five rows between insertion of dorsal fin and lateral line. Dorsal fin with eight rays; its base one-half as long as head, and the longest ray equal to length of head without snout. Anal fin with ten rays; the base as long as the snout and eye combined, the longest anal ray two-thirds as long as head. Tail fin moderate in size and deeply forked. Color olivaceous above; darker edges on scales; sides silvery; a dark line down back; a row of dark dots along base of anal fin; males with snout tuberculate in spring, the forehead, gill cover region, and base of dorsal being then flushed with red. May grade into dilectus, but with longer and sharper snout and smaller eye.

HUDSONIUS (Girard)

Hudsonius hudsonius (De Witt Clinton)

(Spawn-eater; Spot-tailed Minnow)

Head cone-shaped, with short, blunt snout equal to diameter of eye, which is contained three and one-half times in length of head. Length of head contained in length of body four and three-fourths times. Mouth moderate, nearly horizontal, the back part of upper jaw nearly reaching to eye. Body elongate, considerably flattened sidewise in adult; depth of body contained in length four times. Lateral line nearly straight, slightly decurved forward. Thirty-nine scales in lateral line;

five rows between dorsal and lateral line. Dorsal fin with eight rays, its base two-thirds as long as head, and the longest ray as long as the head. Anal fin with eight rays, its base one-half and the longest ray four-fifths as long as the head. Tail large and deeply forked, its middle rays half as long as the outer. Color very pale, usually with dusky or black spot at base of tail, especially in young; sides with a broad, silvery band, which is sometimes dusky; width of band about equal to diameter of eye. A large species, four to six inches long.

### CODOMA (Birard)

#### Codoma topeka (Gilbert)

Head contained in length of body four times. Body flattened sidewise, stout and chubby; snout blunt; mouth small, terminal, oblique. Depth of body contained in length three and three-fifths times. Diameter of eye contained in eye four and one-fifth times. Dorsal fin with eight rays; fourteen scales before dorsal. Anal fin with seven rays. Lateral line decurved forward. Thirty-five scales in lateral line; five rows between dorsal and lateral line. Color olivaceous, a dusky lateral streak ending in a small caudal spot; males in spring and summer with sides and lower fins bright red or orange. Length two and three-fourths inches.

### COCCOTIS (Jordan)

#### Coccotis senatus (Agassiz)

Head contained in length four and one-fourth times. Eye very large, its diameter contained in length of head three times. Body rather elongate, the head long. Mouth with jaws equal, the back part of upper jaw not reaching eye; snout bluntish. Lateral line decurved, with forty-two scales in it; six rows between dorsal and lateral line. Dorsal fin with eight rays. Anal fin with nine rays. The color olivaceous, with black lateral band (plumbeous in female); no tail spot and no spots on fins. Male in the spring with the sides and lower parts flame-red. Length five inches.

Family CATOSTOMIDAE

(The Suckers)

1. Dorsal fin elongate with twenty-five to thirty rays . . . . . 2  
 Dorsal fin short with ten to eighteen rays . . . 7
2. A non-bony space on top of head covered with a membrane; body ovate; scales large, from thirty-five to forty-one in lateral line . . . . . 3  
 Non-bony space on top of head obliterated by the union of bones; body elongate; scales small, about fifty-six in lateral line; mouth small, inferior; head small; jet-black in color . . . . .
- Cyteleptus elongatus (Le Sueur)  
 (Black Horse; Gourd Seed Sucker)
3. Mouth large, more or less terminal, capable of being drawn forward; large species, dark in color . . . . . 4  
 Mouth smaller, inferior, capable of being drawn downward; smaller species, pale in color . . . 6
4. Eight rows of scales from insertion of dorsal fin downward to lateral line; mouth small and slightly inferior, lips thicker than in next . . . . . 5

Seven rows of scales from insertion of dorsal fin downward to lateral line; mouth large, terminal; lips very thin; gill cover large, striated, nearly one-half the length of the head . . . . .

Megastomatobus cyprinella (Cuvier and Valenciennes)  
(Red-mouthed Buffalo)

5. Back scarcely elevated, the greatest depth of the body three and one-fourth times in length; back without keel; anal fin rounded; head not much pointed . . .

Ictiobus urus (Agassiz)  
(Mongrel Buffalo; Black Buffalo)

Back elevated and almost keeled, the depth of the body two and one-half to two and three-fourths in length; anal fin with rays rapidly shortened, the middle ones much shorter than the longer; head pointed, triangular . . . . .

Ictiobus bubalus (Rafinesque)  
(Small-mouthed Buffalo; Razor-back)

6. Body somewhat tapering toward both ends, rather more abruptly forward, the greatest depth about three times in length; lips thin, silvery white in life, the halves of the

lower lip meeting at a wide angle; dorsal  
fin with thirty rays . . . . .

Carpiodon carpio (Rafinesque)  
(Carp Sucker)

Body oval oblong, the back elevated, the depth  
two and one-half times in length; lips  
full, thick, reddish in life, halves of  
lower lip meeting at an acute angle;  
dorsal fin with twenty-six rays, the  
first ray usually very long . . . . .

Carpiodon velifer (Rafinesque)  
(Spear Fish; Skin Back)

7. Lateral line complete, not chain-like; scales  
small, fifty to seventy in lateral line . . . 8

Lateral line complete, or chain-like; may be feeble  
or absent; scales large, thirty-six to  
fourty-seven in lateral line . . . . . 9

8. Head cone-shaped, crosswise convex between the  
eyes; scales in lateral line sixty-four  
to seventy, scales crowded toward head;  
upper lip with three to six series of  
fleshy projections . . . . .

Catostomus commersonii (Lacepede)  
(Common Sucker; Fine-scaled Sucker)

Head broad, crosswise concave between eyes;  
scales in lateral line forty-eight to

fifty-five, not crowded toward the head;  
lips very thick, upper lip with eight to  
ten series of fleshy projections . .

Hypentelium nigricans (Le Sueur)  
(Hog Sucker; Stone Roller)

9. Mouth small, slightly inferior; muzzle project-  
ing very little beyond the mouth . . . . 10

Mouth large, inferior; bluntish muzzle project-  
ing beyond mouth, lips full and folded;  
lower fins pale, always red in life .

Hexostema aureolum (Le Sueur)  
(Red Horse; Large-Scaled Sucker)

10. No lateral line; usually pale streaks along rows  
of scales; young with a black lateral  
band not found in next; fifteen series  
of scales from dorsal to ventral fins;  
scales more or less crowded forward .

Erismyzon sucetta (Lacepede)  
(Creek Fish; Chub Sucker)

Lateral line, more or less developed, especially  
in adult; dark streaks along rows of scales;  
thirteen series of scales from dorsal to  
ventral fins; scales not crowded forward .

Minytrema melanops (Rafinesque)  
(White Sucker; Spotted Sucker)

CYCLOPTUS (Rafinesque)

(Black Horse)

Head very small, short and slender, six to seven times in length of body; its upper surface rounded. Eye small, behind middle of head, not very high up. Non-bony spot on top of head entirely obliterated. Mouth small, entirely inferior, overlapped by the projecting snout; upper lip thick, pendent, covered with several rows of tubercles; lower lip moderate, less full than Catostomus. Gill cover smooth and narrow. Body elevated, elongate, moderately flattened sidewise; portion between dorsal fin and tail long; scales moderate, about equal over the body, with wide, exposed surfaces; the number in the lateral line fifty-five to sixty. Lateral line well developed, nearly straight. Fins rather large; dorsal beginning in front of ventrals and ending just before the anal, of about thirty rays, the first and second developed rays in length more than one-half the length of base of the fin, the rays rapidly shortened to about the eighth, the rest of the rays all short; tail fin large, deeply forked. Anal fin quite small, low, of seven or eight rays, scaly at base. Ventrals moderate, with ten rays. Sexual differences marked; the males in spring with black pigment; the head then covered with small tubercles. One species known.

Cycloptus elongatus (Le Sueur)

(Black Horse; Gourd Seed Sucker)

Head contained six to eight and one-half times in the length of the body. Depth of body contained four to five in length. Eye small, its diameter contained six to seven in length of head. Dorsal fin with thirty rays; the longest dorsal ray a little longer than head. Anal fin with seven or eight rays. Pectorals rather longer than head. Fifty-six scales in lateral line; nine rows between dorsal and lateral line. Color very dark, the males in spring almost black. Size large.

ICTIOBUS (Rafinesque)

(Buffalo Fishes)

Body robust. Scales large, thick, nearly equal over the body; lateral line well developed, slightly decurved



forward. Head very large and strong. Eye moderate and forward. Non-bony space on top of head, which is covered with membrane, large and well open. Gill cover strongly furrowed. Mouth terminal. Lips little developed; the upper narrow and smooth; the lower rather full on the sides, but reduced to a narrow rim in front. The dorsal fin elongate, its rays twenty-five to thirty; forward rays somewhat elevated, their length about one-half that of base of the fin; tail not much forked; anal fin not much elevated, its rays about nine; pectorals and ventrals moderate, the latter with about ten rays. Sexual differences slight. Coloration dark, not silvery. Fishes of large size.

Ictiobus urus (Agassiz)

(Mengrel Buffalo; Black Buffalo)

Head very stout, strongly convex crosswise, thicker, larger, and less pointed than in I. bubalus; its length about four in length of body. Eye about equal to snout, five and one-half in length of head, smaller than in I. bubalus. Mouth large, considerably oblique, opening well forward, approaching that of M. cyprinella. Body less elevated and less flattened sidewise than in I. bubalus, the back not at all keeled; depth of body three to three and one-fourth times in length. Forty-one scales in lateral line; eight series between insertion of dorsal fin and lateral line. Dorsal fin lower and less rapidly shortened than in the next, the longest ray scarcely one-half the length of the base of the fin. Dorsal fin with thirty rays. Anal fin with ten rays. Anal rounded; its rays not rapidly shortened; the middle ones not much shorter than the longest. Color very dark; fins all black. May be very close to M. cyprinella.

Ictiobus bubalus (Rafinesque)

(Small-mouthed Buffalo; Razor-backed Buffalo)

Head moderate, triangular in outline when viewed from the side; its length contained four times in length of body. Eye equal to snout, about four to five times in the length of head, much larger than in I. urus. Mouth quite small, notably smaller and more inferior than in I. urus. Body considerably elevated and flattened sidewise above; the back region almost keeled; belly thick; depth of the body contained in length of body two and one-half to two and three-fourths times; axis of the body nearly twice as far from the back as from the belly. Dorsal fin with

twenty-nine rays; elevated in front and rapidly declined, the highest ray reaching much beyond the middle of the fin, the seventh ray about one-half the length of the third or longest. Anal rays ten, rapidly shortened behind, the middle rays much shorter than the first long ones. Ventral rays ten. Thirty-nine scales in lateral line; eight rows between insertion of dorsal fin and the lateral line. Color paler; the lower fins slightly dusky.

MEGASTOMATOBUS (Fowler)

(Big-mouthed Buffalofish)

Megastomatus cyprinella (Cuvier and Valenciennes)

(Common Buffalo; Red-mouthed Buffalo)

Head very large and thick, its length contained three and one-half times in length. Body robust, moderately flattened sidewise, the outline somewhat elliptical, but the back rather more curved than the belly. Depth of the body contained in length two and one-half to three and one-half times. Thirty-seven to forty-one scales in lateral line. Gill cover apparatus very strong, the gill cover itself forming nearly one-half of the head. Color dull brownish olive, not silvery; fins dusky. Size very large; reaches a length of three feet and a weight of twenty or thirty pounds.

CARPIOIDES (Rafinesque)

(Carp Suckers)

Body oblong; the upper outline more or less arched; the lower outline nearly straight; depth of body from one-half to one-third of length; sides flattened sidewise; the back sharp edged; portion between dorsal and tail short and deep. Head short and deep; its upper surface rounded. Eye moderate. Non-bony space on top of head always well developed. Mouth small, horizontal, and inferior; lips thin, the upper capable of being drawn forward, the lower quite narrow; both lips feebly plicate or smooth. Gill cover apparatus well developed. Scales large, about equal over the body; lateral line well developed, nearly straight, with thirty-four to forty-one scales; twelve to fifteen scales in a cross row from

dorsal to ventrals. Dorsal fin beginning near middle of body, somewhat in advance of ventrals. Tail fin forked with the lobes equal. Anal fin comparatively long and low. Ventrals shortish, with usually ten rays. Pectorals short. Coloration always plain; pale olivaceous above, white below, but hardly silvery, the fins plain. Sexual peculiarities little marked. Compared with Ictiobus, the Carpæodes are smaller in size and paler in color. The genus is very close to Ictiobus and not easily separated.

Carploides carpio (Rafinesque)

(Carp Sucker)

Head comparatively short, its length four to five times in length of body. Eye placed forward, its diameter four and one-half times in head. Muzzle short but projecting beyond mouth. Body rather tapering toward both ends than in others, flattened sidewise, but not much arched, its depth contained in length two and two-thirds times to three times. Forward rays of dorsal fin short, notably thickened and hardened at base, especially in adult; the first ray nearer the end of the muzzle than the base of the tail fin, the longest ray a little more than one-half the base of the fin. Tail fin moderately forked. Dorsal fin with thirty rays. Thirty-six scales in lateral line. Size largest of the genus. Variable.

Carploides velifer (Rafinesque)

(Spear Fish; Skim Back)

Muzzle cone-shaped, projecting; maxillary reaching to opposite front of eye. Head arched above, the depth of head two and one-half to three times in length of head. Lips full, thick, flesh-colored in life, the lower lip V-shaped, the halves meeting at an acute angle. Head three and three-fourths to four in length of body. Eye moderate and small; its diameter four to five times in length of head. Body ovate, oblong, the depth about two and one-half in length. Dorsal fin with twenty-six or twenty-seven rays; first ray of dorsal usually nearer muzzle than base of tail; forward rays of dorsal always elevated or filamentous, sometimes as long as base of fin. Tail deeply forked, its lobes slender, the upper the longer. Thirty-seven scales in lateral line. Seven rows between insertion of dorsal fin and lateral line.

CATOSTOMUS (Le Sueur)

## (Fine-scaled Suckers)

Body elongate, rounded, tapering toward both ends. Head long and pointed; eye small, placed high; non-bony space on top of head present, large; mouth rather large, inferior, upper lip thick, capable of being drawn forward; lower lip greatly developed, with a broad free margin, usually forming two lobes which are often more or less separated. Gill cover moderate. Scales comparatively small; typically much smaller and crowded forward. Lateral line well developed, straight. Dorsal with its first ray nearly mid-way of the body, with from nine to fourteen developed rays. Anal fin short and high, with seven developed rays; ventrals inserted under the middle of the back part of the dorsal, with nine or ten rays; tail fin forked, the lobes nearly equal. Sexual peculiarities not much marked; the fins higher in the male and the anal somewhat swollen and covered with tubercles in spring. Breeding male usually with rosy or orange lateral band.

Catostomus commersonii (Lacepede)

## (Common Sucker; Fine-scaled Sucker)

Head rather large and stout, cone-shaped, flattish above, its length four to four and one-half times in body (three and one-half to four and one-half in young). Snout moderately prominent, scarcely overpassing the mouth. Mouth rather large, the lips strongly covered with fleshy projections, the upper with two or three rows. Body moderately stout, varying with age, heavy at the shoulders; its depth contained in length four to four and two-thirds times. Scales crowded forward, much larger on the sides than below; sixty-four to seventy scales in lateral line; ten rows from dorsal to lateral line and from lateral line to ventral fin, nine or ten rows. Dorsal fin usually with twelve rays; second and third rays of dorsal longest, two-thirds the length of head. Anal fin with seven rays; third and fourth rays longest, about equal to length of head. Coloration olivaceous; males in the spring with a faint rosy lateral band; young brownish, more or less mottled, often with confluent blackish lateral blotches or a lateral band. Adults light olive varying to paler and sometimes darker; sides silvery. One of the commonest of the suckers.

HYPERENTELIUM (Rafinesque)Hyperentelium nigricans (Le Sueur)

(Hog Sucker; Stone Roller)

Head flattened on top, the space between the eyes concave, the frontal bone short, broad and thick. The length of head contained in length of body four and one-half times. Body almost cylindrical, its depth contained four and one-third times in length, or about equal to length of head. Eye rather small, its diameter contained three times in length of snout, four and one-half to five times in length of head. Upper lip very thick, strongly covered with fleshy projections, with a broad free margin, which has eight to ten series of projections upon it; lower lip greatly developed and covered with fleshy projections. Non-bony space on top of head smaller than in C. commersonii. Fins all large. Dorsal fin with ten or eleven rays; its base equal to two-thirds the length of head, while the pectoral is considerably longer than the dorsal. Anal fin with seven rays. Ventrals with nine rays. Forty-eight to fifty-five scales in lateral line; seven rows between insertion of dorsal fin and lateral line; scales moderate. Color olivaceous; sides with brassy luster; belly white; back brown, with several dark cross blotches, irregularly arranged, these becoming obsolete in old individuals; lower fins dull red, with some dusky shading; young considerably variegated, the sides spotted. Size large; length two feet in adult.

MOXOSTOMA (Rafinesque)

(Red Horse)

Body more or less elongate, sometimes nearly cylindrical, usually more or less flattened sidewise. Scales large, nearly uniform in size; lateral line complete, straight or curved forward. Head comparatively long. Eye usually large, from three to six times in the length of the head. Non-bony space on top of head large. The scales large, more or less quadrate in form, and not crowded anywhere, usually about forty-four in the lateral line, and about twelve series between dorsals and ventrals. Mouth always inferior in position. Lips usually well developed, lips with crosswise folds. Bones of the gill cover moderately developed, smooth. Fins well dev-

eloped. Dorsal inserted about midway of body, its first rays usually rather nearer snout than tail. Anal fin short and high, with seven developed rays. Tail fin deeply forked. Sexual peculiarities little marked, the males in spawning season with the lower fins red, and anal rays swollen and somewhat covered with tubercles.

*Hexostoma aureolum* (Le Sueur)

(Red Horse; Large Scaled Sucker)

Head elongate, bluntish, rather broad and flattened above, its length four or five times in length of body, its size somewhat variable. Body oblong, the back in front of dorsal elevated and flattened sidewise. Depth of the body contained three and one-half times in length. Lips rather full, the bluntish muzzle projecting beyond the large mouth; greatest depth of cheeks more than one-half the distance from snout to the bone before the gill cover. Eye rather large, one-fourth the length of the head. Dorsal fin with twelve to fourteen rays, its free edge nearly straight, its longest ray shorter than the head, longest rays as long as the base of the fin. Anal fin with eight rays, the longest ray equal to length of head. Tail fin forked. Scales large, about forty-five in lateral line; six rows between insertion of dorsal and lateral line. Color olivaceous; sides silvery; lower fins in the adult red or orange. This species grows to a length of eighteen inches.

*ERIMYZON* (Jordan)

(Chub Suckers)

Body oblong, flattened sidewise. Head moderate. The mouth moderate; slightly inferior; the upper lip well developed, freely capable of being drawn forward; the lower moderate, infolded, V-shaped in outline, folded, with twelve to twenty folds on each side. Lower jaw rather stronger than usual and oblique when the mouth is closed. Eye moderate. Gill cover bones moderately developed. Non-bony space on top of head rather large. Scales large, rather crowded forward. Lateral line entirely wanting at all ages. Dorsal fin rather short and high, its rays usually eleven or twelve. Pectoral fins moderate. Tail fin moderately forked. Anal fin high and short, more or less bilobed in adult males. One species.

Erinnyzon sucetta (Lacepede)

(Creek Fish; Chub Sucker)

Variety oblongus (Mitchell), known as the sweet sucker. Head quite small and short, the eye smaller, about four and three-fourths in head, being almost exactly midway in the length of the head, which is four and one-half times in the length of the body. Body more elongate and less flattened sidewise than in the typical sucetta, the greatest depth contained about three and one-fourth times in length. Portion between head and dorsal fin swollen. Scales not uniformly overlapping; about forty-three in lateral line; fifteen in a cross series. Dorsal usually with twelve rays. Anal fin with seven rays. Ventrals with nine rays. Color olivaceous, dark above; the adult nearly plain; pale streaks along the rows of scales in typical sucetta; the young with a distinct black lateral band which breaks up into bars with age.

MINYTREMA (Jordan)

(Spotted Suckers)

Body rather elongate, almost cylindrical, becoming deep with age and rather flattened sidewise. Scales rather large, and nearly uniform in size. Head moderate, rather broad above; mouth moderate or small; the upper lip well developed, freely capable of being drawn forward; the lower rather small, V-shaped, with folds. Eye moderate, rather high, placed about midway of the head. The gill cover bones well developed. Non-bony space on top of the head rather large. Lateral line interrupted in the adult, imperfect in partly grown specimens, entirely wanting in young. Dorsal fin rather short and high, with about twelve rays beginning rather nearer snout than base of tail. Pectoral fins moderate. Tail fin moderate, the lobes about equal. Males in spring with head covered with small tubercles.

Minytrema melanops (Rafinesque)

(White Sucker; Spotted Sucker)

Head not very large; its length contained in the length of the body about four and one-third times, not especially flattened. Eye small; its diameter contained



in length of head five to six times. Body oblong, little flattened sidewise, the young nearly cylindrical, the adults deeper; depth about four in length, varying from about three in adults to four and one-half in the young. Scales large, firm, regularly and smoothly overlapping, the scales crowded forward. Twelve rays in the dorsal fin. Seven rays in the anal fin. Nine rays in the ventral fins. Coloration dusky above, with usually a black blotch behind the dorsal fin; each scale along the sides with a small, more or less distinct blackish spot at its base, these spots forming interrupted lengthwise series along the rows of scales; these lines are usually very distinct, especially in the adult, but young specimens often show them only faintly; sides and belly silvery; old males with the heads covered with small tubercles in spring. No great change with age either in form or coloration. Size large.

#### Family SCIAENIDAE

(The Creakers)

#### APLODINOTUS (Rafinesque)

(River Drums)

Body oblong, the snout blunt, the back elevated and flattened sidewise; mouth rather small, low, horizontal, with teeth in velvety bands, the outer above scarcely enlarged. No barbels. Bone before the gill cover very slightly notched. Dorsal spines strong and high, with a close-fitting scaly sheath at the base, the two dorsals somewhat connected; second anal spine very strong. Large and coarse fishes.

#### Aplodinotus grunniens (Rafinesque)

(Fresh-water Drum; Creaker; White Perch)

Head rather short, its length contained three and two-thirds times in the total length without tail. Mouth moderate, almost inferior, low, the back part of the upper jaw reaching past middle of eye; eye moderate; the teeth in velvety bands, the outer above scarcely enlarged; snout bluntish, longer than eye. Body oblong; back much elevated and flattened sidewise; profile long and steep,



straightish; depth of body contained in length two and three-fourths times. Dorsal fins with ten spines in the first and one spine and thirty rays in the second; dorsal fins somewhat connected; the third dorsal spine longer and stouter, its length one-half of length of head. Anal fin with two spines and seven rays. The second anal spine is the longer, its length two-fifths of length of head. The rays of the soft dorsal are longer near the end of the fin. Scales irregularly placed, about fifty-five in lateral line; nine rows between insertion of dorsal and lateral line; scales on breast rather large. Color grayish silvery, dusky above, sometimes very dark; back sometimes with oblique dusky streaks along the rows of scales. The names drum, croaker, and thunder pumper have been applied to this fish because of certain sounds produced by the fish either by means of its air bladder or by grinding together the large molar-like teeth in the pharynx.

#### Family COTTIDAE

(The Sculpins)

#### COTTUS (Artedi) Linnaeus

(Miller's Thumbs)

Body spindle-shaped. Head feebly armed; skin smooth or more or less velvety, its prickles, if present, not bony or scale-like; velvety bands of teeth on jaws and roof of mouth. Dorsals nearly or quite separated, the first of six to nine slender spines; ventrals moderate, each with a short, concealed spine and four soft rays. Lateral line present, usually more or less chain-like, sometimes incomplete. Bone before the gill cover with a simple spine at its angle which is usually curved upward, its base more or less covered by skin; usually two or three spines turned downward below this. The species are numerous and there may be more than one in Kansas. The species are hard to determine and are often confused.

#### Cottus ictalops (Rafinesque)

(Miller's Thumb; Blob; Muffle-jaw)

Head contained in length of body three and one-third

times. Body slender or stout, tapering regularly backward to the tail; space between the eyes with a groove; bone before the gill cover with a short, sharp spine, little hooked, directed backward and upward, mostly concealed by skin; below this are two smaller concealed spines. Skin smooth, except the region immediately behind the pectorals, which is beset with very small, sharp, prickles, which are sometimes obsolete. Lateral line conspicuous, continuous, or interrupted behind. Dorsal fins with six to eight spines in the spinous dorsal and sixteen or seventeen rays in soft dorsal. First dorsal low and feeble; pectoral fins large, their length nearly equal to that of the head, their tips usually reaching beyond the origin of the soft dorsal; ventral fins moderate. Anal fin with about twelve rays. Ventrals with one spine and four rays. Color olivaceous, more or less barred or mottled. Non-migratory species which consequently shows local variations. ("the name means cat's eye; eyes like those of the catfishes with oblong eyes" Rafinesque)

Family PERCIDAE  
and  
Family ETHEOSTOMIDAE

(The Perches and Darters)

1. Membrane bone in front of gill cover notched, the  
teeth on it turned forward; no fleshy anal  
projection; mouth terminal; small gills  
on inner surface of gill cover very well  
developed . . . . . 2
- Membrane bone in front of gill cover entire; a  
fleshy anal projection usually present;  
small gills on inner surface of gill  
cover imperfect or not present . . . . . 4
2. Canine teeth on jaws and bones of upper and outer

part of roof of mouth; body elongate;  
ventral fins well separated, the distance between them equal to width of their base . . . . . 3

Canine teeth none; body oblong; ventral fins near together; mouth large; sides with six or eight broad black vertical bars

Perca flavescens (Mitchell)  
(Yellow Perch; Ringed Perch)

5. Black blotch on last dorsal spines; no black blotch on base of pectoral; second dorsal simply mottled; cheeks and upper surface of head sparsely scaled; body somewhat flattened sidewise . . . .

Stizostedion vitreum (Mitchell)  
(Wall-eyed Pike; Yellow Pike)

No black blotch on last dorsal spines; a black blotch at base of pectoral; second dorsal simply mottled; cheeks and upper surface of head more or less closely scaled; body cylindrical . . . .

Cynoperca grisea (De Kay)  
(Grey Pike; Sand Pike)

4. Ventral fins widely separated, the interspace being more or less equal to width of their

base, except Clariicola whipplii . . . . 5

Ventral fins very close together, almost touching; lateral line with a slight arch, running high forward; the body slender; the head naked above . . . . .

Beleichthys fusiformis (Girard)

5. Space between the eyes broad; snout cone-shaped, pig-like, projecting beyond the inferior mouth; bottom line with a series of scales which fall off leaving a naked strip .

Percina caprodes (Rafinesque)  
(Log Perch; Hog Molly)

Space between the eyes not broad; mouth less inferior; the snout projecting less . . . . 6

6. Body not glassy or transparent, not extremely elongate, its surface almost entirely covered with scales . . . . . 7

Body glassy or transparent, extremely elongate and almost cylindrical; head long, and pointed; anal spine single, nearly as long as the second dorsal; belly mostly scaleless . . . . .

Vigil pellucidus (Baird)  
(Sand Darter)

7. Middle line of belly more or less with enlarged

- plates which fall off leaving a naked  
strip . . . . . 8
- Middle line of belly without enlarged plates,  
normally scaled . . . . . 9
8. Lower jaw as long as upper, snout very narrow,  
pointed; space between mouth and gill  
cleft about two-thirds of length of head;  
twelve series of scales between dorsal  
fin and lateral line . . . . .

Alvordius phoxocephalus (Nelson)

- Lower jaw shorter than upper, snout less pointed;  
space between mouth and gill cleft about  
one-half of length of head; nine series  
of scales between dorsal fin and the  
lateral line . . . . .

Alvordius maculatus (Girard)  
(Black-sided Darter)

9. Anal fin with two spines; anal fin usually  
smaller than the soft dorsal; ventral  
fins with one spine and five rays . . . . 10
- Anal fin with one obscure spine; anal fin  
smaller and shorter than soft dorsal;  
ventral fins with one spine and four or  
five soft rays . . . . . 11
10. Front edge of upper jaw not capable of being

drawn forward; teeth very feeble; mouth  
terminal or slightly inferior . . . . . 12

Front edge of upper jaw capable of being drawn  
forward, slightly joined to forehead in  
the middle; teeth on jaws strong; head  
short and blunt with enlarged cheeks,  
profile very convex; mouth small and  
quite inferior . . . . .

Etheostoma blennioides (Rafinesque)  
(Green-sided Darter)

11. Ventral fins with one spine and five soft rays;  
lateral line slightly chain-like behind;  
the eye contained in length of head three  
to four times; five rows of scales between  
dorsal fin and lateral line; scales not  
large . . . . .

Boleosoma nigrum (Rafinesque)  
(Johnny Darter)

Ventral fins with one spine and four soft rays;  
lateral line not interrupted; the eye  
contained in length of head five times;  
four rows of scales between dorsal fin  
and lateral line; scales large . . .

Boleosoma mesaeum (Cope)

12. Cheeks and gill covers naked; mouth moderate and

terminal; ventral fins near together,  
the interspace very narrow; lateral  
line incomplete . . . . . 13

Cheeks and gill covers scaly; mouth small,  
almost inferior; ventral fins separated by a distinct interspace; the  
lateral line complete; six dark brown  
spots on back connected by alternating  
spots to a broad lateral band, from  
which eight narrower blue bands encircle  
the body below . . . . .

Nanostoma zonale (Cope)  
(Banded Darter)

13. Gill openings not restricted to the sides;  
fourty to fourty-eight scales in the  
lateral line, five rows between dorsal  
fin and lateral line; males with alternate oblique bars of red and blue . .

Oligocephalus caeruleus (Storer)  
(Rain-Bow Darter; Soldier Fish)

Gill openings restricted to sides; sixty to  
seventy scales in lateral line, nine  
rows between dorsal and the lateral line;  
males with red spots and red markings on  
fins . . . . .

Claricola whipplai (Girard)

Family PERCIDAE

(Perches)

PERCA (Artedii) Linnaeus

(River Perch)

Body oblong, somewhat flattened sidewise, the back elevated. Cheeks scaly; gill covers mostly scaleless; the gill cover armed with a single spine; bone before the gill cover notched, the notches turning forward below. Mouth moderate, terminal; front part of upper jaw capable of being drawn forward; teeth in velvety bands on jaws and roof of mouth; no canine teeth. The small bands of teeth on the palatines. The small gills on inside of gill cover small but perfect; no anal projection. Scales rather small. Dorsal fin entirely separate, the first of twelve to sixteen spines; anal fin with two slender spines, well separated from the soft rays; ventral spines well developed, the ventral fins near together.

Perca flavescens (Mitchell)

(Yellow Perch; Ringed Perch)

Head moderately long, its length contained three and one-fourth times in the length of the body; snout pointed, one and one-third as long as the eye. Mouth rather large, the jaws equal, the back part of the upper jaw reaching to below middle of pupil of eye. Body rather spindle-shaped and moderately elongate; back highest at origin of spinous dorsal, which is more or less behind insertion of pectoral; profile convex from dorsal to back part of head, then concave forward, the snout projecting. Depth of body at the ventral origin contained in length three and one-fourth times; the depth nearly equal to the length of the head. The least depth of the body between dorsal and tail equal to one-third of the length of the head. The greatest width of the body equals one-half its greatest height. The region between the eyes is rather flat, equal to one and one-half times the diameter of eye. Bone before the gill cover coarsely toothed on its hind margin, the teeth on the upper border directed partly upward and partly backward, those on the lower limb pointing downward and some backward. Scales on the cheeks in about thirteen rows from before to dorsal part; four short rows of scales on the upper and



forward part of the gill cover. First dorsal fin with thirteen to fifteen spines; the first dorsal spine inserted above or a little behind the pectoral; second dorsal with two spines and thirteen to fifteen rays. Anal with two spines and seven or eight rays; origin of anal under fourth or fifth soft dorsal ray; the first anal spine one-third as long as the head, and nearly as long as the second. The tail is notched, the middle rays contained one and one-third times in the length of the outer rays. Color olivaceous, varying into greenish or bluish; sides golden yellow; belly pale; sides with six or eight broad, dark bars, which extend from the back to below the axis of the body, the widest wider than the eye. Fins above olivaceous; lower fins largely red or orange; with or without a distinct black spot on forward or posterior part of spinous dorsal.

### STIZOSTEDION (Rafinesque)

(American Pike Perches)

Body elongate, spindle-shaped, the back broad. The head almost cone-shaped, long. Cheeks, gill covers, and top of head more or less scaly. Mouth large, the jaws about equal, front part of upper jaws capable of being drawn forward, little movable. Teeth in broad velvety bands, the jaws and outer part of roof of mouth with long canine teeth. Bone before the gill cover notched, the notches below turned forward; gill cover with one or more spines, terminations of the radiating striations. Dorsal fins well separated, the first of twelve to fifteen spines, the second with seventeen to twenty-one soft rays; last dorsal spine not erectile, bound down by membranes; anal spines two, slender, the soft rays eleven to fourteen in number. Ventral fins well separated, the space between them equal to their base; ventral spine slender. Scales small. Large carnivorous fishes.

### Stizostedion vitreum (Mitchell)

(Wall-eyed Pike; Yellow Pike)

Head contained in length three and two-thirds times. Eye shorter than snout, contained in length of head four and one-half to five times. The lower jaw projects slightly; the back part of the upper jaw reaching beyond the pupil of the eye. Body slender, becoming flattened sidewise with age, the back more arched than in related

species. Gill covers scaly; upper surface of the head nearly naked. About ninety scales in the lateral line, ten rows above and nineteen below. Dorsal fins divided, the first of twelve to sixteen spines, length of longest dorsal spine nearly as long as head; soft dorsal nearly as long as spinous, of nineteen to twenty-one rays. The space between dorsal fins equal or greater than diameter of the eye. The anal fin longer than high of two spines and twelve to fourteen rays. The pectoral reaches to below the tenth spine of the dorsal; as long as the ventral and one-half the length of the head. Color dark olive, finely mottled with brassy, the latter color forming indistinct oblique lines; lower jaw flesh colored; belly and lower fins pinkish; spinous dorsal with a large jet-black blotch on the membrane of the last two or three spines, otherwise nearly plain; second dorsal and tail mottled olive and yellowish; base of pectoral dusky, without distinct black blotch. The eye of the living fish is like a glowing emerald.

### CYNOPERCA (Gill and Jordan)

#### Cynoperca grisea (DeKay)

(Grey Pike; Sand Pike)

Head contained in length three and one-half times. Body elongate, more slender than in related species, the flesh rather translucent; head flattened and pointed. Depth of body contained in length four and one-half to six times. Mouth smaller than in the pike perch; the back part of upper jaw reaching to hind margin of eye. Dorsal fin with eleven to fifteen spines in the spinous, and one spine and seventeen to nineteen rays in the soft dorsal. Anal fin with two spines and eleven rays. One hundred to one hundred and twenty-five scales in the lateral line; nine above and twenty-five below. Color olive gray, sides brassy or orange, with dark mottlings, more distinct in the young, which are sharply marked; first dorsal with two or three rows of round, black spots; no black blotch on last spines; second dorsal with three irregular rows of round, black spots; a black blotch on base of pectoral; tail dusky and yellowish.

Family ETHEOSTOMIDAE

(Darters)

SOLEICHTHYS (Girard)

Genus containing a small and slender species. The lateral line is incomplete and has a slight upward arch forward. Top of head not scaly. Species variable and hard to determine.

SOLEICHTHYS fusiiformis (Girard)

Head rather long and narrow; its length contained in length of body three and one-half to four times; muzzle short, decurved, shorter than the eye, the mouth comparatively large, terminal; back part of upper jaw reaching past front of eye; eyes large, the diameter contained four times in head. Body elongate, flattened sidewise; its depth contained about six times in length. Gill cover spine strong. Lateral line beginning at the eye, on about twelve to fifteen scales, high up. Forty-three to sixty scales in the lateral line; three series between the dorsal fin and the lateral line; twelve below the lateral line. Cheeks scaled; gill covers and the breast usually well scaled; the breast sometimes partly naked. Fins moderate; pectorals broad about reaching to ventrals. Dorsal fin with nine or ten spines in the first, and nine to twelve rays in the second. Anal fin with two spines and six to eight rays. Color olivaceous, sides and back blotched with dusky, paler beneath; head dark above, with dusky dots on sides, a dark line downward and another forward from the eye; base of tail with four dark spots in a vertical row. Dorsal and tail fins speckled and barred with dark; the spinous dorsal in life usually bright blue, with a median crimson band. An extremely variable species.

PERCINA (Haldeman)

(Log Perches)

Body elongate, slightly flattened sidewise, covered with small scales. Lateral line continuous; ventral line with enlarged plates, which fall off, leaving a naked strip. Head flattened, rather pointed, the mouth being

small and inferior, overlapped by a tapering, pig-like snout; the upper jaw not capable of being drawn forward. Teeth on upper part of the mouth. Dorsal fins well separated, the first the larger, of thirteen to fifteen spines; the second dorsal rather longer than the anal, which has two spines, the first of which is usually the shorter. Pectorals rounded, or bluntly pointed, their rays fourteen or fifteen; ventral fins well separated, the interspace about equal to their base. Size largest of the darters.

*Percina caprodes* (Rafinesque)

(Log Perch; Hog Molly)

Head long and pointed; flat on top tapering off to a flat-pointed snout which is squared off at the end like the snout of a pig, resemblance heightened by the form of the small mouth underneath. Back part of upper jaw not reaching front of eye. Body long and slender, spindle-shaped, firm and wirey to the touch. Depth of body contained in length five to six and one-half times. Cheeks, gill covers, and portion of body above head scaly. Ninety to ninety-five scales in the lateral line; nine above and fifteen below. Fins rather low. Dorsal with thirteen to seventeen spines in the first, and twelve to seventeen rays in the second. Anal with two spines and nine to twelve rays. Middle line of belly with a row of enlarged scales, which fall off leaving a naked strip. Color yellowish-green, or yellow, with about fifteen black vertical bars which reach half-way down the sides. The hindmost bar forms a mere spot on the base of the tail, and there are many dots and speckles on the fins.

VIGIL (Jordan)

Body slender and elongate, almost cylindrical, transparent in life. Head slender, the mouth rather wide, terminal, horizontal. Upper part of upper jaw very capable of being drawn forward; teeth on roof of mouth. Scales thin, little overlapping; no ventral plates, the belly naked. Dorsal fins moderate, about equal to the anal fin and to each other; dorsal with about ten spines; anal spines single, weak; ventrals well separated, behind pectorals, their spines feeble; pectorals pointed, of twelve to fifteen rays. Darters of moderate or rather large size inhabiting the sandy bottoms of clear streams.

Vigil pellucidus (Baird)

(Sand Darter)

Head contained in length four to four and three-fourths times. Back part of upper jaw reaching barely to opposite the large eye, which is contained three and two-thirds to four times in the head, high up, nearly equal to snout, and separated by a narrow, grooved space. Body elongate, nearly cylindrical, the flesh transparent in life. Cheeks and gill covers scaled; the scales embedded. Neck above thinly scaled or naked; scales of body not very rough, those along lateral line and portion between dorsal and tail most closely overlapping; belly entirely naked; gill cover ending in a short, flat spine. Depth of body contained in length seven to eight and one-half times. Dorsals with ten spines in the first and nine to eleven rays in the second. Anal with one spine and eight to ten rays. Seventy-five scales in the lateral line. Color translucent; scales with fine black dots; a series of small, squarish olive or blackish blotches along the back and another along each side. Lateral spots connected by a gilt band. Length three inches.

ALVORDIUS (Girard)Alvordius phoxocephalus (Nelson)

Head extremely long, narrow, and tapering, the snout very sharp; length of head contained in length of body three and two-thirds times. Mouth large, the back part of upper jaw reaching to eye; the lower jaw unusually narrow and long, scarcely shorter than the upper; distance between mouth and gill cleft two-thirds of length of head. Body rather slender and flattened sidewise. Cheeks and gill covers with small scales; breast naked; a strong gill cover spine; belly with small scales along the ventral line which fall off leaving a naked strip. Eighty to eighty-two scales in lateral line; twelve above and sixteen below. The first dorsal with eleven or twelve spines, the soft dorsal with twelve to fourteen rays. Anal fin with eight or nine rays. Pectorals shorter than head; ventrals widely separated. A strong spine on gill cover. Color yellowish-brown, lateral spots small and rather numerous, quadrate in form, the hues rather dull; a small blackish spot at each end of the lateral line. A species notable for its very slender head.

Alverdius maculatus (Girard)

(Black-sided Darter)

Head moderately elongate, less pointed than in the preceding; length of head contained in length of body four times. Body spindle-shaped, flattened sidewise behind, its depth contained in length five or six times. Mouth moderate, the lower jaw included; back part of the upper jaw reaching just past the front of the eye. The distance from mouth to gill cleft about half head. The lateral line straight, prolonged forward to the eye. Sixty-five to eighty scales in the lateral line; nine above and seventeen below it. Gill cover with rather large scales; cheeks usually covered with very small ones, which are scarcely visible; breast naked; middle line of belly with enlarged scales which fall off; body otherwise entirely scaly, the scales small and rough. Dorsal fins with thirteen to fifteen spines in the first and eleven to thirteen rays in soft dorsal. Coloration straw-yellow or greenish, with dark tassellations and marblings above, and about seven large dark blotches along the sides, which are partly confluent, thus forming a band; fins barred. Coloration varying much in intensity with different surroundings.

Etheostoma (Rafinesque)Etheostoma blennioides (Rafinesque)

(Green-sided Darter)

Head contained in length of body four and one-third times. Body stout, elongate, little flattened sidewise; its depth contained in length four and three-fourths to six times; profile very convex. Eyes large, the diameter three and one-half times in length of head, high up and close together; a furrow between them. Mouth small, horizontal, quite inferior; upper jaw concealed in a furrow under the snout. Gill cover spine long; distance from mouth to gill cleft two-thirds length of head. The scales moderate; those on belly large; cheeks with fine scales; gill covers with large ones; neck scaly; chest naked; fifty-eight to seventy-eight scales in the lateral line, six rows above and fourteen below. Anal projection very large. Dorsal fins with twelve to fourteen spines, and twelve to fifteen rays in the soft dorsal. Anal fin

with two spines and eight or nine rays. Anal spines strong. Lower rays of the pectorals, and the rays of the ventrals enlarged and fleshy in males. Pectorals longer than the head of fifteen rays. Color olive green, tasselated above; sides with about eight double vertical bars, each pair forming a Y-shaped figure; these are sometimes joined above, forming a sort of wavy lateral band; in life these markings are of clear deep green; sides sprinkled with orange dots; head with dark bars; first dorsal dark orange brown at base, blue above, becoming pale at the tip; second dorsal and anal of a rich blue green, with some reddish; tail greenish, faintly barred; young and female are more or less dull, but the pattern is peculiar.

BOLEOSOMA (De Kay)

(Tasselated Darters)

Body moderately elongate, spindle-shaped, but slightly translucent. Head small, narrowed forward, the profile convex. Mouth small, horizontal, front of upper jaw capable of being drawn forward. Scales large; lateral line continuous or interrupted behind; belly with ordinary scales. Dorsal spines usually nine, very slender and flexible; soft dorsal much larger than anal; anal fin normally with a single, short, slender spine, the first ray simple. Ventrals well separated. Coloration olivaceous and speckled, the males with inky black in spring; no red or blue. Small active fishes abounding among weeds in clear streams.

Boleosoma nigrum (Rafinesque)

(Johnny Darter)

Head contained in length three and three-fourths to four times. Body spindle-shaped, slender, little flattened sidewise. Head conical, moderate, the snout somewhat decurved. Mouth small. Eye three and two-thirds to four times in the length of the head, equal to or a little longer than snout. Cheeks and breast naked; gill covers scaly; space before dorsal mostly scaled. Gill cover spine strong; space between mouth and gill cleft about half the length of the head. Fins high. First dorsal with eight spines, soft dorsal with ten to fourteen rays. Pectorals about as long as head; dorsals about equal in height, the spinous a little longer. Anal small, the



spine short and weak. Color pale olivaceous; back much tassellated with brown; sides with numerous small W-shaped blotches; head speckled above, mostly black in males; a black line forward from eye and sometimes a line downward; fins barred; males in the spring blackish forward, often almost entirely jet-black.

**Boleosoma mesaeum** (Cope)

Head contained in length of body three and three-fourths times. Body stout, little flattened sidewise, with large scales. Diameter of the eye contained five times in head, more than once in muzzle; eye not half as large as specimens of nigrum of same size; snout pointed; mouth large. Outline of back rather elevated. Dorsal fins not in contact, the first of nine spines, the soft dorsal of thirteen rays. Anal fin with nine rays. Ventral fins with one spine and four soft rays. Pectorals longer than ventrals, not reaching vent. Forty scales in lateral line; four above and five below. Lateral line complete. Color in spirits pale brown, with four blotches on back, and a few groups of zigzags on the sides. Second dorsal and tail barred.

**NANOSTOMA** (Putnam)

**Nanostoma zonale** (Cope)

(Banded Darter)

Head small, rather short; its length contained in length of the body four to five times; the mouth small, almost inferior. Snout very short, decurved, rather obtuse; back part of upper jaw scarcely reaching front of eye; eye longer than snout; its diameter contained in length of head three and one-half to four times. Body slender, somewhat flattened sidewise; its depth contained in length five to six times. Cheeks, gill covers, and neck more or less scaled, breast usually naked. Forty-eight to fifty-three scales in lateral line; six above and nine below. Teeth very feeble. The first dorsal well developed, separated from the second, with ten or eleven spines. Second dorsal higher and shorter than the anal, with ten to twelve rays. Anal fin with two spines and six to eight rays. Pectorals as long as head or a little longer. Color bright olivaceous above, golden below; six dark brown quadrate spots



on back, which connect by alternating spots with a broad brown lateral band, from which eight narrower dark bluish bands more or less completely encircle the belly; paired, anal, and tail fins golden, brown spotted; middle half of the first dorsal crimson; a series of round crimson spots near the base of the second dorsal; a band on the muzzle and one below eye, black; a black spot on gill cover and one at base of pectoral; females duller and speckled, with ventrals barred and lateral bars feebler.

OLIGOCEPHALUS (Girard)

Oligocephalus caeruleus (Storer)

(Rain-bow Darter; Soldier Fish)

Head large, flattened sidewise, its length contained in length of body three and three-fourths times. Mouth moderate, terminal, oblique, the lower jaw somewhat included, back part of the upper jaw reaching the eye. Diameter of eye four to four and one-half times in length of head, little shorter than snout. Body robust, rather deep and flattened sidewise, the back somewhat elevated. Depth of body contained in length four and one-half times. Thirty-seven to fifty scales in lateral line; five above and ten below lateral line. Cheeks naked or nearly so; gill covers scaled; neck and breast usually naked. Fins all large; dorsals usually slightly connected with nine to ten spines in the spinous and twelve to fourteen rays in the soft dorsal. Anal fin with two spines and seven or eight rays; anal spines almost equal or the first a little longer. Pectorals nearly or quite as long as the head. Males olivaceous, tassellated above, the spots running together into blotches; back without black lengthwise stripes; sides with about twelve indigo-blue bars running obliquely downward and backward, most distinct behind, separated by bright orange interspaces; tail fin deep orange, edged with bright blue; anal fin orange, with deep blue in front and behind; soft dorsal chiefly orange, blue at base and tip; spinous dorsal crimson at the base, then orange, with blue edgings; the ventrals deep indigo; cheeks blue; throat and breast orange; females much duller, with little blue or red, the vertical fins barred or checked; young variously marked, no dark humeral spine or spot. Length two and one-half inches.

CLARICOLA (Jordan and Evermann)Claricola whipplii (Girard)

(Whipple's Darter)

Head contained in length of body three and one-half times. Body rather deep, flattened sidewise; least depth of portion between tail and dorsal equalling the length of snout and eye. Greatest depth of body contained in length four and one-half to five times. Mouth terminal, oblique; back part of upper jaw reaching vertical from front of pupil of eye; front part of upper jaw not capable of being drawn forward. Eye moderate, slightly greater than snout. Gill cover spine strong. Sixty to seventy scales in lateral line, eight or nine series between lateral line and base of spinous dorsal. Fins large; dorsals slightly joined at base, the longest soft ray half length of head; spinous dorsal with about eleven to twelve spines; soft dorsal with twelve to fourteen rays; pectorals somewhat longer than ventrals, which equal distance from snout to pre-gill cover. Anal fin with two spines and seven rays; first anal spine longer and much stronger than second. Scales small; the lateral line straight; gill covers with a few large scales; breast and ventral region, cheeks, and a strip along base of spinous dorsal forward naked or with embedded scales. Colors in life grayish, mottled with darker and with about twelve indistinct dusky bars, becoming more clearly marked backward; scales of lighter interspaces on the sides with small, round, bright, orange-red spots, those near lateral line in longitudinal series of two to five; two orange blotches at base of tail; a dark spot below eye and two behind it, one of these on upper cheek; spinous dorsal dusky translucent at base, a dark bar about half-way up, then a translucent bar, an orange-red bar, and a translucent bar tipped with dusky; soft dorsal similarly marked, with more yellowish; anal like soft dorsal, the orange brighter, sometimes covering half of fin, the base dusky; tail barred with light and dark and margined with black, sometimes with submarginal band of orange.

Lepibema chrysops (Rafinesque)

(White Bass; White Lake Bass)

Head contained in length of body three and one-half times. Diameter of eye contained in length of head five times; snout four and one-third times in head. Body rather deep and flattened sidewise; its greatest depth contained in length two and one-half times; back considerably arched. Mouth moderate, nearly horizontal, the lower jaw little projecting; back part of jaw reaching middle of pupil of eye. Teeth on base of tongue in a single patch, a patch also on each side of tongue. Margin of sub-gill cover with a deep notch; head scaled to between the nostrils. Fifty-five to sixty-five scales in lateral line; ten above and fifteen below. Longest dorsal spine two times in length of head. Spinous dorsal with nine spines. Soft dorsal with one spine and fourteen rays. Anal with three spines and eleven rays; second anal spine contained in head three times. The middle rays of the tail contained one and two-thirds times in the outer. Color silvery, tinged with golden below; sides with narrow dusky lines, about five above the lateral line, one along it, and a variable number below it, these sometimes more or less interrupted or transposed. Length fifteen inches.

Family CENTRARCHIDAE

(The Sunfishes)

1. Dorsal fin with scarcely longer base than the  
anal fin . . . . . 2
- Dorsal fin with much longer base than the anal  
fin . . . . . 3
2. Dorsal spines six, rarely five; anal fin plain  
without network of lines; profile of the  
head rather strongly S-shaped because of  
the strongly projecting snout . . .

Pomoxis annularis (Rafinesque)  
(Crappie; Sackelaw)

Dorsal spines seven, rarely eight; anal fin strongly covered with network of lines; profile of head more or less S-shaped, but snout not so markedly projecting

Pomoxis sparoides (Lacepede)  
(Calico Bass; Strawberry Bass)

3. Body comparatively short and deep, the greatest depth more than two-fifths the length; spinous dorsal not deeply notched toward the back . . . . . 4

Body comparatively elongate, the greatest depth in adult about one-third the length; the spinous dorsal low and deeply notched so that the fin is almost divided . . . . . 10

4. Tongue with teeth; mouth large, back part of upper jaw reaching past middle of eye . . . 5

Tongue without teeth; mouth small, back part of upper jaw barely reaching eye or middle of the eye . . . . . 6

5. Anal spines normally three; dorsal fin with ten spines; the gill cover ending in an extended black convex flap . . . . .

Chaenobryttus gulosus (Cuvier and Valenciennes)  
(Warmouth)

Anal spines normally six; dorsal fin with eleven

spines; gill cover slightly notched  
behind . . . . .

Ampliplites rupestris (Rafinesque)  
(Common Rock Bass; Coggle-eye)

6. Back part of upper jaw with supplemental bone  
rudimentary or lacking; four to six  
rows of scales on the cheeks . . . . . 7

Back part of upper jaw with small distinct  
supplemental bone reaching nearly to  
middle of eye; eight rows of scales on  
the cheeks; often a black spot on back  
part of base of dorsal and anal fins;  
spot on gill cover smaller than eye

Apemotus cyanellus (Rafinesque)  
(Blue-spotted Sunfish; Green Sunfish)

7. Pectoral fins reaching to or beyond front of  
anal fin; pectorals more or less pointed,  
not much, if any, shorter than head . . . . 8

Pectoral fin short, blunt, not reaching beyond  
front of anal fin, considerably shorter  
than head . . . . . 9

8. Scales very large, about thirty-five (thirty-  
three to thirty-nine) in lateral line;  
gill cover spot short, wholly surrounded  
by red margin; sides with red spots;

longest dorsal spine not quite one-half length of head . . . . .

Allotis humilis (Girard)  
(Red-spotted Sunfish)

Scales small or moderate, about forty-three to fifty-two in lateral line; gill cover spot large but not long; dorsal fin with a large black blotch at base of back rays . . . . .

Lepomis pallidus (Mitchell)  
(Blue Gill; Blue Sunfish)

9. Back part of upper jaw extending to past the middle of eye; dorsal spines short, the longest about three times in head; gill cover flap in adult long and broad with pale blue or red margin . . .

Xenotis megalotis (Rafinesque)  
(Long-eared Sunfish)

Back part of upper jaw scarcely reaching eye; dorsal spines high; lower part of gill cover flap always bright scarlet in adult . . . . .

Eupomotis gibbosus (Linnaeus)  
(Common Sunfish; Pumpkin Seed)

10. Mouth moderate, the back part of upper jaw not extending beyond eye in adult; scales

small, about seventeen rows on cheek;  
 young more or less spotted or barred,  
 never with black lateral band . . .

Micropterus dolomieu (Lacépède)  
 (Small-mouthed Black Bass)

Mouth very large, the back part of upper jaw  
 extending beyond the eye in adult;  
 scales rather large, about ten rows  
 on the cheek; young with black lateral  
 band . . . . .

Huro floridania (Le Sueur)  
 (Large-mouthed Black Bass)

POMOXIS (Rafinesque)

(Crappies)

Body more or less elongate, strongly flattened side-  
 wise, the snout projecting. Mouth large, oblique; back  
 part of upper jaw broad, with a well developed supple-  
 mental bone. Teeth on roof of mouth and tongue. Gill  
 cover slightly forked at tip. Scales large. Fins large,  
 the anal larger than dorsal, of six spines and about  
 seventeen rays; dorsal with six to eight graduated spines,  
 the spinous dorsal shorter than soft part; pectorals  
 rounded or obtusely pointed, with fifteen or sixteen rays,  
 the upper the longest. Ventrals close together, with a  
 strong spine. Lateral line complete. The scientific  
 name indicates that the gill cover ends in two sharp  
 points instead of an "ear-flap".

Pomoxis annularis (Rafinesque)

(Crappie; Bachelor)

Head long, the profile more or less strongly S-shaped,  
 owing to the projecting snout, flattened region at the  
 eyes, and prominent thickened region before dorsal fin;

length of head contained in length of body three times. Body elongate; its depth contained in length two and one-half times. Eye large, its diameter contained in length of head four times. Mouth very wide. Scales on cheeks in four or five rows. Thirty-six to forty-eight scales in lateral line. Dorsal fin with six spines and fifteen rays. Anal fin a little larger than dorsal with six spines and eighteen rays. Color silvery olive, mottled with dark green, the dark marks chiefly on upper part of body and having a tendency to form narrow vertical bars; dorsal and tail fins marked with green; anal fin pale, nearly plain. Fins very high, but lower than in P. sparoides. Very variable.

Pomoxis sparoides (Lacepede)

(Calico Bass; Strawberry Bass)

Head long, its profile not strongly S-shaped, the projection of the snout and projection of the region before the dorsal fin with the depression over the eye being less marked than in P. annularis; length of head contained in length of body three times. Body oblong, elevated, much flattened sidewise; its greatest depth contained in length two times. The mouth is smaller than in P. annularis, the back part of upper jaw reaching about to posterior edge of pupil. Forty to forty-five scales in lateral line; six rows on cheek. Fins very high; anal higher than dorsal, its height four to five times in length of body. Dorsal fin with seven or eight spines and fifteen rays. Anal fin with six spines and seventeen or eighteen rays. Color silvery olive, mottled with clear olive green, the dark mottlings gathered in irregular small bunches, and covering the whole body; vertical fins with dark olive marks surrounding pale spots; the anal marked like the dorsal; a dusky gill cover spot.

CHAENOBRYTTUS (Gill)

(Warmouths)

Chaenobryttus gulosus (Cuvier and Valenciennes)

(Warmouth; Goggle-eye)

Head contained in length of body two and one-fifth to two and two-thirds times. Body heavy, deep, more



elongate than in Allotis; depth of body contained in the length two to two and one-half times. Mouth large, the back part of the upper jaw reaching back border of eye, which is contained four to four and one-half times in length of the head; snout about equal to the eye. Forty to forty-six scales in lateral line; six above and eleven below; six to eight rows on cheeks. Dorsal spines low, longest reaching to middle of pupil from tip of snout. Dorsal with ten spines and nine or ten rays. Anal with three spines and eight or nine rays; pectorals not reaching origin of anal fin; ventrals nearly reaching vent; ventral spine about two in distance between origin of the ventrals and anus. Color dark olive green, clouded with darker, usually with red or blue, and brassy; a dusky spot on each scale more or less distinct; vertical fins mottled with dusky; a faint spot on last rays of dorsal, bordered by paler; three oblique dusky or reddish bars radiating from eye; belly yellowish or brassy. Variable in form and color.

### AMBLOPLITES (Rafinesque)

(Rock Bass)

Body oblong, moderately elevated, flattened sidewise. Mouth large, the broad part of posterior upper jaw with a well developed supplemental bone; lower jaw projecting. Teeth on roof of mouth, and on tongue in a single patch. Gill cover ending in two flat points. Scales large; the lateral line complete. Dorsal fin much more developed than the anal fin, with ten or eleven rather low spines; anal spines normally six; pectorals obtusely pointed with fourteen or fifteen rays, the upper the longest.

### Ambloplites rupestris (Rafinesque)

(Common Rock Bass; Goggle-eye)

Head large, the profile little flattened above the eye; its length contained in length of body two and three-fourths times. Body oblong, moderately flattened sidewise; its greatest depth two to two and one-half times in length. Mouth large, the back part of upper jaw extending to opposite back part of pupil of the very large eye, which is contained three and one-half times in the length of the head. Thirty-nine scales in the lateral line; five above and twelve series below; six to eight rows on the cheeks. Dorsal fin with eleven spines and ten rays.

Anal with six spines and ten rays. Color olive green, sides brassy tinged, with much dark mottling; the young irregularly barred and blotched with black, the adult with a dark spot on each scale, these forming interrupted black stripes; a black gill cover spot; dark mottling on the soft dorsal, anal and tail.

### APOMOTIS (Rafinesque)

#### Apomotis cyanellus (Rafinesque)

(Blue-spotted Sunfish; Green Sunfish)

Head large with projecting snout; its length contained in length of body three times. Body oblong, rather elongate, becoming short and deep with age; its depth contained in length of body two and one-half times. The mouth rather large, the back part of upper jaw broad and flat, with a small supplemental bone, reaching nearly to middle of eye; lower jaw projecting. Forty-five to fifty-five scales in lateral line; six or seven above and sixteen below; eight rows on cheek. Dorsal fin with ten spines and eleven rays; dorsal spines quite low, the highest scarcely longer than snout, contained three to four times in length of head, longer in the young. Anal fin with three spines and nine rays. Pectoral short, not reaching vent; ventrals not reaching vent. Gill cover spot small, less than eye, broadly margined with bronze, the black confined to the bony part. Color variable, the prevailing shade green with a strong brassy luster on sides, which becomes nearly yellow below; each scale usually with a sky-blue spot and more or less gilt edging, giving an appearance of pale lateral streaks; besides these marks, dusky or obscure vertical bars are often present, and the sides are sprinkled with dark dots; vertical fins marked with blue or green, the anal usually edged in front with pale orange; usually a conspicuous black spot on back base of dorsal and anal; iris of eye red; cheeks with narrow blue stripes.

### ALLOTIS (Hubbs)

#### Alletis humilis (Girard)

(Red-spotted Sunfish)

Head contained in length of body two and three-fourths

to three times. Profile not very steep. Body oblong; its depth contained in length two and one-fourth to two and one-half times. Eye large, its diameter contained in head three to three and one-half times. Scales large. Thirty-three to thirty-nine in lateral line; five rows between insertion of dorsal and lateral line, eleven series below lateral line. Dorsal fin with ten spines and ten or eleven rays; longest dorsal spine not quite half head. Anal fin with three spines and eight or nine rays. Gill cover flap rather long, broad, with a very broad red margin, which entirely surrounds the black. Color bluish, with conspicuous greenish spots and mottlings toward the back part; sides with many conspicuous round, salmon-red spots, usually a faint black spot on last rays of the dorsal fin; belly and lower fins red.

LEPOMIS (Rafinesque)

Lepomis pallidus (Mitchell)

(Blue Gill; Blue Sunfish)

Head not large, the projecting snout usually forming an angle above the eye; length of head contained in the length of the body two and three-fourths to three and one fourth times. Body comparatively short and deep, flattened sidewise; the young slender, the adult nearly orbicular; depth of body contained in length one and four-fifths to two and one-fourth times. Portion of the body between dorsal fin and tail rather slender. Forty-three to fifty-two scales in the lateral line; seven series above, and sixteen below. Mouth quite small, oblique, the jaws about equal, the back part of the upper jaw barely reaching the eye. Dorsal fin with ten spines and eleven or twelve rays; dorsal spines strong and high, the longest about one-half of head; usually longer than snout and eye; pectorals long, usually longer than the head, reaching past base of anal fin. Anal fin with three spines and ten to twelve rays. Color olive green; adults dark; young more or less silvery, with a purple luster in life; sides with undulating, often chain-like transverse greenish bars, which become obsolete in the adult; no blue stripes on cheeks; a diffuse black blotch at base of posterior rays of dorsal and anal, often obscure in young; no red on fins; very old specimens often with the belly coppery-red.

XENOTIS (Jordan)Xenotis megalotis (Rafinesque)

(Long-eared Sunfish)

Head without flap contained three times in length of body. Body short and deep, flattened sidewise, the back very strongly arched in adult, the profile very steep, usually forming an angle above eye, but sometimes full and convex; depth of body contained in the length one and two-thirds to two and one-half times. Diameter of eye contained in length of head three and one-half to four times. Mouth small, oblique, the front of upper jaw extending to opposite middle of eye. Thirty-six to forty-five scales in lateral line; five series above lateral line and fourteen below it. Dorsal fin with ten spines and ten to twelve rays; dorsal spines very low, the longest little longer than the snout, about three times in head. Pectorals one and one-third to one and one-half times in head. Anal fin with three spines and eight to ten rays. Gill cover flap in the adult very long and broad, with a broad or narrow pale blue or red margin, the margin sometimes very broad, sometimes almost wanting; the flap half or more longer than the eye in the adult, much shorter in the young, its development subject to great variation. Color brilliant blue and orange; the back chiefly blue; the belly entirely orange, the orange on the sides in spots, the blue in wavy, vertical streaks, lips blue; cheeks orange, with bright blue stripes; blue stripes before eye; iris red; soft parts of vertical fins with the rays blue and the membranes orange; ventrals dusky. One of the most brightly colored fishes. Extremely variable.

EUPOMOTIS (Gill and Jordan)Eupomotis gibbosus (Linnaeus)

(Common Sunfish; Pumpkin Seed)

Head rather small; its length contained three to three and one-fourth times in length of body. Body short and deep, flattened sidewise, the profile steep, convex, and usually an angle above the eye; its depth contained in the length one and three-fourths to two times. Mouth small, oblique, the back part of the upper jaw scarcely reaching

the front of the eye, which is contained four to four and one-half times in the head. Forty to forty-four scales in lateral line; six series above the lateral line; four rows on the cheeks. Dorsal fin with ten spines and ten to twelve rays; dorsal spines rather high; the longest, two to two and one-half times in head. The soft rays higher. Anal fin with three spines and ten or eleven rays. Color greenish olive above, shaded with bluish, the sides spotted and blotched with orange; belly orange-yellow; cheeks orange with blue wavy streaks; the lower fins orange, upper bluish and orange spotted. Gill cover flap rather small, the lower posterior part with a bright scarlet mark, a mark which distinguishes this species when adult.

### MICROPTERUS (Lacepede)

#### Micropterus dolomieu (Lacepede)

#### (Small-mouthed Black Bass)

Head contained in length two and one-half to three and one-half times. Body ovate-spindle-shaped, becoming deeper with age; its depth two and three-fourths to three and one-half in length. Gill cover ending in two flat points. Mouth large, but smaller than in H. floridania, the back part of upper jaw ending considerably in front of the hinder margin of the eye, except in very old examples. Diameter of eye one and one-half to two in snout; five to six and one-half times in head. Scales on the cheeks minute, in about seventeen rows; scales on the trunk comparatively small; seventy-two to eighty-five in lateral line, eleven above and twenty-five below it. Dorsal fin with ten spines and thirteen to fifteen rays; dorsal fin deeply notched, but less than in H. floridania, the ninth spine being about half as the fifth not much shorter than the tenth. Fifth dorsal spine about three and one-fifth in head; base of soft dorsal and anal scaly. Anal fin with three spines and ten to twelve rays. Color dull golden green, with bronze luster, young with darker spots along the sides, which tend to form short vertical bars, but never a dark lateral band; three bronze bands radiating from eye across cheeks and gill cover; belly white; a dusky spot on the point of gill covers; tail fin yellowish at base, then black, with white tips; dorsal with bronze spots, its edge dusky. In some waters the fins are not marked, but usually they are very conspicuous in the young.

MURO (Cuvier and Valenciennes)Muro floridania (Le Sueur)

## (Large-mouthed Black Bass)

Head large; its length contained in length of body three to three and one-half times. Body ovate-spindle-shaped, becoming deeper with age, moderately flattened sidewise; depth of body contained in length three to three and one-fourth times. Mouth very wide, the back part of upper jaw in adults reaching beyond the eye, in young shorter. Scales on the cheeks in about ten rows; scales on the trunk comparatively large; sixty-five to seventy scales in lateral line, seven above and eighteen below it. Dorsal fin with ten spines and twelve or thirteen rays; very deeply notched, its fifth spine three and one-fourth times in head. Anal fin with three spines and ten or eleven rays. Color dark green above; sides and below greenish silvery; young with a blackish stripe along the sides from gill cover to the middle of the tail fin; three dark oblique stripes across the cheeks and gill covers; below and above the lateral line some dark spots; tail fin pale at base, then blackish, whitish at tip; belly white. As the fish grows older the black lateral band breaks up and grows fainter; the color becomes more and more of a uniform pale dull green, the back being darker; a dark gill cover blotch usually present.

Family ANGUILLIDAE

## (The True Eels)

ANGUILLA (Shaw)

## (Eels)

Body elongate, flattened sidewise behind, covered with embedded scales. Lateral line well developed. Head long, cone-shaped, moderately pointed, the rather small eye well forward and over the angle of the mouth. Teeth small, in bands on each jaw and a long patch on the roof of the mouth. Tongue free at the tip. Lips rather full, with a free margin behind, attached in front. Lower jaw

forward teeth of the tongue more or less notched; about three, two-pointed teeth on each side of the mouth . . .

Lethenteron appendix (De Kay)  
(Small Black Lamprey)

2. Lower "jaw" plate with seven projections or cusps; head contained in length seven and one-half times. Color silvery, bluish above, a small dusky spot before each gill opening . . . . .

Ichthyomyzon concolor (Kirtland)  
(Silvery Lamprey)

LETHENTERON (Gessner and Hubbs)

Lethenteron appendix (De Kay)

(Small Black Lamprey)

Head moderate, about as long as thorax; mouth small; snout shorter and lips less fringed; dorsal fins connected only in breeding season, inserted behind middle of body, considerably flattened in front of the vent, but not divided into two fins; posterior the highest; insertion of dorsal a little before middle of body; both dorsals high, the first one and three-fourths in height of the second; plate above the mouth with its cusps large, triangular, and well separated; about three teeth on each side of the mouth. Length of head contained in length of body eight times; sixty-seven muscular impressions between gill opening and vent.

ICHTHYOMYZON (Girard)

(River Lampreys)

Allied to the sea lamprey. Dorsal fin continuous,

with a broad notch. Small lampreys.

Ichthyomyzon concolor (Kirtland)

(Silvery Lamprey)

Head broad, with a large mouth disk, which is moderately fringed; teeth strong and nearly uniform, the two above the mouth being similar to those on the rest of the disk. Upper margin of dorsal scarcely flattened in front of the vent; origin of dorsal nearly midway between the tip of the snout and end of tail; fifty-one muscular impressions between gill openings and vent. Body considerably flattened sidewise. Head in length seven and one-half times; depth of body in length twelve times. Color silvery, bluish above, sometimes with bluish spots; a small dusky spot above each gill opening, usually conspicuous even in the larva; larva with small toothless contracted mouth.



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