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A SYNOPTIC LIST OF THE FISHES  
KNOWN TO OCCUR WITHIN  
FIFTY MILES OF CHICAGO.

BY

S. E. MEEK AND S. F. HILDEBRAND.

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CHARLES B. CORY,  
Curator of Department.



CHICAGO, U. S. A.

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# A SYNOPTIC LIST OF THE FISHES KNOWN TO OCCUR WITHIN 50 MILES OF CHICAGO.

BY S. E. MEEK AND S. F. HILDEBRAND.

Owing to the many changes being made in this region on account of the growth of the city, the local fish fauna and its consequent changes are interesting. The present paper is intended to afford students of the local fish-fauna, in and about Chicago, a ready means for the identification of fishes which they may collect, and thus assist in the study of their distribution, breeding and feeding habits, etc. A considerable amount of study along these lines is necessary before one is able to prepare a complete account of the fishes of this region.

In the following pages is given a list, together with keys and brief descriptions, of the fishes which inhabit the lakes, streams, and lagoons in and near Chicago. The general range of each species is given, and a list of localities where each has been taken in the area in question. Many of the descriptions have been drawn directly from specimens taken within the area under discussion, and all have been verified by the junior author with local material, so far as available. In the preparation of this paper free use has been made of previous publications by various authors. Considerable assistance has been received from Dr. Shelford, Dr. Riddle, and their students from the University of Chicago, also from Mr. A. P. Ford (formerly of Berwyn, Illinois), chemist for the Crane Iron Works, Bridgeport, Conn.

Most of the illustrations used in this work are by permission of its authors, taken from "The Fishes of Illinois," by S. A. Forbes and R. E. Richardson; some are made from photographs of colored plates, the others from cuts kindly loaned by Dr. Forbes. A few illustrations are taken from U. S. Government publications.

It is hoped that the present paper may stimulate the study of our local fishes and so be the forerunner of a much more complete account of them.

The following notes and the accompanying figure are given to explain the terms used in the descriptions:

1. Head.
2. Snout.
3. Eye.
4. Premaxillary.
5. Maxillary.
6. Supplemental maxillary.
7. Mandible, or lower jaw.
8. Symphysis.

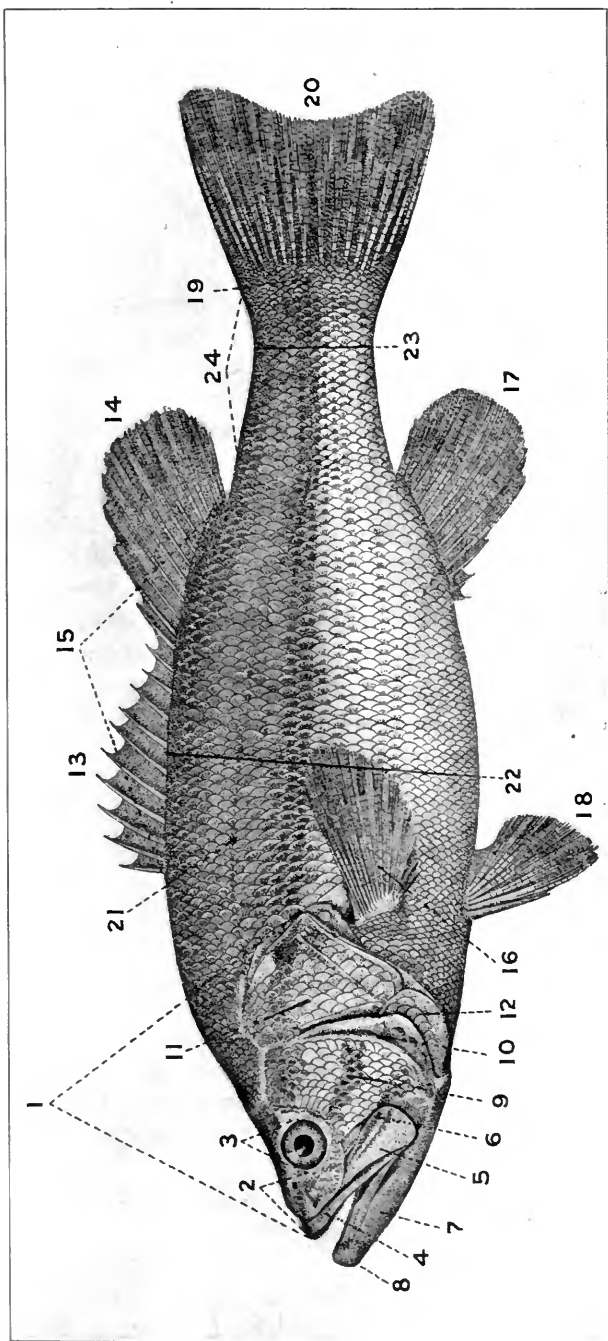


FIG. 16. LARGE-MOUTHED BLACK BASS.  
*Micropterus salmoides* (Lac.), showing parts referred to in description of fishes.

9. Cheek. 10. Preopercle. 11. Opercle. 12. Subopercle. 13. Spinous portion of dorsal fin. 14. Soft portion of dorsal fin. 15. Base of dorsal fin. 16. Pectoral fin. 17. Anal fin. 18. Ventral fin. 19. Base of caudal fin (last vertebra). 20. Caudal fin. 21. Lateral line. 22. Depth of the fish. 23. Depth of caudal peduncle. 24. Caudal peduncle.

The **PROFILE** of the fish, unless otherwise mentioned, is the curve from the highest point on the back to the tip of the snout. The **ORIGIN** of the **DORSAL** or **ANAL FIN** is the insertion of its first spine or ray.

Fishes in general, and especially those treated of in this paper, breathe by means of **GILLS**, which are fine, hair-like projections (**BRANCHÆ**), usually supported on the outer curves by cartilaginous or bony arches known as **GILL ARCHES**; in the true fishes, the normal number on each side is four. The **GILL RAKERS** are a series of bony appendages variously formed along the inner edge of the anterior gill arch.

The **GILL MEMBRANES** usually serve to attach the **GILL COVERS** to the **ISTHMUS**, which is the thick, fleshy projection between the gill openings. The **BRANCHIOSTEGAL MEMBRANES** are attached to the lower posterior portions of the gill covers; the cartilaginous or bony supports of this membrane are the **BRANCHIOSTEGAL RAYS**.

The **PHARYNGEAL BONES** are behind the gills and at the beginning of the **ÆSOPHAGUS**; in the true fishes, they represent a fifth gill arch.

The fins of fishes are composed of **SPINES** and **RAYS**, the former being stiff, bony structures usually connected by a thin membrane; the rays are rather weak, jointed, cartilaginous structures, and are also connected by a thin membrane.

A **CYCLOID SCALE** has its posterior margin smooth; such scales are usually found on soft-rayed fishes. A **CTENOID SCALE** has its posterior margin rough or toothed; such scales are characteristic of the spiny-rayed fishes.

The **LENGTH** of the **BODY** of the **FISH** is measured from the tip of the upper jaw to the base of the caudal fin or end of the last vertebra; the **TOTAL LENGTH**, from the extreme ends of the fish. The **LENGTH** of the **HEAD** is measured from tip of upper jaw to the posterior edge of the opercle; the **LENGTH** of the **SNOUT**, from tip of upper jaw to anterior margin of the orbit. The **DEPTH** of the **BODY** is measured at its deepest part, none of the fins being included; the **DEPTH** of **CAUDAL PEDUNCLE** is measured at its narrowest part, its length from base of last anal ray to end of last vertebra.

The **SCALES** in the **LATERAL SERIES** are counted from upper edge

of opercle to base of caudal fin, the TRANSVERSE SERIES from the dorsal fin to ventrals or origin of anal, whichever is nearest the middle of the body. In making the transverse count the scale on the lateral line, when it is present, is counted with those on the upper part of the body. The LENGTH of the DORSAL and ANAL FINS is measured along their BASES; the HEIGHT is the length of their spines or rays. The length of the other fins is measured from attachment to the body to the tips of the longest rays.

In order to abbreviate, the following expressions are used: "HEAD 4" indicates that the head of the fish is contained 4 times in the distance from the tip of the snout to the end of the last caudal vertebra; "DEPTH 4" that the greatest depth (none of the fins being included) is contained 4 times in the same distance; "D. 8" indicates that the fish has a single dorsal fin which is composed of 8 soft rays; "D. iv, 9," that the dorsal fin is single and is composed of 4 spines and 9 soft rays; "D. iv-9," that there are two dorsal fins, the first one composed of 4 spines and the other of 9 soft rays. Spines are always indicated in Roman letters, soft rays by figures. The abbreviations used in the count of other fin rays and spines are similarly explained. The diameter of the eye, the length of the snout, and many other short measurements are compared with the length of the head. "Eye 3 in head," "Snout 3 in head," indicate that each is contained 3 times in the length of the head. In these particular cases " $\frac{1}{3}$  of the length of the head" would mean the same thing.

When the last caudal vertebra is about the size of those preceding and it ends in a broad plate (*Hypural*) which supports the caudal fin, the tail is called HOMOCERCAL; such belong to most of the true fishes, as the catfishes, suckers, perch, bass, and the like. When the vertebrae are progressively smaller, remaining in the axis of the body, and the Hypural is obsolete or nearly so, the tail is ISOCERCAL; such a tail belongs to the codfishes and their relatives. In the heterocercal tail the vertebrae are progressively smaller, and are turned upward into the upper part of the tail. This form of tail is found in the sturgeon, the garpike, and the dogfish.

In the keys and descriptions external characters are used so far as possible, our aim being to make identification as easy and accurate and with the least amount of mutilation to the specimen in hand as is practicable.

To successfully use this paper the student is advised to get a perch, bass, or sunfish and make a careful study of its external anatomy, much as suggested in the accompanying figure, and its description.

The fishes or fish-like vertebrates of Chicago and its environs belong to two classes: The *Marsipobranchii*, — the lampreys, the hagfishes, and the like; and the *Pisces*, — the sharks, skates, and the true fishes. Of the former but two species occur here; of the latter all are true fishes, there being no sharks or skates.

The fishes, or fish-like vertebrates, may be defined briefly as cold-blooded animals adapted for life in the water, breathing by means of gills, which are persistent throughout life, and having the limbs, if present, developed as fins, never with fingers and toes.

The two classes here mentioned may be defined briefly as follows:

- A. Skull imperfectly developed, without true jaws; gills purse-shaped, not attached to arches; a single median nostril; body eel-shaped.  
*Marsipobranchii*, 231
- AA. Skull well developed, and with true jaws; gills attached to arches; nostrils not median, in one or more pairs. *Pisces*, 234

#### KEY TO THE FAMILIES OF FISHES

- a. Gill openings 7 on each side; mouth circular, disc-like; nostril single, on top of head; no paired fins. *Petromyzonidæ*, 231
- aa. Gill openings one on each side; mouth not disc-like; jaws present; nostrils in pairs.
- b. Ventral fins, when present, abdominal.
- c. Tail heterocercal,
- d. Mouth under the projecting snout; body naked, or with 5 series of bony plates.
- e. Snout produced into a long oar-like blade; opercle produced into a long triangular flap; mouth large, not sucker-like.  
*Polyodontidæ*, 234
- ee. Snout triangular, not produced into an oar-like blade; opercle without triangular flap; mouth small, sucker-like.  
*Acipenseridæ*, 235
- dd. Mouth terminal, jaws about equal; body covered with hard rhombic (ganoid) plates or scales.
- f. Jaws long, beak-like; no gular plate; dorsal rays about 10; body with rhombic plates.  
*Lepisosteidæ*, 237
- ff. Jaws shorter, not beak-like; a gular plate; dorsal rays about 50; body with cycloid scales.  
*Amiatidæ*, 238
- cc. Tail homocercal or isocercal.

- g. Pectoral fins each with a strong spine; head with more than 4 barbels; body without scales. *Siluridæ*, 240
- gg. Pectoral fins each without a strong spine; head usually without barbels, but when present never more than 4; body usually with scales.
- h. Ventral fins without spines, or with one spine and one soft ray; anterior dorsal fin if composed of spines only, these not connected by a membrane.
- i. Scales if present cycloid, their free edges smooth.
- j. Body with true scales or linear embedded ones; ventral fins, when present, with more than 5 soft rays; no disconnected dorsal spines.
- k. Head without scales.
- l. No dorsal adipose fin present.
- m. Ventral surface not armed with bony serræ; lateral line present.
- n. Teeth not present in jaws; anal fin short of less than 15 rays.
- o. Dorsal fin with more than 10 rays; mouth usually inferior with thick fleshy lips, with plicæ or papillæ; pharyngeal teeth in a single row, more than 10. *Catostomidæ*, 248
- oo. Dorsal fin of fewer than 10 rays; mouth usually terminal, with thin lips without plicæ or papillæ; pharyngeal teeth in one or two rows, fewer than 9. *Cyprinidæ*, 257
- nn. Teeth present in jaws; anal fin long, of more than 20 rays.
- p. Body long and slender, eel-shaped; dorsal and anal fins long and continuous with the caudal; scales minute, linear. *Anguillidæ*, 284
- pp. Body deep, compressed, not eel-shaped; dorsal and anal fins not continuous with the caudal; scales large. *Hiodontidæ*, 285
- mm. Ventral surface armed with bony serræ; lateral line wanting.
- q. Dorsal fin with its last ray produced into a long filament; jaws without teeth; maxillary not in 3 pieces. *Dorosomidæ*, 287
- qq. Dorsal fin with its last ray not produced into a long filament; jaws with weak teeth; maxillary in 3 pieces. *Clupeidæ*, 288
- ll. Dorsal adipose fin present. *Salmonidæ*, 289
- kk. Head more or less covered with scales.
- r. Jaws long, with large canine-like teeth; lateral line present. *Esocidæ*, 295
- rr. Jaws short, without canine-like teeth; lateral line wanting, or nearly so.
- s. Upper jaw not protractile. *Umbridæ*, 297
- ss. Upper jaw protractile. *Pæciliidæ*, 298

- jj. Body without scales; ventral fins each of one spine and one soft ray; dorsal fin with 2 or more spines not connected by a membrane. *Gasterosteidæ*, 302
- ii. Scales ctenoid their free edges rough; dorsal fins 2, the posterior adipose. *Percopsidæ*, 303
- hh. Ventral fins composed of one spine and 5 soft rays; anterior dorsal fin of 4 to 10 spines connected by a membrane; body scaly. *Atherinidæ*, 304
- bb. Ventral fins thoracic or jugular.
- t. Ventral rays of one spine and 6 or 7 soft rays; vent before pectoral fins. *Aphredoderidæ*, 305
- tt. Ventral rays not more than one spine and 5 soft rays.
- u. Chin without a barbel; soft dorsal fin of less than 40 rays; ventral fins below or behind pectorals.
- v. Body covered with true scales.
- w. Lateral line not extending on the caudal fin; soft dorsal of less than 25 rays; jaws with teeth.
- x. Spinous and soft dorsal fins united into one fin, the spinous portion lower than soft portion; preopercle usually not serrate. *Centrarchidæ*, 306
- xx. Dorsal fins separate or very slightly joined; the fins of about equal height.
- y. Anal fin with 1 or 2 spines. *Percidæ*, 317
- yy. Anal fin with 3 spines. *Serranidæ*, 332
- ww. Lateral line extending on the caudal fin; soft dorsal of more than 25 rays; jaws without teeth. *Sciaenidæ*, 334
- vv. Body without true scales; more or less armed with prickles or a few scale-like plates; cheeks with a bony stay; ventral rays of one spine and 3 or 4 soft rays. *Cottidæ*, 335
- uu. Chin with a barbel; soft dorsal fin composed of more than 40 rays. *Gadidæ*, 338





## Class MARSIPOBRANCHII.

### THE LAMPREYS AND HAGFISHES.

Skeleton cartilaginous; skull not separate from the imperfectly segmented vertebral column; no true jaws; no limbs; no shoulder girdle; no pelvic elements, and no ribs; gills purse-shaped, without gill arches; 6 or more gill openings on each side; nostril single, on top of the head; heart without arterial bulb; alimentary canal straight, simple, without cœcal appendages, pancreas, or spleen; naked, eel shaped animals.

### Order **Hyperoartii.**

Nasal duct a blind sac not communicating with the palate; mouth nearly circular, suctorial; seven gill openings on each side of the neck.

#### Family I. **Petromyzonidæ.**

##### THE LAMPREYS.

Body eel-shaped, somewhat compressed posteriorly; mouth nearly circular, suctorial, and armed with horny, tooth-like, simple or multi-cuspid tubercles; those just above and below oral opening, and those on tongue more or less specialized; lips or margin of mouth fringed.

A. Supraoral cusps 2 or 3, placed close together; dorsal fin with a broad notch. *Ichthyomyzon*, 231

AA. Supraoral cusps 2, each at end of a crescent-shaped plate; occasionally a rudimentary median cusp; dorsal fin with sharp notch. *Lampetra*, 232

#### Genus **Ichthyomyzon** Girard.

##### RIVER LAMPREYS.

Supraoral plate, with 2 or 3 cusps placed near each other; anterior lingual tooth with a median groove; dorsal fin with a broad shallow notch. Small lampreys inhabiting lakes and rivers of eastern United States.

**Ichthyomyzon concolor** (Kirtland). SILVERY LAMPREY.

Head 6.5 to 8.3; depth 9.8 to 13.8. Body elongate, eel-shaped; mouth a suctorial disc, anterior and slightly inferior and with marginal fringe; supraoral plate usually bicuspid, occasionally with 1, 3 or 4 cusps; infraoral plate with 7 to 9 cusps, occasionally with 10 to 13; anterior lingual tooth with a median groove; diameter of eye 6 to 8 in head; muscular impressions between last gill opening and vent 49 to 55; dorsal fin continuous with the caudal.

Color silvery, bluish above, sometimes with bluish spots; a small dusky spot above each gill opening.

Length about 10 inches.

This lamprey occurs in the Great Lake Region and the Upper Mississippi Valley; it is parasitic on all larger fishes, but prefers fishes without scales, as the catfishes, or the soft-scaled, as the suckers, to the hard-scaled fishes, like the basses and perch.

It ascends small brooks in the spring to spawn, after which it is believed to die. The eggs deposited in nests on the bottom of the streams soon hatch, and the small worm-like larva burrows in the sand, where it remains from 3 to 5 years, when it emerges as a full grown lamprey. Often found in the pound nets set at south end of Lake Michigan.

Lake Michigan, Whiting, Indiana; Lake Michigan, Edgemoor, Indiana.

Genus **Lampetra** Gray.

## BROOK LAMPREYS.

Supraoral plate, crescent-shaped, with a cusp at end, with occasionally a small median cusp; anterior lingual tooth with median enlarged denticli; dorsal fin with a sharp notch or entirely divided. Small lampreys inhabiting brooks and small streams of Europe and eastern North America.

**Lampetra wilderi** (Gage). BROOK LAMPREY; SMALL BLACK LAMPREY.

Head 7.9 to 8.7; depth 13 to 16. Body elongate, eel-shaped; mouth a suctorial disc, anterior, and slightly inferior, and with marginal fringe of closely set tubercles; supraoral plate with cusp at each end, separated by a distance nearly twice the width of base of a single cusp; infraoral plate with 6 or 7 cusps, the extreme ones much larger than the others; 3 lateral cusps on each side of the mouth bicuspid, the others simple; diameter of eye 5 to 7 in head; muscular impressions

between the last gill opening and vent 70 to 73; dorsal fin divided by a deep notch or a narrow space.

Length 6 to 10 inches.

This lamprey ranges from New York to the Great Lakes and Upper Mississippi Valley. Its habits are quite similar to the preceding. It spawns in April. The time after this species emerges from its larval stage to its spawning time is so short that it is doubtful if it is ever parasitic on fishes; not recorded from the Chicago area.

## Class PISCES.

Skeleton more or less ossified; skull well developed, separate from the segmented vertebral column; mouth with true jaws; limbs, shoulder, and pelvic bones usually present; usually less than 6 gill openings on each side; gills attached to imperfect skeletal arches; nostrils one or more pairs; heart with arterial bulb; alimentary canal variable in form, and with pancreas and spleen; tail heterocercal, homocercal, or isocercal.

### Order **Selachostomi.**

#### THE PADDLE-FISHES.

Skeleton chiefly cartilaginous, the vertebræ imperfectly formed, acentrous; anterior vertebræ single; ventral fins abdominal; maxillary obsolete; air bladder cellular, with open duct to œsophagus; snout long and paddle-shaped; tail heterocercal.

### Family **Polyodontidæ.**

#### THE PADDLE-FISHES.

Body elongate, not covered with scales or bony plates; ventral fins abdominal; fins without spines; opercle and subopercle small; mouth large, its border formed by premaxillaries; maxillaries obsolete; snout long, paddle-shaped; 2 pairs of minute barbels on snout, just in front of the mouth; jaws and palatines in young with numerous fine deciduous teeth; intestine with spiral valve; pyloric cœca broad, leaf-like; arterial bulb with several pairs of valves.

### Genus **Polyodon** Lacépède.

Gill-rakers numerous, very long and slender; caudal fulcra of moderate size, 13 to 20 in number; opercle produced into a long triangular flap.

**Polyodon spathula** (Walbaum). PADDLE-FISH; SPOONBILL CAT.

Head (from tip of snout to end of opercular flap) 1.5 to 1.7; depth 4 to 4.8 (without snout); A. 60. Body fusiform, little compressed; skin smooth; snout broad, its greatest width 3.4 to 4.3 in its length; opercle with long flap; its tip reaching ventrals (adults) or nearly to front of dorsal (young); gill rakers long and slender, in a double series on each arch; no scales; tip of caudal peduncle and sides of upper caudal lobe with small elongate rhombic plates.

Color pale to dusky, or bluish olive.

Length about 6 to 8 feet.

This fish lives in the larger rivers and in bayous. It is not native to Lake Michigan, but is reported to have been taken there.

## Order **Chondrostei.**

### THE STURGEONS.

Skeleton chiefly cartilaginous; vertebræ simple and acentrous, the notochord persistent; ventral fins abdominal; opercular series represented by an opercle and interopercle; maxillary present; air bladder simple; connected by a duct with the œsophagus.

### Family **Acipenseridæ.**

#### THE STURGEONS.

Body elongate, armed with 5 longitudinal rows of bony plates, head covered with bony plates; ventral fins abdominal; fins without spines; gills 4; an accessory opercular gill; nostrils double, in front of eye; optic nerves forming a chiasma; mouth inferior, protractile, with thickened papillose lips; 4 barbels in front of mouth; stomach without pyloric cœca; intestine with spiral valve; arterial bulb with several pairs of valves.

#### Genus **Acipenser** Linnæus.

Snout conical; caudal peduncle short, roundish, and not entirely covered with bony plates; spiracles and pseudobranchs present; gill-rakers lance-shaped; air bladder well developed, not cellular.

## LAKE STURGEON

**Acipenser rubicundus** Le Sueur.

Head 3.1 to 3.8; depth 7 to 7.8; D. 35 to 36; A. 25 to 28. Body elongate, cylindrical; snout subconical, convex above, flattened below, overhanging the mouth, 2 to 2.4 in head; eye small, 3.3 to 4.2 in head; lips 2-lobed; gill membranes united to the isthmus; barbels of nearly equal length; dorsal scutes 12 to 16; lateral 32 to 43; ventral 8 to 10. These almost entirely disappear in specimens of 150 pounds weight; upper caudal lobe the longer, not produced into a filament; caudal fulcra numerous.

Color dark olive above; sides paler to reddish; body often with irregular blackish blotches. Length 6 to 12 feet.



FIG. 17. LAKE STURGEON.  
*Acipenser rubicundus* Le Sueur. (After Forbes and Richardson.)

This sturgeon inhabits large streams and lakes of the Upper Mississippi Valley, the Great Lakes and northward. About twenty-five years ago it was abundant in the lakes near Chicago. There was no market for it then and many were buried in the sand to get rid of them. At present it is quite rare and sells in the market for double the price of the best fish found in Lake Michigan. The sturgeon spawns in the spring.

Lake Michigan, Chicago, Illinois; Lake Michigan, Millers, Indiana; Lake Michigan, Pine, Indiana; Lake Michigan, Edgemoor, Indiana.

Order **Rhomboganoidea.**

## THE GARPIKES.

Skeleton ossified; vertebræ connected by ball and socket joints, the cavity of each vertebra being posterior; ventral fins abdominal; fins without spines; opercular skeleton complete; maxillary present; air bladder cellular, lung-like, opening into the side of the œsophagus.

Family **Lepisosteidae.**

Body elongate, subcylindrical, covered with hard rhombic ganoid scales or plates, imbricated, in oblique series running downward and backward; premaxillary forming most of the upper jaw; jaws long, beak-like; teeth on jaws, vomer, and palatines, some of the teeth in the jaws large and canine-like; tail heterocercal; an accessory gill on under side of opercle; spiral valve of intestine rudimentary.

Genus **Lepisosteus** Lacépède.

GAR PIKES.

Jaws with one or more series of teeth, some being enlarged and fitting into a depression in the opposite jaw; usually some of the anterior teeth movable; teeth on vomer and palatines; in the young the anterior teeth are usually enlarged.

- a. Jaws long and slender; snout more than twice the length of the head. *osseus*, 237
- aa. Jaws shorter and broader, little longer than the rest of the head. *platostomus*, 238

**Lepisosteus osseus** (Linnæus). LONG-NOSED GAR; BILLFISH.

Head 2.7 to 3.1; depth 10 to 13; D. 8 or 9; A. 8 or 9; scales 60 to 63. Body elongate, cylindrical; jaws long, slender, beak-like; more than twice the length of the rest of the head; greatest width of snout 6, least width 20 in its length; young with upper lobe of caudal prolonged into a filament.

Color pale olive, silvery below; vertical fins and posterior part of the body with round black spots, more distinct in the young; very young with a black lateral band.

Length from 3 to 5 feet.

It inhabits the larger streams and lakes, ranging from the Upper Mississippi Valley, and the Great Lakes to Florida and the Rio Grande in Mexico. It is active, feeding on minnows and the young of other fishes. It spawns in the spring, usually in May or June. In this area it has been taken in Lake Michigan and in the Des Plaines and Fox rivers.

Not used for food except in the southern part of its range.

Fox Lake, Illinois; Fox River, McHenry, Illinois; Lake Michigan, Millers, Indiana.

**Lepisosteus platostomus** Rafinesque. SHORT-NOSED GAR.

Head 3 to 3.9; depth 8 to 10; D. 8; A. 8; scales 60 to 64. Similar to the preceding but with a much shorter and broader beak; greatest width of beak 2.3, its least width 5.5 in its length.

Color dark olive green above; belly white; dorsal caudal and anal each with roundish dark spots; young with a broad black lateral band.

Length 2 to 3 feet.

Common in the Mississippi Valley, being more abundant in the southern part of its range. In appearance and habits it resembles the former species in this area.

## Order **Cycloganoidea.**

Skeleton bony; vertebræ biconcave, the anterior ones not modified; ventral fins abdominal; opercle, preopercle, interopercle, and subopercle present; maxillary present; air bladder bifid anteriorly, cellular, lung-like; tail heterocercal.

### Family **Amiatiidæ.**

Body elongate, subcylindrical anteriorly, compressed posteriorly, covered with hard cycloid scales; head with external bones very hard and scarcely covered by skin; jaws, vomer, palatines, and pterygoids with teeth; fins without spines or fulcra; air bladder connected by a glottis with the pharynx, and able to assist in respiration; a bony gular plate between the branches of the lower jaw; stomach a blind sac, without pyloric cœca; intestine with a rudimentary spiral valve.

#### Genus **Amiatus** Linnæus.

DOG FISH; BOWFIN. "JOHN A. GRINDLE."

Dorsal fin long; its base twice the length of the head.

#### **Amiatus calva** Linnæus. DOG FISH; BOWFIN; GRINDLE.

Head 3.5 to 4.3; depth 4.6 to 6.2; D. 47 to 51; A. 9 to 10; scales 66 to 68. Body elongate, compressed posteriorly; head subconic, depressed; mouth large, maxillary reaching to vertical behind eye;



eye small, its diameter 8.8 to 10.3 in head. A pair of short nasal barbels, cupped at the tips; caudal fin rounded; lateral line complete.

Color dark olive above; lighter on sides and ventral region; the mingling of the darker and lighter forming reticulations on the sides; dorsal fin with dark band near base and one near tip; sometimes broken into short bars; caudal fin with dark bars; pectoral, ventral,

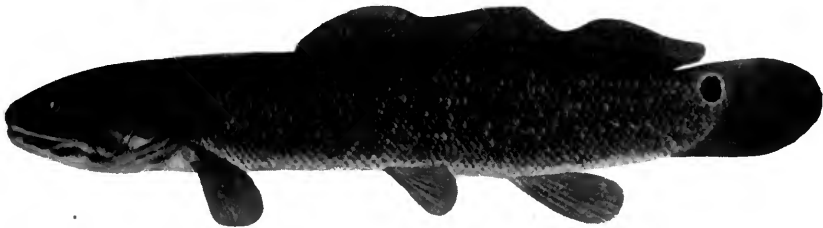


FIG. 18. DOG FISH: BOWFIN; "JOHN A. GRINDLE."  
*Amia calva* Linnaeus. (After Forbes and Richardson.)

and anal fins green or greenish; males with a black spot with yellowish border at base of upper caudal rays; males smaller than the females.

Length  $1\frac{1}{2}$  to 2 feet.

This species ranges from the Great Lakes to Florida and Texas. It is most abundant in sluggish waters with weedy bottoms. It feeds on fishes, crayfishes, mollusks, and is to some extent a scavenger. It is a game fish of some importance, but though marketed it is regarded as an inferior food fish. It spawns in stagnant water from April to July. Common in all sluggish water in the Chicago area.

Fox Lake, Illinois; Jackson Park, Chicago, Illinois; Calumet River, Clark, Indiana; Deep River. Liverpool, Indiana.

## Order **Nematognathi.**

### THE WHISKERED FISHES.

Skeleton bony, the 4 anterior vertebræ coösfied; ventral fins abdominal; dorsal and pectoral fins each with anterior rays modified into a hard spine; subopercle absent; margin of upper jaw formed by premaxillary; maxillary often rudimentary and supporting the base of a barbel; air bladder with duct; arterial bulb with a pair of opposite valves; optic nerves do not form a solid chiasma; intestine without spiral valve.

Family **Siluridae**.

## THE CATFISHES.

Body more or less elongate; no true scales; 2 dorsal fins, the posterior being adipose; upper and lower jaws with barbels, resembling the whiskers on a cat (whence the name catfish); dorsal and pectoral fins each with a strong spine.

- a. Adipose fin short, with the posterior margin free and distinct from the caudal fin.
- b. Band of teeth on upper jaw (premaxillary) without lateral backward extensions; anal rays 17 to 35.
- c. Bony bridge from snout to dorsal fin complete; tail deeply forked. *Ictalurus*, 240
- cc. Bony bridge from snout to dorsal fin not complete; tail rounded, or slightly emarginate to moderately forked (in the Great Lake species). *Ameiurus*, 241
- bb. Band of teeth on upper jaw with a lateral backward extension on each side; anal rays 12 to 15. *Leptops*, 244
- aa. Adipose fin adnate to the back, and separated from caudal fin by a notch.
- d. Band of teeth on upper jaw with lateral backward extensions. *Noturus*, 244
- dd. Band of teeth on upper jaw without lateral backward extensions. *Schilbeodes*, 245

Genus **Ictalurus** Rafinesque.

## CHANNEL CATS.

**Ictalurus punctatus** (Rafinesque). CHANNEL CAT; FIDDLER.

Head 3.6 to 4; depth 2.4 to 5.0; D. 1-6; A. 24 to 29. Body long, slender, compressed posteriorly; head subconic; interorbital space

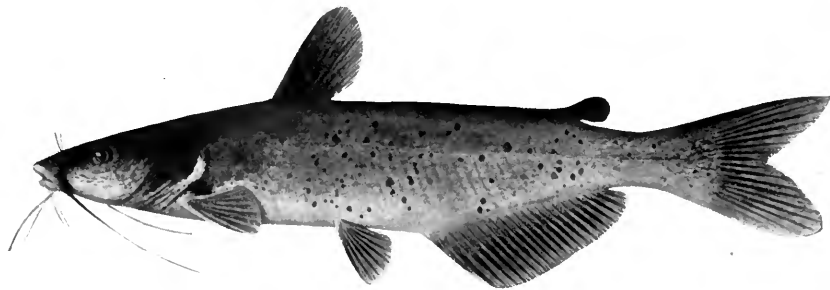


FIG. 19. CHANNEL CAT; FIDDLER.  
*Ictalurus punctatus* (Raf.). (After Forbes and Richardson.)

flat or slightly convex; mouth terminal, the upper jaw slightly the longer; maxillary barbels long and slender, their tips reaching past gill opening; eye nearer upper than lower surface of the head, its diameter 4 to 8 in head; dorsal fin high, its distance from snout 2.5 to 2.7 in length; caudal fin deeply forked, the upper lobe longer and more slender than the lower.

Color light grayish green above, below silvery; back and sides with small, round, irregularly distributed dark spots.

This fish reaches a weight of 15 to 20 pounds, but those usually taken for the market seldom reach a weight of 4 or 5 pounds.

It inhabits clear water from the Great Lake Region to Louisiana and Mexico, preferring river channels to still water. An excellent food and a fair game fish.

Deep River, Liverpool, Indiana.

Genus **Ameiurus** Rafinesque.

BULLHEADS; HORNED POUTS.

Body moderately elongate, robust anteriorly, compressed posteriorly; supraoccipital bone separate from the second interspinal buckler, forming a break in bony bridge from snout to dorsal fin; mouth large; teeth in jaws in broad bands, the band in upper jaw not forming backward extensions; caudal fin short, its margin rounded to slightly forked.

- a. Caudal fin moderately forked; anal rays 24; species large. *lacustris*, 242
- aa. Caudal fin rounded, truncate, or slightly emarginate; species small, usually less than 12 inches in length.
- b. Anal rays 24 to 27; caudal fin rounded. *natalis*, 242
- bb. Anal rays 17 to 24; caudal fin slightly emarginate.
- c. Anal rays 21 to 24; pectoral spine in young with 5 to 10 well developed teeth on its posterior edge, these reduced in size in adults, the number increasing to from 15 to 20; anal fin with membrane and rays about equally colored, the former slightly the darker on distal third. *nebulosus*, 242
- cc. Anal rays 17 to 20; pectoral spine at all ages entire or slightly roughened behind, or rarely in adults with 5 to 10 obscure, weak, and blunt teeth on its posterior edge; anal fin with the membranes uniformly colored and darker than the rays. *melas*, 243

**Ameiurus lacustris** (Walbaum). GREAT LAKE CATFISH.

Head 3.8; depth 4.5; D. 1-6; A. 24. Body robust; head broad, depressed, its width 1.2 in its length; interorbital space flat, 1.8 in head; diameter of eye 8.3 in head; upper jaw the longer; dorsal fin to snout 2.7 in body, its spine short, bluntly pointed, its posterior edge entire; pectoral spine weakly serrate behind; caudal fin moderately forked.

Color dark slaty to bluish black above, paler below; body without dusky spots; anal dusky edged.

It reaches a weight of 40 pounds.

This species inhabits the Great Lake Region.

This fish is frequently taken in Deep River at Liverpool, Indiana and is occasionally taken on set lines and in pound nets at Millers and Pine, Indiana; individuals are sometimes caught in the park lagoons within the city when taking the carp from these waters.

**Ameiurus natalis** (Le Sueur). YELLOW BULLHEAD.

Head 3.1 to 3.5; depth 3.5 to 3.9; D. 1-6; A. 24 to 27. Body very robust; head large, broad, somewhat depressed; its greatest width about equal to its length; eye small, its diameter 7.2 to 8.5 in head; upper jaw slightly longer than the lower; maxillary barbels reaching about to posterior edge of opercles; dorsal fin small, low; caudal fin rounded posteriorly.

Color yellow, brown, green, or black above; yellowish to pale below.

Length 12 to 18 inches.

This species ranges from Dakota to New York, Florida, and Texas. Lagoon, Pine, Indiana; Lagoon, Clark Junction, Indiana.

**Ameiurus nebulosus** (Le Sueur). COMMON BULLHEAD; SPECKLED BULLHEAD; HORNED POUT.

Head 3.2 to 3.6; depth 3.5 to 4.3; D. 1-6; A. 21 to 24.

Body elongate to moderately robust; head subconic, rather narrow, its greatest width 1.2 to 1.3 in its length; upper jaw slightly longer than the lower; maxillary barbel reaching beyond gill opening, often beyond humeral process; pectoral spine 1.8 to 2.4 in head, the posterior edge with 6 to 10 (young) to 10 to 25 (adults) well developed retrorse teeth, shorter when more numerous; base of anal fin 3.2 to 4.1 in body; free margin of fin but little rounded from 8th to 15th ray; caudal fin slightly emarginate.

Color dark yellowish to much marbled or mottled with darker to nearly black; anal fin with membrane and rays of nearly the same color.

Length about 18 inches.

It inhabits lowland streams and ponds from Minnesota to Maine and Texas. This species spawns in the spring. For some time after the young are hatched they swim in a brood, accompanied by the mother. A good food fish.

Des Plaines River, Chicago, Illinois; Des Plaines River, Berwyn, Illinois; Butterfield Creek, Elliotts Park, Illinois; Lagoon, Buffington, Indiana; Calumet River, Clark Junction, Indiana.

**Ameiurus melas** (Rafinesque). BLACK BULLHEAD.

Head 3.1 to 3.5; depth 3.1 to 3.5; D. 1-6; A. 17 to 20.

Body robust, head large, profile slightly convex, its width 1.1 to 1.2 in its length; mouth wide, the jaws about equal; maxillary barbels reaching to or slightly beyond gill opening; pectoral spine short, rather blunt, its length 2.4 to 3.6 in head; posterior edge of pectoral

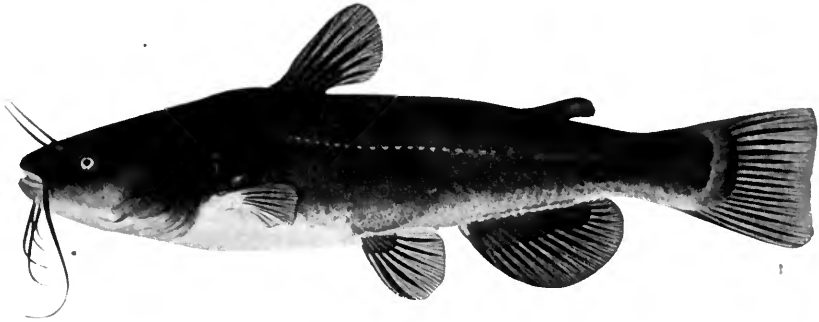


FIG 20. BLACK BULLHEAD.  
*Ameiurus melas* (Raf.). (After Forbes and Richardson.)

spine entire or slightly roughened; seldom with 5 to 10 weak teeth in adults; base of anal fin 3.9 to 4.4 in body, its free margin distinctly rounded; caudal fin slightly emarginate.

Color dark brown or greenish to black above, becoming lighter or yellowish below; anal rays very light in contrast with black inter-radial membranes.

Length 12 inches.

Found usually with the preceding from New York to Kansas and Texas, which it much resembles in appearance and habits.

Lagoon, Jackson Park, Chicago, Illinois; Des Plaines River, Berwyn, Illinois; Chicago River, Edgebrook, Illinois; Thorn Creek, Thornton, Illinois; Salt Creek, Lyons, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois; Lagoon, Pine, Indiana; Calumet River, Clark Junction, Indiana; Lagoon, Clark, Indiana.

Genus **Leptops** Rafinesque.

Body elongate, much depressed anteriorly; head large, wide; supraoccipital bony bridge incomplete; teeth in broad bands on both jaws, those of the upper jaw continued backward on each side; lower jaw the longer; caudal fin oblong, subtruncate, with numerous short rays at upper and lower margins.

**Leptops olivaris** (Rafinesque). MUD CAT; YELLOW CAT; GOUJON; MORGAN CAT.

Head 3.2 to 4; depth 4.4 to 5.2; D. 1-6; A. 12 to 15.

Body elongate; head long and broad, much depressed; its width 3.7 to 4.4 in body; interorbital space nearly flat, its width 3.7 to 4.4 in body; lower jaw the longer; lips thin; maxillary barbels not reaching gill openings; eye small, its diameter 8 to 14 in head; pectoral spine short, 3 to 4.4 in head, its anterior and posterior edges roughened or weakly serrate; caudal fin subtruncate.

Color usually dark olive to yellowish above; lighter yellowish to gray below; young mottled.

It reaches a weight of 50 to 75 pounds.

This fish inhabits the larger streams of the Mississippi Valley, south to Northern Mexico. It is a good food fish. Spawns in May and later.

Genus **Noturus** Rafinesque.

## STONE CAT.

Body elongate, head broad flattened above; posterior part of body nearly cylindrical; adipose dorsal long and attached for its entire length; separated from caudal fin by a notch; band of teeth in upper jaw with lateral backward extensions; a poison gland at base of pectoral fin.

**Noturus flavus** Rafinesque. STONE CAT.

Head 3.6 to 3.9; depth 4.0 to 5.0; D. 1-6; A. 16.

Body elongate, its anterior half broad and flattened, its posterior cylindrical; tail compressed; head broad, its width 4 to 5 in length of body; upper jaw the longer; maxillary barbels short, about half length of head; diameter of eye 4 to 6 in head; dorsal fin to tip of snout 2.4 to 2.8 in body; the spine short, its length 3 in height of fin; pectoral spine with a few weak retrorse teeth on its anterior edge near tip, the posterior edge smooth or nearly so; caudal fin rounded.

Color dark olive green above, sides yellowish, below white; a blotch of yellowish before and behind dorsal; fins color of adjacent parts with edges lighter.

Length 10 to 12 inches.

This fish inhabits rather swift running water from Virginia, the Great Lakes, to Montana and Texas.

This species deposits its eggs in June under objects in the water, guarding them till hatched. It is not used for food.

Hickory Creek, New Lenox, Illinois.

### Genus *Schilbeodes* Bleeker.

#### MAD TOMS.

Body short or moderately elongate, its anterior half subcylindrical, the tail compressed; adipose dorsal long and attached for its entire length, continuous with caudal or separated by a notch; teeth in broad bands, those of upper jaw without lateral backward extensions; caudal fin rounded with numerous short rays above and below caudal peduncle; a poison gland at base of pectoral fin. All of the species of this genus are too small to be used for food.

a. Pectoral spine not serrated on posterior margin; adipose fin continuous with caudal; depth of body 3.8 to 4.4 in its length.

*gyrinus*, 245

aa. Pectoral spine distinctly serrated on its posterior edge; adipose fin separated from caudal by a notch; depth of body 4.6 to 6.0 in its length.

b. Pectoral spine 3 in head; a light colored squarish blotch on back before dorsal and a smaller crescentic one behind it.

*exilis*, 246

bb. Pectoral spine less than 2 in head; 4 saddle-like blotches on back.

*miurus*, 247

### *Schilbeodes gyrinus* (Mitchill). TADPOLE CAT.

Head 3.2 to 3.9; depth 3.8 to 4.4; D. 1-6; A. 13 to 15.

Body robust, tadpole-like in form; head large; profile steep and nearly straight from snout to dorsal; jaws equal; maxillary barbels scarcely reaching gill openings; diameter of eye 6.3 to 7.6 in head; dorsal fin to tip of snout 2.5 to 2.9 in length of body; its spine more than  $\frac{1}{2}$  height of fin; pectoral spine strong, its length 1.9 to 2.4 in head, its edges smooth or the anterior with 2 or 3 obscure teeth; lateral line imperfect, and wanting on posterior half of body.

Color olivaceous to almost black, top of head darker; a dark streak on middle of side and one near ventral surface; pectoral and ventral fins dusky, other fins plain.

Length 3 to 5 inches.

This species inhabits small sluggish streams and ponds from the Rainy River eastward through the Upper Mississippi Valley to the Hudson River, Florida, and Alabama. It probably spawns in May. It feeds on small crustaceans and insects.

Bull Creek, Zion City, Illinois; Dead River, Beach, Illinois; Lagoon, Jackson Park, Chicago, Illinois; Des Plaines River, Berwyn, Illinois; Chicago River, Edgebrook, Illinois; Calumet Lake, Pullman, Illinois; Lake George, Indiana; Lagoon, Pine, Indiana; Lagoon, Clark Junction, Indiana.

**Schilbeodes exilis** (Nelson). SLENDER STONE CAT.

Head 3.9 to 4.3; depth 4.9 to 6.0; D. 1-6; A. 14 to 17.

Body elongate, the head slightly depressed; caudal region compressed; head small; upper jaw slightly the longer; maxillary barbels not reaching gill openings; diameter of eye 5.3 to 7.3 in head; dorsal fin to tip of snout 2.9 to 3.1 in length, its spine scarcely half the height of the fin; pectoral spine 2.7 to 3.1 in head; weakly serrate anteriorly near tip, the basal  $\frac{2}{3}$  of its posterior margin with about 6 slender teeth; caudal fin rounded.

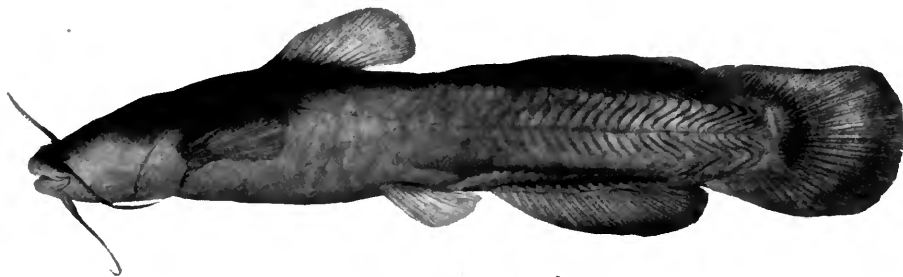


FIG. 21. SLENDER STONE CAT.  
*Schilbeodes exilis* (Nelson). (From Forbes and Richardson.)

Color yellowish brown, uniform on sides, darker above with a lighter squarish spot on occiput and a crescentic one behind dorsal; fins pale or slightly dusky with darker margins.

Length 3 to 4 inches.

This fish inhabits small streams, with clear running water, from Wisconsin to Indiana and Kansas.

Hickory Creek, New Lenox, Illinois.



**Schilbeodes miurus** (Jordan). BRINDLED STONE CAT.

Head 3.5 to 3.9; depth 4.6 to 5.6; D. 1-6; A. 13 to 15.

Body elongate, broad anteriorly, slender and compressed posteriorly; head wide, depressed anteriorly; upper jaw slightly longer than the lower; maxillary barbels scarcely reaching gill openings; diameter of eye 4.3 to 5.0 in head; dorsal fin to tip of snout 2.6 to 2.8 in the length; dorsal spine more than half the length of the fin; pectoral spine 1.5 to 1.8 in head, curved, the basal  $\frac{2}{3}$  of anterior edge finely serrate, the posterior margin with 6 to 8 strong hook-like teeth; caudal fin rounded.



FIG. 22. BRINDLED STONE CAT.  
*Schilbeodes miurus* (Jordan). (From Forbes and Richardson.)

Color grayish with small black spots, the back crossed by saddle-like blotches, one before dorsal, one behind it, one on adipose fin and one at base of caudal; tip of dorsal, caudal, and anal blackish.

Length  $3\frac{1}{2}$  inches.

This species inhabits small clear streams and ponds from Lake Michigan to Louisiana.

## Order **Eventognathi.**

### THE CARP-LIKE FISHES.

Skeleton osseous, the anterior vertebræ modified and with Weberian apparatus; opercular bones present; jaws without teeth; ventral fins abdominal; air bladder with open duct; body usually covered with ordinary scales.

- a. Pharyngeal teeth numerous, comb-like; dorsal fin of more than 10 rays; lips thick, covered with plicate or papillose skin.

*Catostomidæ*, 248

- aa. Pharyngeal teeth fewer, 4 to 8 on each bone; dorsal fin of less than 10 rays; lips without thickened skin. *Cyprinidæ*, 257

### Family **Catostomidæ.**

#### THE SUCKERS.

Body oblong or elongate, usually more or less compressed and covered with large cycloid scales; fins without true spines; gill membranes united to the isthmus; pseudobranchiæ present; branchiostegals 3; margin of upper jaw formed in the middle by the small premaxillaries and on sides by maxillaries; lower pharyngeal bones falciform and with a single row of comb-like teeth; mouth with thick lips covered with plicate or papillose skin; fins without spines; caudal fin forked; no pyloric cœca; air bladder in 2 or 3 parts, connected to œsophagus.

- a. Dorsal fin elongate, of more than 20 developed rays.  
 b. Mouth large, more or less terminal, protractile forward;  
 \* pharyngeal teeth and bones moderate; coloration, dark.  
*Ictiobus*, 249  
 bb. Mouth smaller, inferior, protractile downward; pharyngeal bones narrow, with the teeth thin and weak; coloration, pale.  
*Carpiodes*, 250  
 aa. Dorsal fin shorter, of less than 20 rays.  
 c. Lips plicate.  
 d. Lateral line wanting or imperfectly developed; sides with dark band or dark lateral stripes; air bladder in 2 parts.  
 e. Lateral line entirely wanting; sides with a single dark lateral band.  
*Erimyzon*, 251  
 ee. Lateral line incomplete; sides with dark lateral stripes along the rows of scales.  
*Minytrema*, 252  
 dd. Lateral line complete; sides without dark lateral band or lateral stripes; air bladder in 3 parts.  
 f. Pharyngeal teeth compressed; mouth wholly inferior.  
*Moxostoma*, 253  
 ff. Pharyngeal teeth large, molar-like; mouth somewhat oblique.  
 †(*Placopharynx*)

\*The pharyngeal bones are situated on either side of the œsophagus just back of the gill arches.

†*Placopharynx duquesnii* (Le Sueur) probably does not occur in the waters in and about Chicago. In form and appearance it resembles the common red-horse, with which it is often identified, but from which it is easily separated because of its molar-like pharyngeal teeth.

cc. Lips papillose; air bladder in 2 parts; scales 48 to 110.

*Catostomus*, 255

Genus **Ictiobus** Rafinesque.

THE BUFFALO FISHES.

Body robust, compressed, both dorsal and ventral outlines curved; head rather large; mouth terminal or slightly inferior; lips thin, plain or more or less plicate; the upper protractile downwards and forwards; eye nearer angle of preopercle than upper corner of gill cleft; pharyngeal bones broad, but thin and weak; the teeth long; dorsal fin long, of 25 to 30 rays; the anterior ones produced to about  $\frac{1}{2}$  length of fin; air bladder in 2 parts; lateral line complete; coloration dark, never silvery. All are good food fishes.

a. Body slender, the dorsal region little elevated, depth 3.0 to 3.5 in the length. *urus*, 249

aa. Body deeper, the dorsal region elevated; depth 2.5 to 2.8 in length. *bubalus*, 249

**Ictiobus urus** (Agassiz). MONGREL BUFFALO.

Head 3.7 to 4.0; depth 3.0 to 3.4; D. 29 or 30; A. 9 or 10; scales 36 to 40.

Body robust, the dorsal and ventral outlines about equally curved; snout bluntly rounded; mouth small, little oblique, protractile downward and forward, lips plicate; eye small, 5.1 to 6.6 in head; interorbital space 2.0 to 2.3 in head; tips of anterior rays of dorsal when deflexed not reaching past middle of fin; lateral line complete.

Color dark slaty-gray to almost black; fins all dark.

This fish reaches a weight of 50 pounds but those usually seen in the market seldom exceed 10 pounds.

It inhabits the larger streams and bayous throughout the Mississippi Valley, the southern end of Lake Michigan and the tributary streams. It spawns in April.

Lagoon, Jackson Park, Chicago, Illinois.

**Ictiobus bubalus** (Rafinesque). SMALL-MOUTH BUFFALO.

Head 3.6 to 4.1; depth 2.5 to 2.9; D. 27 to 30; A. 9 to 10; scales 37 to 39.

Body robust, the dorsal region considerably elevated; snout bluntly pointed; mouth small, inferior, protractile downward and forward; lips coarsely and brokenly plicate; eye small, 4.4 to 6.2 in head; interorbital space 2.1 to 2.6 in head; tips of anterior rays of dorsal when deflexed not reaching middle of fin; lateral line complete.

Color dull brownish olive, never silvery.

This species reaches a weight of 40 lbs., a little smaller than the preceding.

It is usually found with the preceding species, which it much resembles in appearance and habits. Not known to occur in the Great Lake Basin.

### Genus **Carpiodes** Rafinesque.

#### THE CARP SUCKERS.

Body thin, compressed; ventral line almost straight, the dorsal much arched; head small, short; lips thin and slightly striate, the upper protractile downwards; eye equidistant from lower posterior angle of preopercle and upper corner of gill cleft; pharyngeal bones broad but thin, the teeth weak and much compressed; dorsal fin long, of 23 to 30 rays, the anterior ones produced to more than half length of fin; lateral line complete; coloration silvery. All are used for food, but of less value than species of *Ictiobus*.

- a. Snout short, 3.5 to 4.5 in head; nostrils well forward, the distance from anterior nostril to end of snout less than diameter of the eye. *difformis*, 250
- aa. Snout longer, 3.0 to 3.5 in head; nostrils situated well back, the distance from the anterior nostril to end of snout usually greater than diameter of the eye; tip of lower jaw far in advance of the nostrils. *velifer*, 251

#### **Carpiodes difformis** Cope. BLUNT-NOSED RIVER CARP.

Head 3.9 to 4.3; depth 2.4 to 2.7; D. 24 to 25; A. 8; scales 35 to 37.

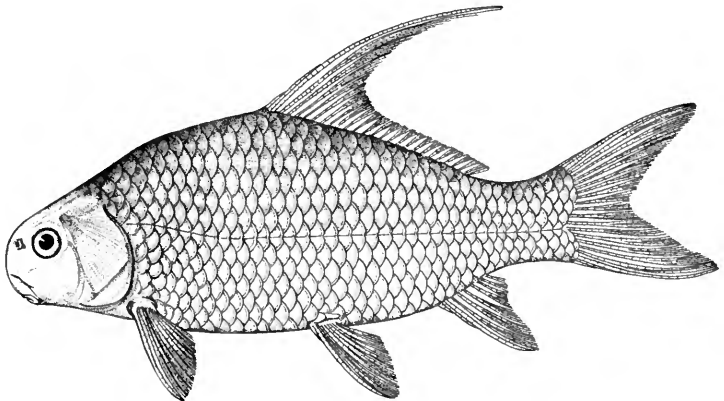


FIG. 23. BLUNT-NOSED RIVER CARP  
*Carpiodes difformis* Cope. (From Forbes and Richardson.)

Body short, compressed; the dorsal region much arched; snout small, wholly inferior; lips weakly plicated, the halves of the lower meeting at a rather sharp angle, tip of lower lip scarcely in advance of the nostrils; interorbital space 2.2 to 2.5 in head; snout short, very blunt, its length 3.9 to 4.5 in head; nostrils near tip of snout; anterior dorsal rays as long as or longer than the fin; lateral line complete.

Color silvery, darker above.

This fish seldom reaches a length of more than 12 inches.

It occurs in the Ohio Valley and westward in the larger streams.

**Carpiodes velifer** (Rafinesque). QUILLBACK; SILVER CARP.

Head 3.6 to 4.0; depth 2.7 to 3.0; D. 27 to 30; A. 9 to 10; scales 39 or 40.

Body ovate, compressed; dorsal region much arched; mouth small, slightly oblique; lips weakly plicate, the lower halves meeting at a sharp angle; tip of lower lip far in advance of nostrils; interorbital space 2.3 to 2.5 in head; snout long, bluntly pointed, its length 2.9 to 3.5 in head; nostrils much nearer eye than tip of snout; anterior dorsal rays about as long as the fin; lateral line complete.

Color light olive above, sides silvery; fins pale.

Length about 12 inches.

This species occurs in the smaller rivers and creeks from Ohio to Iowa and southward. It spawns in April. Similar in size and appearance to the preceding.

Genus **Erimyzon** Jordan.

THE CHUB SUCKERS.

Body elongate, more or less compressed; head short; mouth subinferior, slightly oblique; upper lip protractile, lower lip plicate, its halves meeting in an acute angle; no anterior fontanelle, the posterior well developed; pharyngeal bones weak, the teeth small and slender, rapidly decreasing in length upward; air bladder in two parts; lateral line wanting.

**Erimyzon sucetta** (Lacépède). CHUB SUCKER.

Head 3.5 to 4.1; depth 3.1 to 3.9; D. 9 to 12; A. 7; scales 36 to 45

Body oblong, compressed, becoming deeper with age; head short; mouth subinferior, small, slightly oblique; lower lip strongly plicate, its halves meeting at an acute angle; eye large, 3.8 to 5.8 in head;

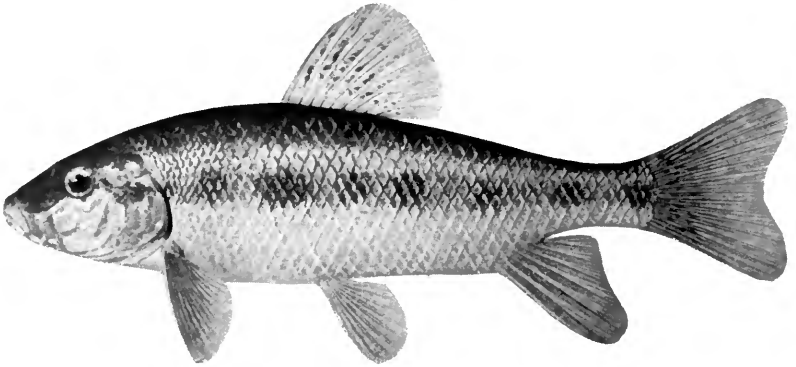


FIG. 24. CHUB SUCKER.  
*Erimyzon sucetta* (Lac.). (After Forbes and Richardson.)

interorbital space slightly convex, 2.2 to 2.6 in head; dorsal fin a little higher than long, its free margin convex; lateral line absent.

Color uniform brownish olive, with more or less coppery lustre; sides with dark lateral band, most conspicuous in the young; fins dusky.

Length about 10 inches.

This fish ranges from the Great Lake Region to Virginia and Texas. It prefers sluggish or still water where there is much vegetation. It spawns in April. Of little value as a food fish.

Fox River, Illinois; Dead River, Beach, Illinois; Des Plaines River, Berwyn, Illinois; Hickory Creek, Alpine, Illinois; Lagoon, Buffington, Indiana; Lagoon, Pine, Indiana; Calumet River, Clark, Indiana; Lagoon, Edgemoor, Indiana; Lagoon, Gary, Indiana.

### Genus **Minytrema** Jordan.

#### STRIPED SUCKER.

Body elongate, somewhat compressed; head small; mouth inferior, the upper lip protractile, the lower plicate; fontanelle large; pharyngeal bones weak, the teeth well developed; lateral line absent in young, imperfectly developed in adults; air bladder in 2 parts.

**Minytrema melanops** (Rafinesque). STRIPED SUCKER.

Head 3.9 to 4.6; depth 3.9 to 4.5; D. 11 or 12; A. 7 or 8; scales 42 to 46.

Body elongated, moderately compressed; snout blunt; mouth small, inferior; lower lip plicate, its halves meeting at a short angle;

snout 2.3 to 2.7 in head; eye small, 4.4 to 6.9 in head; interorbital space convex, 2.2 to 2.5 in head; free margin of dorsal fin concave; lateral line absent in young, incomplete in adult.

Color olivaceous to coppery; each scale with a dark spot, these forming lines along rows of scales; fins plain.

Length about 18 inches.

This species inhabits smaller rivers, creeks, and ponds from the Great Lakes to North Carolina and Texas. It is not abundant anywhere and is of little value as a food fish.

Genus **Moxostoma** Rafinesque.

REDHORSE SUCKERS.

Body elongate, more or less compressed; mouth inferior, lips transversely plicate, the folds rarely so broken as to form papillæ; posterior fontanelle well open; pharyngeal bones weak, the teeth rather coarse; lateral line well developed; air bladder in 3 parts; caudal fin well forked.

- a. Lips strongly plicate; halves of the lower lip meeting in wide angle; margin of dorsal fin convex. *aureolum*, 253
- aa. Folds of the lower lip more or less broken into papillæ; dorsal fin with its margin straight or concave.
- b. Head long, 3.5 to 4.3 in body; halves of lower lip meeting in a sharp angle; margin of dorsal fin straight. *anisurum*, 254
- bb. Head short, 4.5 to 5.5 in head; halves of lower lip truncate behind; margin of dorsal fin convex. *breviceps*, 254

**Moxostoma aureolum** (Le Sueur). COMMON REDHORSE.

Head 3.9 to 4.5; depth 3.6 to 4.4; D. 12 to 14; A. 7; scales 41 to 48.

Body elongate, robust anteriorly, compressed posteriorly; the back little elevated; head moderate, flattened above, the cheeks nearly vertical; mouth large, lips thick, coarsely plicate; eye large,

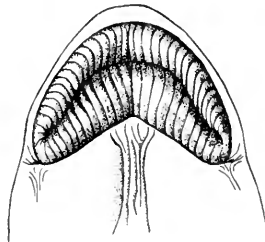


FIG. 25. LIPS OF THE COMMON REDHORSE. *Moxostoma aureolum* (Le S.). (From Forbes and Richardson.)

4.0 to 5.8 in head; free margin of dorsal straight, the fin a little higher than long; upper lobe of caudal a little longer than the lower; lateral line complete.

Color uniformly olivaceous above and on sides, becoming pale below; dorsal dusky; lower fins with some orange at base; the outer margins dusky.

Length about 18 to 24 inches.

This fish inhabits the clearer streams and lakes from the Assiniboin through the Great Lake Region to Arkansas and Georgia. It spawns in April and May, ascending streams for that purpose. Of little value as a food fish.

Fox Lake, Illinois; Fox River, McHenry, Illinois; Dead River, Beach, Illinois; Hickory Creek, New Lenox, Illinois.

**Moxostoma anisurum** (Rafinesque). WHITE-NOSED SUCKER.

Head 3.5 to 4.3; depth 3.3 to 4.1; D. 14 to 17; A. 7; scales 42 to 45.

Body elongate, compressed, robust anteriorly, the dorsal region elevated; head broad and short; interorbital space flat, 2.2 to 2.6 in head; snout long, 2.1 to 2.6 in head; mouth rather large, the lips thick, the folds broken into papillæ; eye large, 4.0 to 6.4 in head;

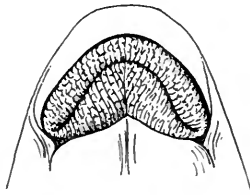


FIG. 26. LIPS OF THE WHITE-NOSED SUCKER.  
*Moxostoma anisurum* (Raf.). (From Forbes and Richardson.)

dorsal fin long, its free margin straight, upper lobe of caudal a little longer than the lower; lateral line complete.

Color pale, silvery, darker above, the nose and chin whitish; dorsal and caudal with some dusky; lower fins white to light reddish.

Length about 18 inches.

It inhabits the clearer streams of the Great Lake Region to North Carolina. Smaller and less common than the preceding.

**Moxostoma breviceps** (Cope). SHORT-HEADED REDHORSE.

Head 4.6 to 5.4; depth 3.8 to 4.6; D. 12 or 13; A. 7; scales 43 to 45.

Body subfusiform, moderately compressed; head short, subconical, interorbital space 1.9 to 2.4 in head; snout 2.3 to 2.9 in head; diameter of eye 4 to 5 in head; mouth small, upper lip coarsely



plicate, the lower breaking into papillæ on distal margin; lower lip truncate behind; free margin of dorsal fin concave; upper lobe of caudal falcate, usually longer than the lower; lateral line complete.

Color pale yellowish olive above, paler below; dorsal scarcely dusky; caudal light with reddish tinge; lower fins salmon colored with greenish margins.

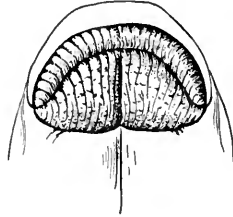


FIG. 26. LIPS OF THE SHORT-HEADED REDHORSE.  
*Moxostoma breviceps* (Cope). (From Forbes and Richardson.)

Length about 15 inches.

It inhabits streams and lakes of the Great Lake Region and the Upper Mississippi Valley. A food fish of not much importance.

Fox River, McHenry, Illinois.

### Genus *Catostomus* Le Sueur.

#### FINE-SCALED SUCKERS.

Body elongate, subfusiform; head elongate, rather broad; mouth inferior; lips thick, papillose; upper lip protractile; posterior fontanelle large; pharyngeal teeth shortish; air bladder in two parts; lateral line developed.

- a. Head transversely convex above; scales in lateral series more than 60; scales on anterior portion of the body reduced in size.
- b. Scales in lateral series 95 to 115. *catostomus*, 255
- bb. Scales in lateral series 68 to 80. *commersonii*, 256
- aa. Head broad, transversely concave; scales large, 48 to 55 in the lateral series. *nigricans*, 257

***Catostomus catostomus* (Forster).** LONG-NOSED SUCKER; RED SUCKER; NORTHERN SUCKER.

Head  $4\frac{1}{4}$  to 4.6; depth 4.3 to 4.6; D. 10 or 11; A. 7; scales 95 to 114.

Body elongate, subterete; head long and slender; interorbital space convex; mouth small, lips coarsely tuberculate; snout long, rather pointed, overhanging the large mouth; eye small 8.2 in head;

scales on sides and upper part of body reduced in size anteriorly; lateral line complete; caudal forked.

Color olivaceous above, lighter below; sides of male in breeding season with a broad rosy band.

Length about 24 inches.

This species inhabits the Great Lake Region, the Upper Missouri and Columbia Rivers, and northward into Alaska. Frequently taken by fishermen at Pine and Millers, Indiana. Not abundant and of little value as a food fish.

Lake Michigan, Millers, Indiana; Lake Michigan, Pine, Indiana.

**Catostomus commersonii** (Lacépède). COMMON SUCKER.

Head 4.0 to 4.8; depth 4.3 to 5.3; D. 11 to 13; A. 7; scales 63 to 80.

Body elongate, subterete, robust anteriorly; head subconical, flattish above; interorbital space nearly flat; 2.1 to 2.6 in head; snout blunt; mouth inferior, the lips strongly papillose; the diameter of eye 4.5 to 6.8 in head; scales smaller on anterior portion of body;

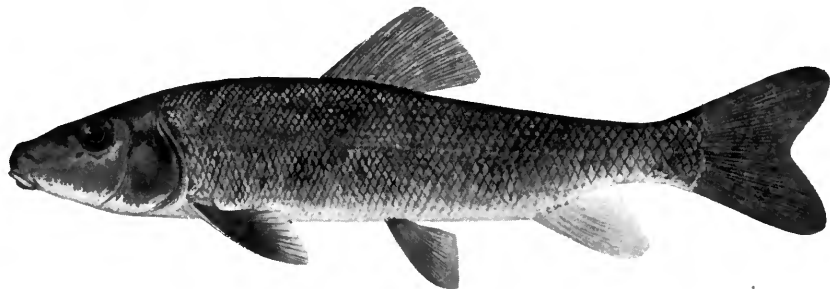


FIG. 27. COMMON SUCKER.  
*Catostomus commersonii* (Lac.). (After Forbes and Richardson.)

lateral line complete in adults, partially absent in the young; caudal fin forked.

Color olivaceous on back and sides; lighter below; spring males with a faint rosy lateral band.

Length about 18 inches.

This species inhabits the smaller streams from Georgia to Missouri and northward to Great Bear Lake and Hudson Bay. Spawns in the spring. Too full of small bones to be of much value as a food fish.

Fox River, McHenry, Illinois; Bull Creek, Zion City, Illinois; Bull Creek, Beach, Illinois; Pettibone Creek, North Chicago, Illinois; Ravine, Glencoe, Illinois; Jackson Park, Chicago, Illinois; Des Plaines River, Chicago, Illinois; Thorn Creek, Thornton, Illinois; Hickory Creek, Alpine, Illinois; Hickory Creek, New Lenox, Illinois;

Lake Michigan, Millers, Indiana; Lagoon and Lake Michigan, Pine, Indiana; Calumet River, Clark, Indiana.

**Catostomus nigricans** Le Sueur. HOG SUCKER; STONE-ROLLER.

Head 3.6 to 4.5; depth 4.6 to 5.1; D. 10 to 13; A. 7; scales 46 to 51.

Body elongate, subfusiform, robust anteriorly; head very large and broad; interorbital space transversely concave, 1.9 to 2.5 in head; snout long and strongly decurved, 1.8 to 2.2 in head; mouth inferior, the lips thick and strongly papillose; diameter of the eye 4.5 to 7.0 in head; scales on sides and dorsal region of nearly uniform size; lateral line complete; caudal fin forked.

Color dark olivaceous above, sides with brassy lustre; belly white; young with 4 dark oblique bars on back and sides; pectorals and ventrals with some darker markings.

Length about 24 inches.

This species inhabits clear water, from the Lake of the Woods to Kansas and east to the Atlantic slope, north of the Carolinas, ascending streams in the spring to spawn. Of little value as a food fish.

Fox River, McHenry, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois.

## Family **Cyprinidæ.**

### THE MINNOWS.

Body elongate, more or less compressed; mouth large or small, terminal or subinferior; margin of the upper jaw formed by the pre-maxillaries; no teeth in the jaws; pharyngeal bones well developed, falciform, and nearly parallel with the gill arches, each provided with 1 to 3 rows of teeth, usually 4 to 7 in the main row; fewer in the other rows if present; barbels, usually none, never more than 2 to 4; belly rounded, rarely compressed to an edge, and never serrate; gill membranes broadly joined to the isthmus; branchiostegals always 3; gills 4; pseudobranchiæ usually present; ventral fins abdominal; air bladder large, usually in two lobes; stomach without appendages.

This family comprises many small fresh-water fishes. A few of our western forms reach a large size. On this continent the southernmost limit of this family is in the Balsas basin in southern Mexico.

This large group of small fishes which so much resemble each other in form, size, and coloration is one of the most difficult in which to distinguish genera and species. Before one can make much progress in the study of these species, careful attention must be given to the

teeth, as the genera are based largely on dental characters. The teeth are confined to the pharyngeal bones which are just back of the gill openings on either side of the œsophagus. In American species the teeth on each pharyngeal bone are in one large row of 4 or 5, in front of which is usually a smaller row of one or two teeth. The pharyngeal bones must be removed with great care to avoid breaking the teeth from them. It is best to clean the teeth by tearing away the flesh with a needle or other sharp-pointed instrument, after which they are easily examined with a hand lens. The herbivorous species have teeth usually not hooked and with a flat or concave surface. In the carnivorous species they usually have a sharp cutting or a serrated edge and hooked tips. Their number is indicated by a dental formula. Thus "teeth 4-4," indicates that only the principal row on each side is present. "Teeth 2. 4-5, 2," indicates the principal row on one side contains four teeth, the other five, while the lesser row on each side contains two each, and so on.

During the breeding season the males are more or less covered with tubercles, outgrowths of the epidermis. Usually these are confined to the head, but often are found over the entire body. The lower parts of the body and the fins are often highly colored; the prevailing color being red, although in some genera it is satin white, yellow, or black. In some cases the males are deeper than the females. Young examples are always difficult to identify; these are usually more slender and have a larger eye than the adults. Often the young have a lateral band and a dark caudal spot which the adults do not possess. In the following descriptions the rudimentary rays of the dorsal and anal fins are not counted. Besides the native species here mentioned, three species from Europe and Asia have been introduced into some of the streams and lakes of the United States and Mexico, where they have become quite abundant. They are easily distinguished from the native fresh-water fishes by the long dorsal fin which is preceded by a serrated spine.

- a. Anterior dorsal rays not forming a stiff serrated spine; dorsal fin of less than 10 rays.
- b. Alimentary canal more than twice the length of the body; peritoneum usually black, or dark gray.
- c. Air bladder surrounded by convolutions of the intestine; about 50 scales in the lateral series, teeth 4-4 or 1, 4-4, 0.

*Campostoma*, 260

- cc. Air bladder not surrounded by convolutions of the intestine.
- d. Scales very small 65 to 90 in the lateral series; teeth 5-5 or 4-5.

*Chrosomus*, 260

- dd. Scales larger, 35 to 50 in lateral series; teeth 4-4.
- e. Scales between nape and dorsal fin slightly or not smaller than those on rest of body; 12 to 16 in number; first short dorsal ray closely attached to second. *Hybognathus*, 261
- ee. Scales between nape and dorsal fin much smaller than those on rest of body; 22 to 25 in number; first dorsal ray separated from second by a membrane. *Pimephales*, 262
- bb. Alimentary canal less than twice the length of the body; peritoneum usually pale.
- f. Premaxillaries protractile; scales in lateral series, usually less than 60.
- g. No barbel at posterior end of maxillary.
- h. Mouth very small, its gape very oblique, making with vertical an angle of less than 40°; peritoneum pale; teeth 4-5 or 5-5. *Opsopæodus*, 263
- hh. Mouth larger, its gape horizontal or more or less oblique, making with the vertical an angle of more than 40°.
- i. Abdomen behind ventral fins with a sharp keel-like edge over which the scales do not pass; lateral line much decurved, concurved with the ventral outline; body much compressed; teeth 5-5; anal rays 12 to 14. *Notemigonus*, 264
- ii. Abdomen behind ventrals rounded, its surface fully scaled.
- j. First dorsal ray separated from second by a membrane; snout blunt; teeth 4-4. *Cliola*, 265
- jj. First ray of dorsal closely attached to second.
- k. Lips normal, nowhere conspicuously thickened.
- l. Lower portion of head without externally visible mucous channels. *Notropis*, 266
- ll. Lower portion of head with distended mucous cavities, appearing externally as transverse vitreous streaks. *Ericymba*, 275  
*Phenacobius*, 276
- kk. Lower lip thickened at each side forming fleshy lobes.
- gg. One or two barbels at or near posterior end of maxillary.
- m. Maxillary barbel or barbels terminal; scales large, 35 to 45 in lateral series, 14 to 25 in series before dorsal. *Hybopsis*, 277
- mm. Barbel on upper side and near tip of maxillary; scales smaller, 50 or 60 in the lateral series. About 35 scales in series before dorsal. *Semotilus*, 280
- ff. Premaxillaries not protractile; scales small, more than 60 in the lateral series. *Rhinichthys*, 281

- aa. Anterior dorsal rays forming a stiff serrated spine; dorsal fin with 15 to 22 rays.
- n. Mouth with 4 long barbels; scales in lateral series, 35 to 40; teeth 1, 1, 3-3, 1, 1. *Cyprinus*, 282
- nn. Mouth without barbels; scales in lateral series, 25 to 30; teeth 4-4. *Carassius*, 283

### Genus **Campostoma** Agassiz.

Body elongate, little compressed; mouth small, lips thick; premaxillaries protractile; no maxillary barbel; pharyngeal teeth 4-4 or 1, 4-4, 0, with oblique grinding surface and a slight hook on one or two teeth; alimentary canal coiled around the air bladder; peritoneum black.

#### **Campostoma anomalum** (Rafinesque). STONE-ROLLER.

Head 4.0 to 4.6; depth 3.9 to 4.8; D. 8; A. 7 or 8; scales 46 to 53.

Body elongate, subterete; head subconic, the snout projecting beyond the mouth; mouth horizontal, the maxillary scarcely reaching vertical from posterior nostril, its length 3.3 to 4.6 in head; eye small, 4.2 to 5.2 in head; snout 2.3 to 2.8; teeth 4-4 or 1, 4-4, 0, with oblique grinding surface; origin of dorsal fin about midway between end of snout and base of caudal; alimentary canal 5 to 9.5 times length of body; peritoneum black; scales small, 15 to 26 in a series between nape and dorsal fin, lateral line complete.

Color brownish olive, sides irregularly blotched with darker; a dusky vertical bar behind opercle, dorsal, and anal with a dusky bar through the middle on males.

Length 6 inches.

This fish is abundant in small streams from Wyoming to New York, North Carolina, and Texas. It prefers clear running water, spawning on riffles in the spring.

Bull Creek, Zion City, Illinois; Des Plaines River, Berwyn, Illinois; Thorn Creek, Thornton, Illinois; Lockport, Illinois; Hickory Creek, Alpine, Illinois; Hickory Creek, Marley, Illinois.

### Genus **Chrosomus** Rafinesque.

Body moderately elongate, little compressed; mouth small, terminal; lips normal; premaxillary protractile; no maxillary barbel; pharyngeal teeth 5-5 or 4-5, moderately hooked tips, and with grind-

ing surface; alimentary canal twice length of the body; peritoneum black.

**Chrosomus erythrogaster** Rafinesque. RED-BELLIED DACE.

Head 4.0 to 4.2; depth 4.4 to 4.9; D. 7; A. 7 or 8; Scales 77 to 91.

Body rather robust, not much compressed; head rather pointed; mouth terminal, margin of upper lip on level with middle of pupil; maxillary 3.2 to 4.0 in head; its tip reaching slightly past anterior nostril; diameter of eye 3.3 to 3.8 in head; snout pointed, 2.9 to 3.5; teeth 4-4 or 4-5 or 5-5, with tips slightly hooked and with flat or grooved surfaces; alimentary canal 2.4 to 3.5 times length of the body; peritoneum black; scales very small, 35 to 40 scales in series before dorsal fin; lateral line incomplete.

Color brownish olive, a dark vertebral streak; dark spots on upper part of sides; sides with two black stripes; a dark caudal spot; spaces between dark lateral stripes cream colored to red; males in spring with sides and belly with much scarlet.

Length 2 to 3 inches.

This species inhabits clear water from the Dakotas to Maine, Alabama, and Kansas. It is nowhere especially abundant except in the streams of the Ozark mountains, where it occurs in large numbers.

Bull Creek, Zion City, Illinois; Pettibone Creek, North Chicago, Illinois; Hickory Creek, Alpine, Illinois; Hickory Creek, Marley, Illinois; Lagoon, Pine, Indiana.

Genus **Hybognathus** Agassiz.

Body elongate, somewhat compressed; mouth small, the jaws sharp edged; premaxillary protractile; no barbel; teeth 4-4 with oblique grinding surface, little if any hook; alimentary canal 3 to 10 times length of the body; peritoneum black.

**Hybognathus nuchalis** Agassiz. SILVERY MINNOW.

Head 4.0 to 4.6; depth 3.9 to 4.5; D. 8; A. 8; scales 37 to 39.

Body elongate, somewhat compressed; head small, subconical; mouth small, terminal, oblique, margin of upper jaw slightly below middle of pupil, maxillary 3.6 to 4.3; diameter of eye 3.8 to 4.5 in head; snout 2.9 to 3.5; lower jaw slightly the shorter, with sharp hard edge; teeth 4-4, with narrow grinding surface, tips slightly if at all hooked; alimentary canal 3.7 to 8.0 times length of the body; peritoneum dusky; scales large, 13 to 16 in a series before dorsal; lateral line complete.

Color olivaceous green above, sides silvery; scales not distinctly dark-edged.

Length 6 inches.

A small silvery minnow ranging from the Dakotas to Delaware, Georgia and Northern Mexico. It prefers clear running water. So far it is not recorded from the Chicago area.

### Genus **Pimephales** Rafinesque.

#### FATHEADS.

Body robust or elongate, little compressed; head short and rounded, mouth small, subinferior or slightly oblique; premaxillary protractile; no barbel; teeth 4-4 with oblique grinding surface; tips usually not hooked; alimentary canal more than twice length of the body; peritoneum black.

- a. Body short, robust, depth about 3.5 to 4 in length; lateral line incomplete. *promelas*, 262
- aa. Body more elongate, depth about 4.5 in length; lateral line complete. *notatus*, 262

#### **Pimephales promelas** Rafinesque. FATHEAD; BLACKHEAD MINNOW.

Head 3.6 to 4.0; depth 3.2 to 4.0; D. 9; A. 8; scales 42 to 48.

Body robust; head broad and short; snout blunt; mouth small, nearly horizontal in males to very oblique in females, the tip of upper lip on level with lower margin of orbit to upper margin of pupil; maxillary reaching very little past anterior nostril, its length 3.5 to 4.5 in head; jaws about equal; diameter of eye 4.1 to 4.8 in head; snout 3.0 to 3.5; teeth 4-4 or 4-5; alimentary canal 2 to 3 times the length of body; peritoneum black; first dorsal and anal ray in males connected to second by a membrane, not adnate to it as is usual in minnows; lateral line incomplete; scales rather small, 25 to 30 rows in a series in front of dorsal fin. \*

Color dark olivaceous; dorsal fin with a dusky bar across its middle, more prominent in males; spring or breeding males with head jet black, and body and fins dusky.

It reaches a length of about 3 inches.

This fish inhabits ponds and sluggish streams from the Saskatchewan to New York and south to Northern Mexico.

Ravine, Glencoe, Illinois; Willow Springs, Illinois.



**Pimephales notatus** (Rafinesque). BLUNT-NOSED MINNOW.

Head 4.0 to 4.4; depth 4.3 to 4.8; D. 8 or 9; A. 7; scales 41 to 44.

Body elongate, little compressed; head small, flat above; snout blunt, the small mouth subinferior, tip of upper lip on a level with inferior margin of orbit; maxillary 3.8 to 4.3 in head; diameter of eye 3.5 to 4.4; teeth 4-4; alimentary canal about twice length of the body; peritoneum black; lateral line usually complete; scales smaller on anterior part of body, about 23 in a series before dorsal fins.

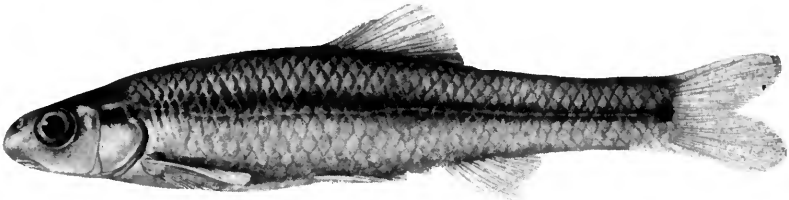


FIG. 28. BLUNT-NOSED MINNOW.  
*Pimephales notatus* (Raf.). (From Forbes and Richardson.)

Color pale olivaceous, sides with a dark band from snout to base of caudal; a dark caudal spot; dorsal fin with a dark blotch in front on first rays; breeding males darker, the head often black.

Length 2 to 3½ inches.

This fish has about the same range as the preceding but is usually found in clear water. It is one of the most abundant minnows in the Chicago area.

Fox River, McHenry, Illinois; Dead River, Beach, Illinois; Bull Creek, Beach, Illinois; Pettibone Creek, North Chicago, Illinois; Ravine, Glencoe, Illinois; Lake Michigan, Chicago, Illinois; Des Plaines River, Chicago, Illinois; Thorn Creek, Flossmore, Illinois; Chicago River, Edgebrook, Illinois; Salt Creek, Lyons, Illinois; Thorn Creek, Thornton, Illinois; Butterfield Creek, Elliotts Park, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois; Wolf Lake, Roby, Indiana.

Genus **Opsopœodus** Hay.

Body elongate, moderately compressed; mouth very small, terminal; maxillary protractile; no barbels; teeth 4-5 or 5-5 with serrated edges, tips hooked; alimentary canal about length of the body; peritoneum pale; scales 37 to 42 in lateral series.

**Opsopœodus emiliæ** Hay. SMALL-MOUTHED MINNOW.

Head 4.2 to 4.5; depth 4.1 to 4.8; D. 8 or 9; A. 8; scales 38 to 40.

Body elongate, moderately compressed; head small; mouth very small and oblique, its gape making an angle of about 30° with vertical; maxillary 3.7 to 4.6 in head; snout 3.2 to 3.8; diameter of eye 3.1 to 3.7; teeth 5-5 or 4-5, slender and strongly hooked; alimentary canal a little shorter than the body; peritoneum dusky to white; dorsal fin inserted nearer tip of snout than base of caudal; lateral line incomplete; scales not smaller on anterior part of body, 15 to 18 in series before dorsal fin.

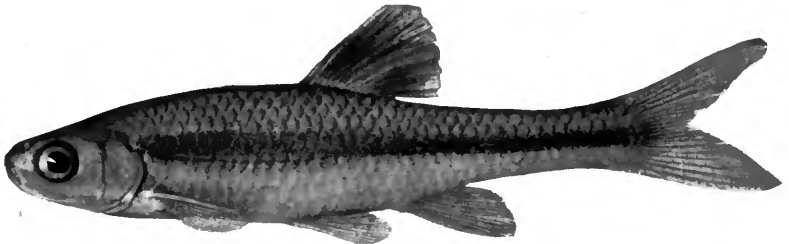


FIG. 29. SMALL-MOUTHED MINNOW.  
*Opsopœodus emiliæ* Hay. (From Forbes and Richardson.)

Color light olivaceous, scales conspicuously dark edged; a dark lateral band; no caudal spot; dorsal fin with one or two dark blotches, most conspicuous in breeding males, other fins plain.

Length about  $2\frac{1}{4}$  inches.

A small fish ranging from Mississippi to Oklahoma to Northern Illinois.

Wolf Lake, Roby, Indiana.

Genus **Notemigonus** Rafinesque.

BREAMS.

Body deep, much compressed; edge of ventral surface in front of ventral fins forming a keel over which the scales do not pass; pre-maxillary protractile; mouth terminal, oblique; teeth 5-5, hooked and with grinding surface; alimentary canal short; peritoneum pale; scales 39 to 55; lateral line present, much decurved.

**Notemigonus crysoleucas** (Mitchill). GOLDEN SHINER; ROACH;  
BREAM.

Head 4 to 4.5; depth 3.0 (adult) to 4.5 (young); D. 8; A. 11 to 14; scales 45 to 52.

Body elongate, much compressed; head small, subconic; mouth small, terminal, oblique, tip of upper lip on level with upper margin of pupil; maxillary not reaching past anterior nostril, its length 3.5 to 3.9 in head; snout 3.2 to 4.0; diameter of eye 3.4 to 4.4; teeth 4-4 to 5-5; alimentary canal 1 to 1.8 times length of body; peritoneum light, or slightly dusky; lateral line complete, deeply decurved;

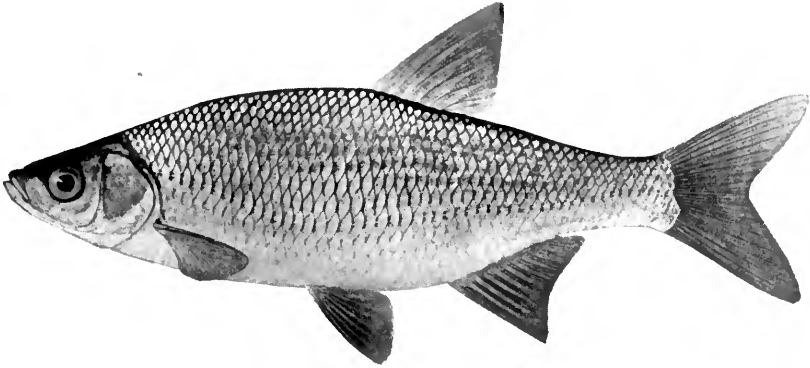


FIG. 30. GOLDEN SHINER; ROACH.  
*Notemigonus crysoleucas* (Mitch.). (After Forbes and Richardson.)

scales not smaller on anterior part of body, about 25 to 30 in front of dorsal fin.

Color greenish olive; sides silvery or with golden reflections; dorsal and anal fins tipped with dusky, young with a dark lateral band. Length 6 to 12 inches.

This fish ranges from the Dakotas to New Brunswick, Florida, and Texas. It usually inhabits ponds and sluggish streams. Very abundant in the Chicago area.

Dead River, Beach, Illinois; Lagoon, Jackson Park, Chicago, Illinois; Des Plaines River, Chicago, Illinois; Des Plaines River, Berwyn, Illinois; Salt Creek, Lyons, Illinois; Willow Springs, Illinois; Thorn Creek, Thornton, Illinois; Hickory Creek, Alpine, Illinois; Hickory Creek, Marley, Illinois; Wolf Lake, Roby, Indiana; Lake George, Indiana; Lagoon, Buffington, Indiana; Calumet River, Clark Junction, Indiana; Calumet River, Clark, Indiana.

#### Genus **Chola** Girard.

Body elongate, little compressed; mouth small, subinferior; no maxillary barbel; premaxillary protractile; teeth 4-4; hooked at

tips and without grinding surface; alimentary canal shorter than the body; peritoneum pale; scales 42 to 48; first dorsal ray connected to second by a membrane as in *Pimephales*, which in general appearance it much resembles.

***Cliola vigilax* (Baird & Girard).** BULLHEAD MINNOW; FLATHEAD.

Head, 3.7 to 4.1; depth 4.1 to 4.5; D. 9; A. 7; scales 39 to 44.

Body rather robust; snout blunt; mouth small, subinferior, tip of upper lip on level with inferior margin of orbit; maxillary not reaching orbit, its length 2.9 to 3.6 in head; snout 2.9 to 3.3; diameter of eye 3.2 to 4.0; teeth 4-4 with grinding surface and slight hooks; alimentary canal about equal to length of body; peritoneum pale;

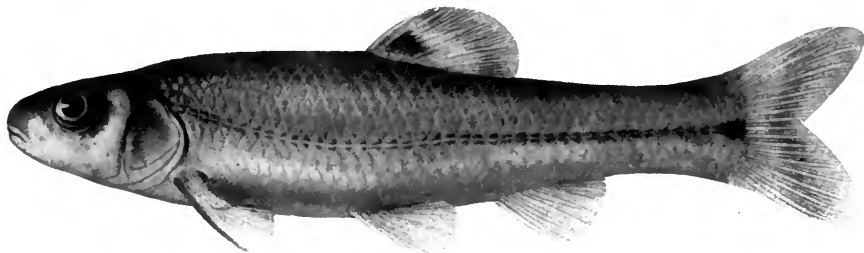


FIG. 31. BULLHEAD MINNOW; FLATHEAD.  
*Cliola vigilax* (Baird and Girard). (From Forbes and Richardson.)

lateral line complete; scales smaller on anterior half of body, 21 to 27 rows in a series before dorsal fin.

Length 2 or 3 inches.

Color dusky olive or yellowish above; sides silvery, with a faint suggestion of a dark lateral band; a small jet-black caudal spot, and a prominent black spot on the anterior 3 or 4 rays of the dorsal fin; spring males with head leaden to blackish, and entire body more or less dusky.

This fish inhabits clear water, ranging from Iowa to Ohio, Georgia, and Texas.

Genus **Notropis** Rafinesque.

SILVERY MINNOWS.

Body more or less elongate, not much compressed; mouth terminal oblique to nearly horizontal and inferior; premaxillaries protractile; no barbels; teeth in one or two rows, the main row always 4-4; alimentary canal about the length of the body, peritoneum pale

to dusky; scales large, 30 to 40 in lateral series; not smaller on anterior part of body.

- a. Scales moderate, fewer than 40 in the lateral series; fewer than 20 scales in a series between nape and dorsal fin.
- b. Anal fin with 7 to 9 rays; origin of dorsal fin near middle of the body.
- c. Scales on sides not or scarcely deeper than long.
- d. Body subterete, not much compressed; tip of first ray of dorsal fin reaching past tip of last ray when the fin is deflexed.
- e. Sides with a distinct dark lateral band prominent on sides of head and on snout; lateral line incomplete.
- f. Mouth oblique, partially or entirely above lower margin of black lateral band; origin of dorsal nearer tip of snout than base of caudal; snout pointed.
- g. Mouth very oblique, making with the vertical an angle of less than 40°; anterior margin of lower jaw on level with upper border of lateral band. *anogenus*, 268
- gg. Mouth less oblique, the angle with the vertical more than 40°; anterior margin of lower jaw on level with middle of lateral band. *heterodon*, 268
- ff. Mouth nearly horizontal, its gape wholly below lateral band; origin of dorsal fin midway between tip of snout and base of caudal; snout blunt. *cayuga*, 269
- ee. Sides without distinct lateral band; lateral line complete; snout blunt; mouth little oblique.
- h. No dark spot at base of caudal; 12 to 15 scales before dorsal fin; maxillary 2.8 to 3.7 in head.
- i. Interorbital broad, 2.5 to 2.9 in head; 12 to 14 scales before dorsal fin; maxillary 3.3 to 3.7 in head. *blennioides*, 270
- ii. Interorbital narrow 3.0 to 3.6 in head; 13 to 15 scales before dorsal; maxillary 2.8 to 3.4 in head. *jejunus*, 270
- hh. A prominent dark spot at base of caudal; 15 to 18 scales before dorsal; maxillary 3.7 to 4.5 in head; interorbital 2.5 to 2.9. *hudsonius*, 271
- dd. Body compressed; tip of last ray of dorsal not reaching tip of last ray when the fin is deflexed. *whiplii*, 272
- cc. Scales on sides deeper than long. *cornutus*, 272
- bb. Anal fin with 10 to 12 rays; origin of dorsal fin much nearer base of caudal than tip of snout.
- j. Head short,  $4\frac{2}{3}$  in length of body; body slender, its depth  $5\frac{1}{2}$  in length. *atherinoides*, 273

- jj. Head longer, 4 in length of body; body deeper,  $4\frac{2}{3}$  in length. *rubrifrons*, 274  
 aa. Scales smaller; 40 to 50 in the lateral series, more than 20 scales in series between nape and origin of dorsal. *umbratilis*, 274

**Notropis anogenus** Forbes. LEAST MINNOW.

Head 4.3 to 4.5; depth 4.3 to 4.5; D. 8; A. 7; scales 34 to 37.

Body elongate, slightly compressed; head small; mouth very small and very oblique, its gape making an angle of  $20^\circ$  to  $30^\circ$  with the vertical; maxillary not reaching back of posterior nostril, its length 4.5 to 5.1 in head; snout 4.5 to 4.8; diameter of eye 3.1 to 3.3; teeth 4-4 with well developed grinding surface, more or less hooked; dorsal fin slightly behind ventrals, a little nearer base of caudal than tip of snout; alimentary canal 1.2 to 1.3 times length of body; peri-

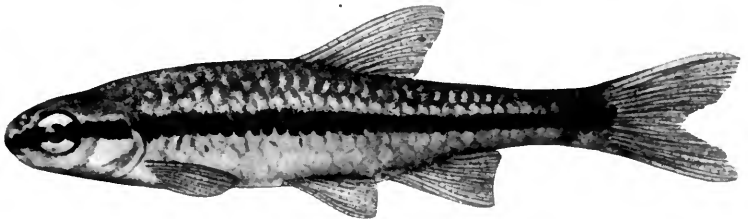


FIG. 32. LEAST MINNOW.  
*Notropis anogenus* Forbes. (After Forbes and Richardson.)

toneum dusky; lateral line complete or nearly so; scales not smaller on anterior portion of body, about 13 or 14 before dorsal fin.

Color dark olivaceous above, silvery below; sides with a dark lateral band, ending in a caudal spot; tip of lower jaw black.

Length about  $1\frac{1}{4}$  inches.

A small species, 2 or 3 inches in length, ranging from Iowa to New York.

Fox River, McHenry, Illinois; Hickory Creek, New Lenox, Illinois.

**Notropis heterodon** (Cope). BLACK-STRIPED MINNOW.

Head 3.9 to 4.2; depth 4.1 to 4.6; D. 8; A. 7 or 8; scales 35 to 38.

Body elongate, moderately compressed; head small, conic; mouth terminal, oblique, its gape making an angle of  $40^\circ$  to  $60^\circ$  with vertical, the tip of upper jaw on level with upper margin of the pupil; maxillary scarcely reaching front of orbit; its length 3.6 to 4.0 in head; snout pointed, 3.5 to 3.8; diameter of eye 2.7 to 3.0; teeth 1 or 0, 4-4, 1 or 0, the first three hooked and with grinding surface; alimentary canal shorter than the body; peritoneum silvery; dorsal

fin over ventrals, its origin nearer tip of snout than base of caudal; lateral line usually incomplete; scales before dorsal 12 to 14.

Color dark olivaceous above, silvery below; a dark lateral band from snout through eye to base of caudal; margin of lower lip black. Length 2 inches.

This fish ranges from Minnesota to New York, Ohio, and Kansas. Hickory Creek, New Lenox, Illinois; Wolf Lake, Roby, Indiana.

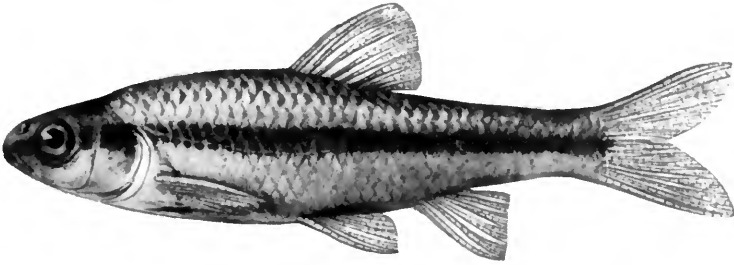


FIG. 33. BLACK-STRIPED MINNOW.  
*Notropis heterodon* (Cope). (From Forbes and Richardson.)

**Notropis cayuga** Meek. BLUNT-NOSED MINNOW.

Head 3.7 to 4.1; depth 4.5 to 5.2; D. 8; A. 7 to 8; scales 34 to 36.

Body elongate, not much compressed; head rather large; snout blunt; mouth small, but little oblique, the tip of upper lip below level of lower margin of the eye; maxillary not reaching eye, its length 4.2 to 4.9 in head; snout 3.2 to 3.8; diameter of eye 3.1 to 3.5; teeth 4-4, hooked, the grinding surface narrow; alimentary canal 1 to 1.2 times

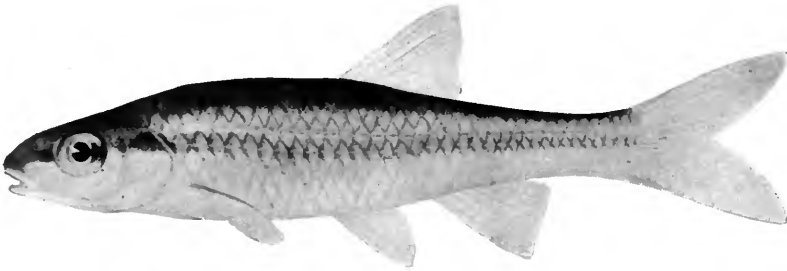


FIG. 34. BLUNT-NOSED MINNOW.  
*Notropis cayuga* Meek. (After Forbes and Richardson.)

length of body; peritoneum silvery; lateral line usually incomplete; scales 12 to 15 rows before dorsal fin.

Color olivaceous, the scales dark edged; a black lateral stripe from snout to base of caudal; a faint caudal spot; margin of lower jaw without black.

Length  $2\frac{1}{2}$  inches.

This fish inhabits sluggish water where there is considerable vegetation, having about the same range as the preceding.

Dead River, Beach, Illinois; Salt Creek, Lyons, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois; Wolf Lake, Roby, Indiana.

**Notropis blennius** (Girard). STRAW-COLORED MINNOW.

Head 3.8 to 4.2; depth 4.2 to 4.8; D. 8; A. 7; scales 32 to 36.

Body elongate, robust; head small, conic; snout blunt; mouth small, slightly oblique, the tip of the upper lip on level of lower margin of pupil to lower margin of eye; maxillary 3.3 to 3.7 in head; snout 3.3 to 3.8; diameter of eye 3.0 to 3.4; teeth 4-4, hooked and with grinding surface; alimentary canal about equal to length of body; peritoneum white or slightly dusky; lateral line complete; origin of

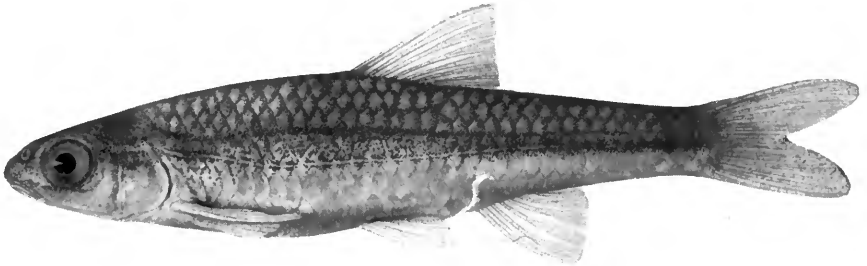


FIG. 35. STRAW-COLORED MINNOW.  
*Notropis blennius* (Girard). (From Forbes and Richardson.)

dorsal over or slightly in advance of ventrals, about equidistant between tip of snout and base of caudal; scales before dorsal 12 to 14.

Color light olive, paler below; a faint lateral band; caudal spot present or indistinct; lateral band not conspicuous on head.

Length  $2\frac{1}{2}$  inches.

This small minnow inhabits clear water, ranging from Wyoming to New York and Texas

Dead River, Beach, Illinois; Des Plaines River, Berwyn, Illinois; Des Plaines River, Libertyville, Illinois; Hickory Creek, Alpine, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois; Wolf Lake, Roby, Indiana; Lake Michigan, Pine, Indiana; Lake Michigan, Edgemoor, Indiana.

**Notropis jejunus** (Forbes). SILVERY MINNOW.

Head 3.8 to 4.5; depth 3.8 to 5; D. 7 or 8; A. 7; scales 34 to 37.

Body elongate, compressed; head somewhat depressed; snout



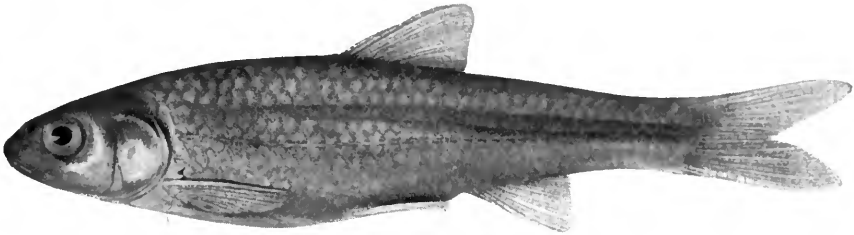


FIG. 36. SILVERY MINNOW.  
*Notropis jejunus* (Forbes). (From Forbes and Richardson.)

blunt and rounded; mouth rather large, slightly oblique, the tip of the upper lip above the level of the inferior margin of the pupil; maxillary scarcely reaching front of orbit, its length 2.8 to 3.4 in head; snout 3.1 to 3.6; teeth 2, 4-4, 2, grinding surface, if present, narrow and irregular; alimentary canal .9 to 1.2 times the length of the body; dorsal fin almost directly over ventrals, about equidistant between the tip of snout and base of caudal fin; lateral line complete, little decurved; scales on sides rather large, thin and rounded, 13 to 15 in series before dorsal fin.

Color pale, sides silvery with a broad lead-colored band; a vertebral streak; no caudal spot; fins all plain.

Length 2 to 2½ inches.

This small species ranges from Winnipeg to Kansas and Pennsylvania.

**Notropis hudsonius** (DeWitt Clinton). SPOT-TAILED MINNOW.

Head 4.1 to 4.7; depth 4.0 to 4.5; D. 8; A. 8; scales 36 to 39.

Body elongate, robust, compressed; head short; mouth rather small, slightly oblique, the tip of upper lip below level of lower margin of pupil; maxillary not reaching eye, its length 3.7 to 4.5 in head; snout bluntish, its length 3.2 to 3.5 in head; diameter of eye 2.8 to 3.5 in head; teeth variable, 0, 1 or 2, 4-4, 2, 1 or 0, with narrow grinding surface, and slightly hooked tips; alimentary canal 1 to 1.4 times

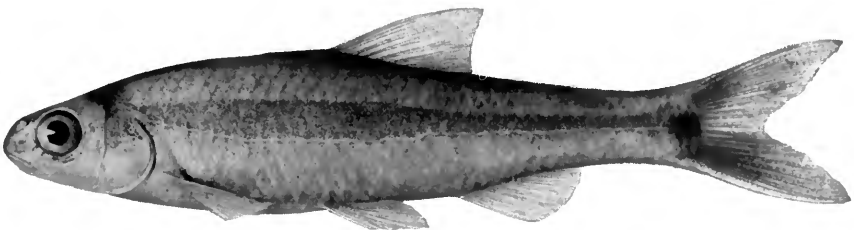


FIG. 37. SPOT-TAILED MINNOW.  
*Notropis hudsonius* (De W. Clinton). (From Forbes and Richardson.)

length of body; peritoneum silvery; origin of dorsal slightly in advance of ventrals, nearer tip of snout than base of caudal; lateral line usually complete; scales 15 or 18 in series before dorsal.

Color pale olivaceous, silvery below; a dark lateral band, usually a large caudal spot.

Length 4 to 6 inches.

This fish occurs in the larger streams and lakes from North Dakota to Quebec and Missouri.

Fox River, McHenry, Illinois; Lake Michigan, Chicago, Illinois; Des Plaines River, Berwyn, Illinois; Wolf Lake, Roby, Indiana; Lake Michigan, Pine, Indiana; Lake Michigan, Edgemoor, Indiana.

**Notropis whipplii** (Girard). STEEL-COLORED MINNOW; SILVERFIN.

Head 3.9 to 4.2; depth 3.6 to 4.4; D. 8; A. 8 or 9; scales 36 to 39.

Body elongate, considerably compressed; head small, subconic; mouth moderate, terminal, oblique, the tip of upper lip on level with lower margin of the pupil; maxillary scarcely reaching eye; its length 3.1 to 3.6 in head; snout pointed, 2.8 to 3.2; diameter of eye 3.9 to 4.8; teeth 4-4 or 1, 4-4, 1, the edges crenate; alimentary canal shorter than the body; peritoneum silvery; origin of dorsal fin a little behind ventrals, a little nearer base of caudal than tip of snout; 14 or 16 scales in series before dorsal fin; lateral line complete, decurved anteriorly.

Color olivaceous, bluish above and on sides, silvery below; two dark blotches on posterior membranes of dorsal fin. Breeding males with tips of caudal and anal satin white; lower fins lemon-yellow.

Length 3 to 4 inches.

This minnow inhabits clear water from Minnesota to the St. Lawrence, Virginia, and Arkansas.

**Notropis cornutus** (Mitchill). COMMON SHINER.

Head 3.8 to 4.2; depth 3.3 to 4.4; D. 8; A. 9 or 10; scales 37 to 40.

Body elongate, compressed; head large, snout pointed to bluntish; mouth large, oblique, the tip of upper lip above lower margin of orbit; maxillary scarcely reaching front of orbit, its length 2.9 to 3.2 in head; snout 2.8 to 3.3; teeth 2, 4-4, 2, with narrow grinding surface; alimentary canal 1.0 to 1.5 times length of the body; dorsal fin slightly in advance, of ventrals and nearer tip of snout than base of caudal; lateral line complete; scales on sides much deeper than long, about 16 to 25 in a series before dorsal fin.

Color olivaceous above, silvery below; a faint lateral band, no

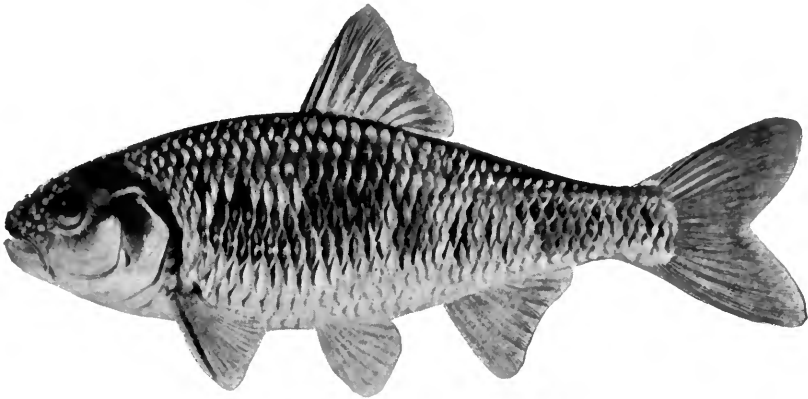


FIG. 38. COMMON SHINER.  
*Notropis cornutus* (Mitch.). (After Forbes and Richardson.)

caudal spot. Breeding males have upper parts greenish, the sides salmon-pink.

Length from 5 to 8 inches.

This fish is abundant in clear water east of the Rockies, except in the Gulf states.

Dead River, Beach, Illinois; Des Plaines River, Berwyn, Illinois; Salt Creek, Lyons, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois.

**Notropis atherinoides** Rafinesque. SHINER.

Head 4.1 to 4.8; depth 4.8 to 5.5; D. 8; A. 10 or 11; scales 36 to 40.

Body elongate, somewhat compressed; head short, conical; snout pointed; mouth large, terminal, oblique, tip of upper lip on level with middle of pupil; maxillary nearly reaching orbit, its length 3.0 to 3.4 in head; snout 3.3 to 3.6; diameter of eye 3.0 to 3.4; teeth 1 or 2, 4-4, 2; narrow grinding surface; alimentary canal shorter than the body; dorsal fin well behind ventrals, much nearer base of caudal than tip of snout; 18 to 21 scales in series before dorsal fin; lateral line complete.

Color olivaceous green above, silvery on sides and below; a faint lateral band; no caudal spot.

Length  $2\frac{1}{2}$  to  $4\frac{1}{2}$  inches.

This minnow inhabits the larger lakes and streams in the Great Lake Region, Ohio and Mississippi Valleys.

Lake Michigan, Chicago, Illinois; Lagoon, Jackson Park, Chicago,

Illinois; Wolf Lake, Roby, Indiana; Lake Michigan, Edgemoor, Indiana.

**Notropis rubrifrons** (Cope). ROSY-FACED MINNOW.

Head 4.3 to 5.0; depth 4.8 to 5.8; D. 8; A. 9 to 11; scales 36 to 40.

Body elongate, moderately compressed; head long, conic; snout pointed; mouth large, oblique, terminal, tip of upper lip on level with middle of upper margin of pupil; maxillary reaching front of orbit, its length 2.7 to 3.1 in head; snout 3.0 to 3.4; diameter of eye 3.2 to 3.6; teeth 2, 4-4, 2, grinding surface slight; alimentary canal less than length of the body; peritoneum silvery with brown specks; dorsal fin well behind ventrals, and nearer base of caudal than tip of snout; lateral line complete; 17 to 21 rows of scales in series before dorsal fin.

Color dark olive above, silvery below, a faint dark lateral band; no caudal spot.

Length  $2\frac{3}{4}$  inches.

This fish inhabits clear water, ranging from New York to Michigan and Kansas.

Hickory Creek, New Lenox, Illinois.

**Notropis umbratilis** (Girard). REDFIN.

Head 3.7 to 4.3; depth 3.2 to 4.2; D. 8; A. 10 to 12; scales 41 to 48.

Body elongate, compressed; head conic; snout pointed; mouth moderate, terminal, oblique, tip of upper lip above lower margin of pupil; maxillary reaching front of orbit, its length 2.7 to 3.2 in head; snout 2.8 to 3.3; diameter of eye 3.4 to 4.2 in head; teeth 2, 4-4, 2, with grinding surface on median teeth; alimentary canal shorter than

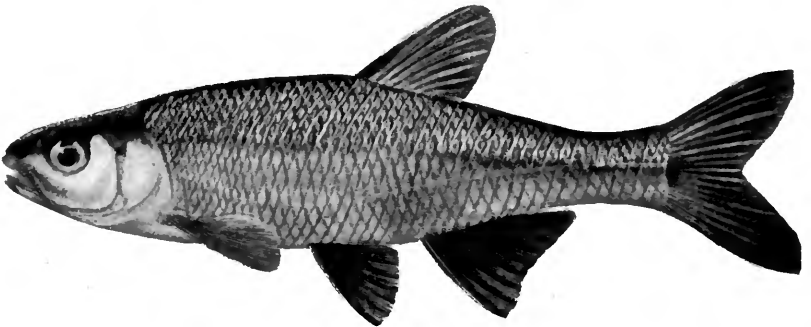


FIG. 39. REDFIN.  
*Notropis umbratilis* (Girard). (After Forbes and Richardson.)

body; peritoneum silvery; dorsal fin well back of ventrals, nearer base of caudal than tip of snout; scales on anterior part of body reduced in size, 26 to 30 in a series in front of dorsal fin; lateral line complete, deeply decurved.

Color dark purplish blue above, greenish blue below, not silvery; dorsal fin with black spot at its base in front. Breeding males with much red on sides and on lower fins.

Length about 3 inches.

This minnow ranges from Wisconsin to Mississippi and Arkansas. It prefers clear running water.

Des Plaines River, Berwyn, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois.

### Genus *Ericymba* Cope.

Body elongate, little compressed; premaxillary protractile; teeth 4-4 or 1, 4-4, 1, without grinding surface; hooked interorbitals, suborbitals, and dentary bones with greatly developed mucous channels; alimentary canal short; peritoneum silvery; lateral line complete.

#### *Ericymba buccata* Cope. SILVER-MOUTHED MINNOW.

Head 3.5 to 3.7; depth 4.1 to 5.2; D. 8; A. 7 or 8; scales 32 to 35.

Body elongate, fusiform; head long, snout blunt; mouth small, horizontal, subinferior, tip of upper lip on level with lower margin of orbit; maxillary not reaching past anterior nostril, its length 3.5 to 4.0 in head; lower jaw the shorter; snout 2.6 to 3.0 in head; diameter of eye 3.3 to 3.6; teeth 4-4 or 1, 4-4, 1; alimentary canal about as long as the body; peritoneum silvery; bones of lower part of head with well developed mucous channels appearing externally as vitreous streaks, a character peculiar to the genus; dorsal fin over ventrals,

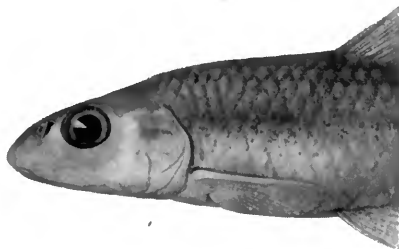


FIG. 40. SILVER-MOUTHED MINNOW.  
*Ericymba buccata* Cope. (From Forbes and Richardson.)

slightly nearer tip of snout than base of caudal; lateral line complete; 13 to 15 scales in a series before dorsal fin.

Color pale olivaceous above, silvery below; lateral band developed posteriorly; no caudal spot.

Length 3 to 4 inches.

This small minnow ranges from Michigan to Florida and Kansas Kankakee, Illinois.

### Genus **Phenacobius** Cope.

#### SUCKER-MOUTHED MINNOWS.

Body elongate, little compressed, mouth inferior, the lower lip thin in the middle and enlarged into a fleshy lobe on each side, upper jaw protractile, no barbel; teeth 4-4, hooked and with grinding surface; intestine short, peritoneum silvery; dorsal rays 8, anal 7, scales 45 to 60; lateral line complete.



FIG. 41. SUCKER-MOUTHED MINNOW.  
*Phenacobius mirabilis* (Girard). (From Forbes and Richardson.)

#### **Phenacobius mirabilis** (Girard). SUCKER-MOUTHED MINNOW.

Head 3.9 to 4.5; depth 4.7 to 5.5; D. 8; A. 7; scales 43 to 51.

Body moderately slender; head short, blunt anteriorly; mouth small; inferior maxillary not reaching eye, its length 3.7 to 4.3 in head; upper jaw provided with a fleshy lip which is continuous on each side with the lower lip, forming rather prominent laterally projecting lobes, these separated by a frenum; snout 2.3 to 2.6 in head; diameter of eye 3.6 to 4.8; teeth hooked, occasionally with narrow grinding surface; alimentary canal equal to length of head and body; peritoneum plain silvery; lateral line complete.

Color pale olivaceous; a silvery lateral band ending in a conspicuous caudal spot; fins all plain.

Length  $3\frac{1}{2}$  inches.

This fish is found from Northern Illinois to Iowa and Arkansas.

Hickory Creek, Marley, Illinois.

Genus **Hybopsis** Agassiz.

Body elongate, robust; mouth terminal or inferior, one or more barbels on posterior end of maxillary; premaxillary protractile; teeth 4-4 or 1, 4-4, 1 or 0, hooked and with grinding surface; alimentary canal short; peritoneum pale dusky or black; scales 35 to 60 in lateral series. All of the species of this genus inhabit clear running water.

- a. Mouth small, horizontal or nearly so; snout blunt; margin of upper lip on or below level of lower margin of orbit; sides silvery.
- b. Origin of dorsal fin about midway between base of caudal and tip of snout; preorbital bone moderate; head 3.6 to 4.2 in length of body.
- c. Scales moderate, 38 to 47 in lateral series; diameter of eye 3.1 to 3.8; back and sides with irregular dark blotches. *dissimilis*, 277
- cc. Scales larger, 35 to 38 in lateral series; diameter of eye 2.8 to 3.1; sides silvery, without dark blotches. *amblops*, 278
- bb. Origin of dorsal fin much nearer tip of snout than base of caudal; preorbital bone large, silvery; head 4.3 to 5.3 in the body. *storerianus*, 278
- aa. Mouth large, oblique; snout pointed; margin of upper lip about midway between lower margin of eye and lower edge of cheek; sides little or not at all silvery. *kentuckiensis*, 279

**Hybopsis dissimilis** (Kirtland). SPOTTED SHINER.

Head 3.9 to 4.2; depth 4.7 to 5.3; D. 8; A. 7; scales 38 to 45.

Body elongate, moderately compressed; head long, flattish above; mouth small, horizontal, inferior, the tip of upper lip below level of

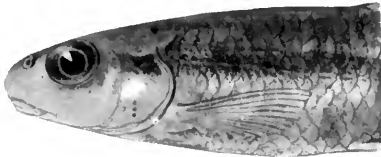


FIG. 42. SPOTTED SHINER.  
*Hybopsis dissimilis* (Kirtland). (From Forbes and Richardson.)

lower margin of eye; maxillary reaching anterior nostril, its length 3.6 to 4.3 in head; maxillary barbel less than diameter of pupil; snout blunt, 2.4 to 2.7 in head; diameter of eye 3.1 to 3.8; teeth 4-4, with narrow grinding surface; alimentary canal 1 to 1.5 times length of

body; peritoneum black; dorsal fin in front of ventrals, about equidistant between tip of snout and base of caudal; scales 14 to 17 in series before dorsal fin; lateral line complete.

Color olivaceous, the sides silvery; a bluish lateral band; back and sides with irregular dark blotches.

Length 3 inches.

This fish ranges from Ohio to Iowa and Arkansas.

**Hybopsis amblops** (Rafinesque). BIG-EYED CHUB; SILVERY CHUB.

Head 3.6 to 3.9; depth 4.6 to 5.2; D. 8; A. 7; scales 35 to 38.

Body elongate, rather robust; head broad, flattened above; mouth small, horizontal, subinferior, the tip of the lower jaw little in advance of first nostril; the tip of the upper lip below the level of lower margin

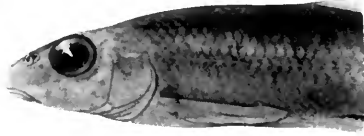


FIG. 43. BIG-EYED CHUB; SILVERY CHUB.  
*Hybopsis amblops* (Raf.). (From Forbes and Richardson.)

of the eye; maxillary usually reaching vertical from front of orbit, its length 3.6 to 4.6 in the head; barbel small; snout blunt, usually overhanging the small mouth, 2.9 to 3.4 in head; diameter of eye 2.8 to 3.1 in head; teeth 1, 4-4, 1, hooked at tip and with narrow grinding surface; alimentary canal shorter than the fish; peritoneum coarsely specked with brown; dorsal fin over ventrals, about equidistant between tip of snout and base of caudal fin; 12 to 15 scales in series between nape and dorsal fin; lateral line complete.

Color olivaceous, silvery; a dusky lateral band continued forward through the eye to end of snout; no dark caudal spot.

Length 2 to 3 inches.

This species ranges from New York to Iowa and Alabama.

**Hybopsis storerianus** (Kirtland). STORER'S CHUB.

Head 4.3 to 5.3; depth 4.3 to 5.3; D. 8; A. 7, 8, or 9; scales 37 to 40.

Body elongate, more or less compressed; head short, compressed; preorbital bone especially prominent; mouth small, inferior, and horizontal, tip of upper lip far below level of lower margin of eye; maxillary scarcely reaching front of orbit, its length 3.2 to 3.7 in head; snout blunt, 2.8 to 3.1; diameter of eye 2.9 to 3.4; teeth 0 or 1, 4-4,



1; alimentary canal scarcely as long as the body; peritoneum silvery; dorsal fin a little in advance of ventrals, much nearer tip of snout than base of caudal; lateral line complete; 14 to 16 rows of scales in series before dorsal fin.

Color light olivaceous above, silvery below; an indistinct lateral band; no caudal spot.

Length 5 to 6 inches.

This species inhabits the larger streams from Wyoming to Ohio and Arkansas.

**Hybopsis kentuckiensis** (Rafinesque). RIVER CHUB; HORNY-HEAD.

Head 3.6 to 3.8; depth 3.9 to 4.5; D. 8; A. 7; scales 39 to 44.

Body elongate, robust, little compressed; head conical, the top convex; mouth rather large, little oblique, the tip of upper lip on level with point about midway between lower margin of eye and chin; maxillary not quite reaching eye, 3.0 to 3.6 in head; snout bluntish, 2.4 to 2.9 in head; diameter of eye 4.1 to 5.6; lower jaw shorter than the

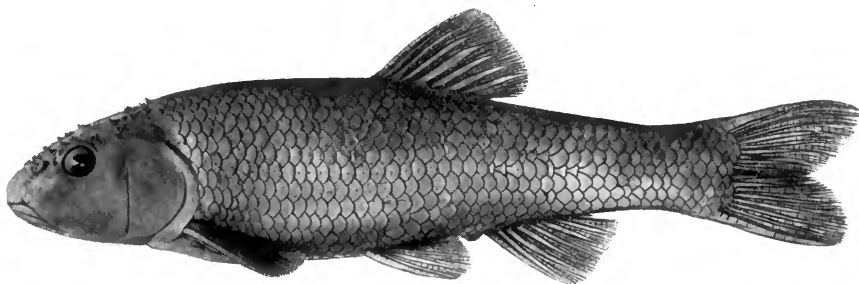


FIG. 44. RIVER CHUB; HORNY-HEAD.  
*Hybopsis kentuckiensis* (Raf.). (From Forbes and Richardson.)

upper; teeth 4-4, or 1, 4-4, 1; alimentary canal 1 to 1.4 times length of the body; peritoneum dusky; dorsal fin inserted over ventrals, and a little nearer base of caudal than tip of snout; lateral line complete or nearly so; 17 to 22 rows of scales in a series before dorsal fin.

Color greenish olivaceous above, lighter below; an indistinct lateral band ending in a dark caudal spot, more prominent in the young; a pale reddish spot behind eye.

Length 6 to 8 inches.

This species ranges from Wyoming to Pennsylvania, and Alabama.

Fox River, McHenry, Illinois; Des Plaines River, Berwyn, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois.

Genus **Semotilus** Rafinesque.

## FALLFISHES.

Body robust; mouth terminal; premaxillary protractile; a small barbel on upper side of maxillary near its extremity; teeth 2, 5-4, 2, hooked and without grinding surface; alimentary canal less than twice the length of the body; peritoneum pale; scales 45 to 60 in lateral series.

**Semotilus atromaculatus** (Mitchill). HORNED DACE; CREEK CHUB.

Head 3.5 to 3.9; depth 4.1 to 4.6; D. 8; A. 8; scales 55 to 69.

Body elongate, robust anteriorly; head large, broadly rounded above; mouth large, terminal, oblique, tip of upper lip on level with

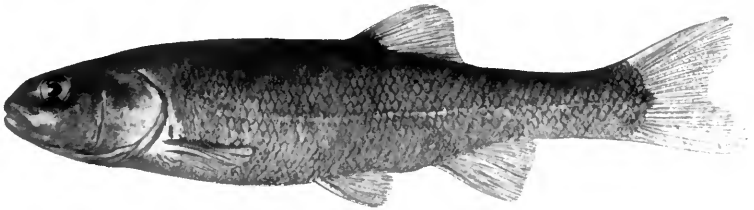


FIG. 45. HORNED DACE; CREEK CHUB.  
*Semotilus atromaculatus* (Mitch.). (From Forbes and Richardson.)

lower margin of pupil; maxillary reaching beyond anterior margin of orbit, its length 2.9 to 3.4 in head; diameter of eye 4.8 to 7.1 in head; teeth variable, usually 2, 4-5, 2, the shorter row may have 0, 1 or 2, the longer one 4 or 5 teeth; alimentary canal about length of body; peritoneum pale; lateral line complete; scales smaller on anterior portion of body, about 35 rows in a series before dorsal fin.

Color dusky bluish above to silvery below; a faint dark lateral band usually ending in a dark caudal spot; dorsal fin with a distinct dark blotch at base of first rays.

Length about 6 to 8 inches.

This species ranges from Wyoming to Maine, North Carolina, and Missouri.

Bull Creek, Zion City, Illinois; Bull Creek, Beach, Illinois; Pettibone Creek, North Chicago, Illinois; Ravine, Glencoe, Illinois; Thorn Creek, Thornton, Illinois; Butterfield Creek, Elliotts Park, Illinois; Hickory Creek, Alpine, Illinois; Hickory Creek, Marley, Illinois.

Genus **Rhinichthys** Agassiz.

Body elongate, little compressed; mouth small, inferior, a small barbel at tip of maxillary; premaxillary not protractile; teeth 1 or 2, 4-4, 1 or 2, hooked and without grinding surface; alimentary canal short; peritoneum dusky; scales small, 60 to 70 in lateral series.

a. Snout long, projecting far beyond the inferior mouth.

*cataractæ*, 281

aa. Snout shorter, not projecting far beyond the subinferior mouth.

*atronasus*, 281

**Rhinichthys cataractæ** (Cuvier & Valenciennes). LONG-NOSED DACE.

Head 4.0 to 4.1; depth 4.8 to 5.2; D. 8; A. 7; scales 63 to 70.

Body elongate, scarcely compressed; head long, the snout overhanging the mouth; mouth small, inferior, tip of the upper lip on level with point half way between orbit and chin; maxillary 2.9 to



FIG. 46. LONG-NOSED DACE.  
*Rhinichthys cataractæ* (C. and V.). (From Forbes and Richardson.)

3.1 in head; lower jaw much shorter than the upper; snout 2.2 to 2.5 in head; diameter of eye 4.8 to 5.6; teeth 2.4-4.2; dorsal fin behind ventrals, much nearer base of caudal than tip of snout.

Color olivaceous above, paler below; sides with dark blotches; an indistinct dark lateral band; a black spot on opercle.

Length about 2½ inches.

This species ranges from Wisconsin to New England and Virginia.

**Rhinichthys atronasus** (Mitchill). BLACK-NOSED DACE.

Head 3.6 to 4.2; depth 4.5 to 5.0; D. 8; A. 7 to 8; scales 62 to 71.

Body elongate, scarcely compressed; head long, wider than deep; mouth small, subterminal, slightly oblique; tip of upper lip on level with lower margin of orbit; maxillary scarcely reaching past anterior nostril, its length 3.3 to 4.0 in head; snout long, 2.7 to 3.0 in head; teeth 2, 4-4, 2; dorsal fin behind ventrals, nearer base of caudal than tip of snout; lateral line complete.

Color dusky to blackish above; the back and sides mottled with



FIG. 47. BLACK-NOSED DACE.  
*Rhinichthys atronasus* (Mitch.). (From Forbes and Richardson.)

darker; a dark lateral band bordered below with a light streak; a distinct blackish spot at base of dorsal behind.

Length 2 to 3 inches.

This species ranges from Minnesota to New England, Virginia and Alabama.

Bull Creek, Zion City, Illinois; Pettibone Creek, North Chicago, Illinois; Ravine, Glencoe, Illinois.

### Genus **Cyprinus** (Artesi) Linnæus.

#### THE CARPS.

Body robust, compressed, the dorsal region elevated; mouth rather small, with 4 barbels; snout blunt, rounded; pharyngeal teeth molar-like, 1, 1, 3-3, 1, 1 in number; scales large; dorsal fin long, its first rays forming a strong serrated spine; anal fin with similar spine; lateral line complete.

**Cyprinus carpio** Linnæus. CARP; GERMAN CARP.

Head 3 to 4; depth 2.7 to 3.3; D. 1, 20; A. 1.5; scales 38.

Body robust anteriorly, more or less compressed; mouth terminal, slightly oblique; interorbital space nearly flat, 2.3 to 2.7 in head; eye 5.5 to 6.8; snout 2.6 to 3.3; maxillary not reaching past anterior nostril, 3.3 to 3.9 in head; two pairs of maxillary barbels, the upper shorter, the lower longer than the eye; dorsal and anal each with a strong posteriorly serrated spine; insertion of dorsal slightly in front of ventrals.

Color olivaceous, upper parts dusky to bluish; lower parts of sides and belly more or less yellowish.

There are three varieties of carp. Those covered with scales are known as Scale Carp, those partially covered with scales are Mirror Carp, those without scales are Leather Carp.

Length, 2 feet or more.

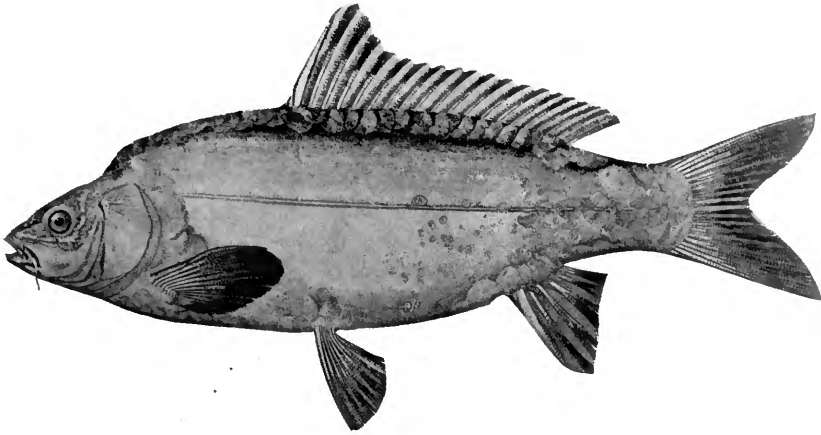


FIG. 48. GERMAN CARP; LEATHER CARP.  
*Cyprinus carpio* L. (After Goode.)

An introduced species which has become established in many streams of the northern half of the United States.

Fox River, McHenry, Illinois; Lagoon, Jackson Park, Chicago, Illinois; Thorn Creek, Thornton, Illinois; Lake Michigan, Millers, Indiana; Lake Michigan, Pine; Indiana.

### Genus *Carassius* Nilsson.

#### GOLD FISHES.

Body oblong, more or less compressed, varying greatly; pharyngeal teeth 4-4; the dorsal region elevated; dorsal fin long, its first rays spine-like; the second or third long and serrated behind; anal short with similar spine; lateral line complete.

a. Soft anal rays 5 to 6; scales in lateral series 28 to 32.

*carassius*, 283

aa. Soft anal rays 7 to 8; scales in lateral series 25 to 27.

*auratus*, 284

***Carassius carassius* (Linnæus).** CRUCIAN CARP; GOLD FISH.

Head 3; depth  $2\frac{3}{4}$ ; D. III, 18; A. III, 5; scales 28 to 32.

Body robust, covered with large scales; dorsal and anal fins with strong spines, serrated behind; lateral line complete.

Color dark brown, becoming golden-yellow to silvery under domestication.

Length about 12 inches.

This fish is generally distributed over central and northern Europe and Siberia. It was introduced for aquariums, and is now thriving in the lagoons in the parks of Chicago.

**Carassius auratus** (Linnæus). GOLD FISH.

Head  $3\frac{1}{2}$ ; depth  $2\frac{1}{4}$ ; D. III, 18; A. III, 7; scales 26.

Body robust, compressed; scales larger than in preceding species; dorsal and anal each with strong spines, serrated behind; lateral line complete.

Color as in preceding species.

Length about 10 inches.

Native of China and Japan. Introduced for aquariums, but it is now abundant in the lagoons in the parks in Chicago. In breeding many varieties have been produced.

## Order **Apodes.**

### THE EELS.

Body very elongate; vertebræ numerous, the anterior ones distinct and without Weberian ossicles; ventral fins absent; fins without spines; skeleton bony; mesocoracoid absent.

## Family **Anguillidæ.**

### THE TRUE EELS.

Body elongate, snake-like; covered with fine embedded scales; head without scales; vertebræ numerous, the anterior ones not modified; fins without spines; dorsal and anal fins continuous with the caudal; tail isocercal; gill openings small; mouth terminal, the jaws about equal; teeth on jaws, vomer, and palatines; air bladder with open duct.

## Genus **Anguilla** Shaw.

### EELS.

Body elongate, slightly compressed; head large; mouth large, jaws about equal; dorsal caudal and anal fins connected.

**Anguilla rostrata.** (Le Sueur). AMERICAN EEL; FRESH-WATER EEL.

Head 7 or 8; depth 12 to 17; D. about 60.

Body elongate, subcylindrical anteriorly, compressed posteriorly; snout pointed, the maxillary reaching past orbit; lips thin; the lower jaw the longer; gill membranes very broadly joined across isthmus, the gill openings small; scales minute, oblong in oblique rows or bunches each at right angles with the other; no ventrals; lateral line complete.

Length 3 to 4 feet.

This eel inhabits the West Indies, and the larger streams of North America east of the Rockies.

Lake Michigan, Millers, Indiana; Lake Michigan, Pine, Indiana.

## Order **Isospondyli.**

### HERRING, SHAD, AND SALMON.

Skeleton bony; anterior vertebræ simple, without Weberian ossicles; dorsal and anal fins without spines; ventral fins abdominal; adipose fin present or absent; pectoral arch suspended from the skull; mesocoracoid developed; opercle well developed; maxillary distinct, forming a part of margin of upper jaw; gills 4, a slit behind the fourth.

- a. No adipose fin; belly behind ventrals, narrow, the scales not passing over its median line.
- b. Lateral line present, well developed. *Hiodontidæ*, 285
- bb. Lateral line absent.
- c. Last dorsal ray much produced; mouth small, subinferior, toothless. *Dorosomidæ*, 287
- cc. Last dorsal ray not produced beyond the others; mouth large, terminal. *Clupeidæ*, 288
- aa. Adipose fin present; belly rounded and covered with scales. *Salmonidæ*, 289

### Family **Hiodontidæ.**

#### THE MOONEYES.

Body deep, much compressed, covered with silvery cycloid scales; head naked; jaws, vomer, palatines, and pterygoids with small cardi-

form teeth; premaxillary not protractile; no adipose fin; caudal fin forked; gill membranes free from the isthmus; gill rakers few, short; stomach horseshoe-shaped, without blind sac; pyloric cœca 1; air bladder large, with open duct; no oviducts, the eggs falling into the body cavity before extrusion.

### Genus **Hiodon** Le Sueur.

Body much compressed, the ventral surface reduced to a narrow edge or keel; belly not serrated; head without scales; mouth terminal, rather large, oblique, and armed with sharp teeth; premaxillary not protractile.

- a. Belly in front of ventrals with a sharp edge over which the scales do not pass; dorsal fin with 9 developed rays. *alosoides*, 286
- aa. Belly in front of ventrals without sharp edge, the scales passing over it; dorsal fin with 11 or 12 developed rays.

*tergisus*, 286

#### **Hiodon alosoides** (Rafinesque). NORTHERN MOONEYE.

Head 4.5 to 4.9; depth 3.3 to 3.7; D. 9; A. 31; scales 56 to 58.

Body elongate, much compressed; head rather small; mouth large, the jaws armed with sharp teeth; interorbital space 3.6 to 4.0 in head; diameter of eye 3.6 to 4.0; snout 4.9 to 5.9; dorsal fin inserted behind front of anal; lateral line complete.

Color bluish above; sides and belly silvery, with more or less golden lustre anteriorly and bluish and pinkish posteriorly.

Length about 12 inches.

This species ranges from the Saskatchewan through the Great Lake Region to Ohio, being most abundant in the northern part of its range.

#### **Hiodon tergisus** Le Sueur. TOOTHED HERRING; MOONEYE.

Head 4.0 to 4.4; depth 3.0 to 3.3; D. 11 or 12; A. 28; scales 55.

Body much compressed, mouth smaller than in preceding species, the jaws armed with pointed teeth, interorbital space 3.9 to 4.0 in head; diameter of eye 2.8 to 3.6; snout 4.0 to 5.5; maxillary not reaching past middle of orbit, its length 2.1 to 2.5 in head; dorsal fin inserted in front of anal; lateral line complete.

Color pale olive-buff above, with faint steel-blue lustre; sides silvery, lighter below.

Length 10 or 12 inches.

The range of this fish is much the same as the preceding.



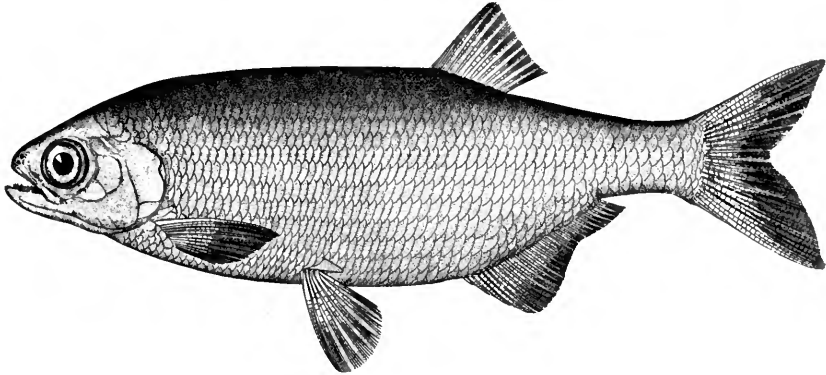


FIG. 49. TOOTHED HERRING; MOONEYE.  
*Hiodon tergisus* Le Sueur. (After Goode.)

Family **Dorosomidae.**

THE GIZZARD SHAD.

Body short and deep, much compressed, covered with thin cycloid scales; head without scales; belly sharp edged, armed with bony serræ; ventral fins abdominal; last ray of dorsal fin much prolonged; gill membranes free from the isthmus; gill rakers slender and very numerous; adipose eyelid present; mouth small; premaxillary not protractile; maxillary with a supplemental bone; jaws without teeth, stomach short, muscular, like the gizzard of a fowl.

Genus **Dorosoma** Rafinesque.

GIZZARD SHAD.

Body much compressed; head without scales; no lateral line; last dorsal ray produced into a long filament.

**Dorosoma cepedianum** (Le Sueur). GIZZARD SHAD; HICKORY SHAD.

Head 3.7 to 4.3; depth 2.6 to 2.9; D. 12; A. 30 or 31; scales 56 to 57.

Body deep, much compressed; head deep posteriorly, tapering to a rather bluntish snout; mouth small, subinferior, without teeth; interorbital space 3.6 to 4.3 in head; diameter of eye 3.4 to 4.8; snout 4.9 to 6.1; dorsal fin inserted about midway between tip of snout and base of caudal, the last ray elongated, its tip reaching past middle of anal; lateral line absent; ventral scutes 19 + 12 or 13.

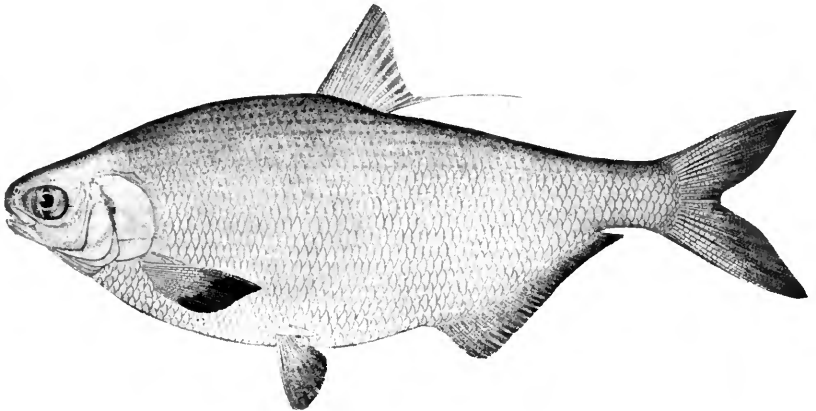


FIG. 50. GIZZARD SHAD; HICKORY SHAD.  
*Dorosoma cepedianum* (Le Sueur). (After Goode.)

Color silvery, bluish above, with reddish and brassy reflections; a large dark spot behind opercle, most conspicuous in the young; fins more or less dusky.

Length usually less than 12 inches.

This species is abundant in the lakes and sluggish streams from the Atlantic and Gulf States to the Mississippi Valley, and southward to Yucatan.

### Family **Clupeidæ.**

#### THE HERRINGS.

Body oblong or elongate, more or less compressed, covered with cycloid scales; head naked; belly rounded or compressed and serrated; no adipose fin; gill membranes free from the isthmus; gill rakers slender; mouth terminal oblique; premaxillaries not protractile; teeth usually small or wanting; air bladder large, with open duct.

#### Genus **Pomolobus** Rafinesque.

##### ALEWIVES.

Body rather elongate, compressed; head pointed, mouth terminal, teeth minute; belly sharp-edged, strongly serrated before and behind ventrals; dorsal fin nearly median, its last ray not produced.

**Pomolobus chrysochloris** Rafinesque. GOLDEN SHAD; SKIPJACK;  
BLUE HERRING.

Head 3.7 to 4.3; depth 3.6 to 4.3; D. 16; A. 18; scales 52 to 54.

Body elongate, compressed; head pointed, mouth terminal, the lower jaw the longer; interorbital space 5.8 to 6.3 in head; diameter of eye 4.5 to 5.9; snout 4.3 to 5.2; maxillary reaching past middle of orbit, its length 2.2 to 2.4 in head; origin of dorsal fin nearer tip of snout than base of caudal, in front of ventrals; no lateral line; ventral scutes 20 + 13.

Color silvery to greenish with bluish and golden reflections; back light olive-gray, sides light olive-green, belly opaque, silvery-white.

Length about 15 inches.

This fish inhabits the Gulf streams from Florida to Texas, ascending the Mississippi and its larger tributaries to Pennsylvania and Kansas.

### Family **Salmonidæ.**

#### THE SALMON, TROUT AND WHITEFISHES.

Body oblong or elongate, covered with cycloid scales; head naked; mouth terminal, the maxillaries forming its lateral margins; supplemental maxillary present; premaxillaries not protractile; adipose fin present; gill membranes free from the isthmus; stomach siphonal; pyloric cœca numerous; air bladder large, with open duct; ova large, falling into the abdominal cavity before exclusion.

a. Mouth not deeply cleft, the articulation of lower jaws before or under the eye; teeth none or minute; scales moderate, 60 to 95 in lateral series.

b. Mouth small; premaxillary broad, its cutting edge vertical or directed backward; lower jaw the shorter; gill rakers on long limb of first arch fewer than 30. *Coregonus*, 290

bb. Mouth larger; premaxillary narrow, its cutting edge nearly horizontal and directed forward; jaws equal or the lower the longer; gill rakers on long limb of first arch more than 35.

*Argyrosomus*, 291

aa. Mouth deeply cleft; the articulation of the lower jaw behind the eye; strong teeth on jaws, vomer, palatines, and tongue; scales small, more than 100 in the lateral series.

c. Vomer flat, teeth on shaft in alternating rows or in one zigzag row; body with dark spots. *Salmo*, 293

cc. Vomer boat-shaped, the shaft strongly depressed and without teeth; with white or gray spots. *Cristivomer*, 294

Genus **Coregonus** (Artedi) Linnæus.

THE WHITEFISHES.

Body more or less elongate, moderately compressed; head small, conical, the blunt snout formed by the broad premaxillary; premaxillary with cutting edge nearly vertical; lower jaw the shorter; jaws toothless or nearly so; gill rakers usually short; caudal deeply forked; pyloric cœca about 100; air bladder large.

a. Body compressed, the dorsal region much elevated; gill rakers 17 to 20 on lower limb of first gill arch; head short, 5 to 5.3 in body. *albus*, 290

aa. Body long, slender, the dorsal region little elevated; gill rakers 11 or 12 on lower limb of first arch; head longer, 3.7 to 4.3 in body. *quadrilateralis*, 291

**Coregonus albus** Le Sueur. COMMON WHITEFISH.

Head 5 to 5.3; depth 3 to 4; D. 11; A. 10; scales 74.

Body oblong, compressed, the back elevated; head very small;

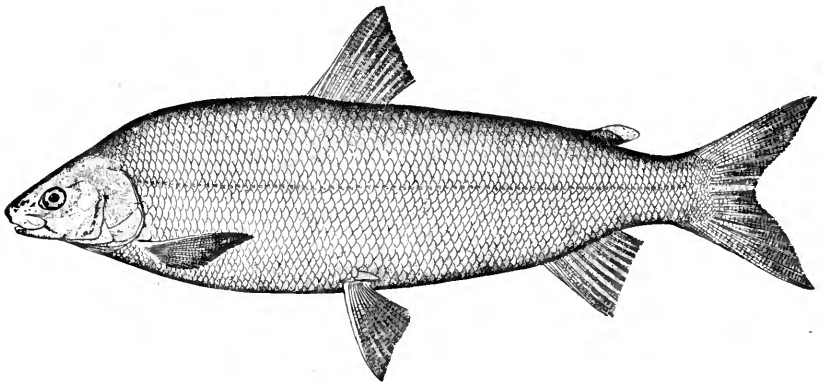


FIG 51. COMMON WHITEFISH.  
*Coregonus albus* Le Sueur. (After Evermann and Smith.)

interorbital space 3.4 in head; diameter of eye 4 to 5; snout 3.8; maxillary reaching past front of orbit; its length about 4 in head; lower jaw the shorter; lateral line complete.

Color olivaceous above, sides white, not silvery; lower fins sometimes dusky.

Great Lakes and neighboring waters.

Lake Michigan, Chicago, Illinois; Lake Michigan, Pine and Millers, Indiana.

**Coregonus quadrilateralis** Richardson. MENOMINEE WHITEFISH.

Head 5; depth 4.7; D. 11; A. 10; scales 80 to 90.

Body elongate, not much compressed, the dorsal region little elevated; head long, the snout compressed and bluntly pointed; interorbital space 3.5 in head; diameter of eye 4.7 to 5.5; snout 3.8; mouth narrow, small, the maxillary not reaching eye; gill rakers short and stoutish, 7 + 10 in number, lower jaw the shorter; lateral line complete.

Color dark bluish above, silvery below.

Length 15 inches.

Lakes of New England, Great Lakes to the Yukon.

Lake Michigan, Chicago.

Genus **Argyrosomus** Agassiz.

CISCOES; LAKE HERRINGS.

Body elongate, little compressed; head larger, the snout pointed, the premaxillary with its cutting edge nearly horizontal; lower jaw the longer; jaws toothless or nearly so; gill rakers long and slender; about 40 on the lower limb; caudal fin deeply forked.

- a. Lower fins pale, or slightly tipped with darker.
- b. Eye large, its diameter not much if any less than the length of the snout, 3.5 to 4.5 in head.
- c. Maxillary 3.3 to 3.6 in head; lower jaw projecting beyond the upper; gill rakers long and numerous, about 47 on first arch.
  - huronius*, 291
- cc. Maxillary 2.6 to 3.0 in head, lower jaw scarcely projecting; gill rakers 39 to 40 on first gill arch.
  - hoyi*, 292
- bb. Eye small, its diameter less than length of snout, about 5 in head; mandible half as long as head.
  - prognathus*, 292
- aa. Lower fins blue black; gill rakers at least 50 on the first arch.
  - nigripinnis*, 293

**Argyrosomus huronius** Jordan & Evermann. LAKE HERRING;  
CISCO AND BLUEBACK HERRING OF LAKE MICHIGAN.

Head 4.1 to 4.5; depth 4.5 to 5.2; D. 10; A. 12; scales 75 to 90.

Body elongate, not much compressed; head rather long pointed; mouth large, the maxillary reaching nearly to middle of the pupil; 3.2 to 3.5 in head; lower jaw the longer; mandible 2.1 in head; interorbital space 3.3 in head; diameter of eye 4.0 to 4.5; snout 3.5 to 4.0; gill rakers long and slender, 15 to 17 + 28 to 34 on first arch; lateral line complete.

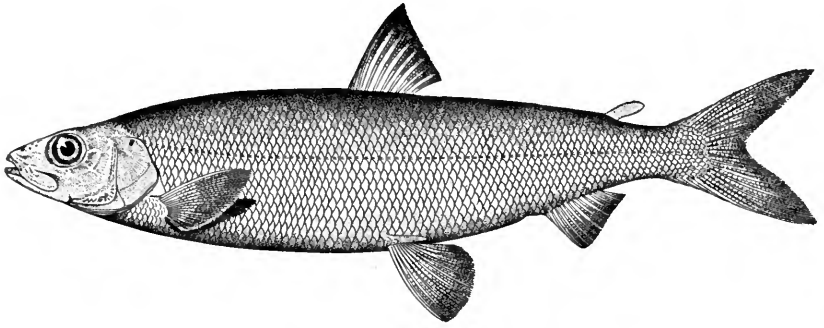


FIG. 52. CISCOE AND BLUEBACK HERRING OF LAKE MICHIGAN.  
*Argyrosomus huronius* Jord. and Ever. (After Evermann and Smith.)

Color bluish black or greenish above; sides silvery; fins mostly pale, the lower dusky tinged.

Lakes Huron and Michigan.

Lake Michigan, Chicago, Illinois; Lake Michigan, Pine and Millers, Indiana.

***Argyrosomus hoyi*** Gill. KIEYE; CHUB.

Head 4.5 to 4.8; depth 4.1 to 4.5; D. 10; A. 11; scales 73 to 80.

Body robust, little compressed; head pointed; mouth rather large; the jaws about equal; maxillary middle of pupil, 2.6 to 3.0 in head; mandible 2.2 in head; interorbital space 3.6 to 4.3; diameter of eye 4.2 to 4.6; snout 3.4 to 3.8; gill rakers 14 + 25 or 26 on first arch; lateral line complete.

Color blue on back; sides and ventral surface silvery; dorsal, caudal, and pectoral fins with some dark on their margins.

Length 13 inches.

Southern and western Lake Michigan.

Pine, Indiana; Millers, Indiana.

***Argyrosomus prognathus*** (H. M. Smith). LONGJAW; BLOATER.

Head 4.3; depth 3.5 to 4; D. 9 or 10; A. 10 or 12; scales 75.

Body robust, moderately compressed; head pointed; mouth large, maxillary reaching pupil, 2.5 in head; mandible 1.7 to 1.8 in head; lower jaw projecting beyond the upper; interorbital space 6.8 in head; diameter of eye 5; snout 6.8; gill rakers slender, about 15 + 28 on first gill arch; lateral line complete.

Color dusky above, the sides silvery; dorsal and caudal fins usually with dark edge.

Length 15 inches.

Deep water of Lakes Ontario, Huron and Michigan.

**Argyrosomus nigripinnis** Gill. BLACKFIN.

Head 4; depth 4; D. 12; A. 12; scales 73 to 77.

Body elongate, somewhat compressed; head large, snout pointed; mouth large; diameter of eye 4.2; lower jaw slightly projecting; gill rakers about 18 + 30 on first gill arch.

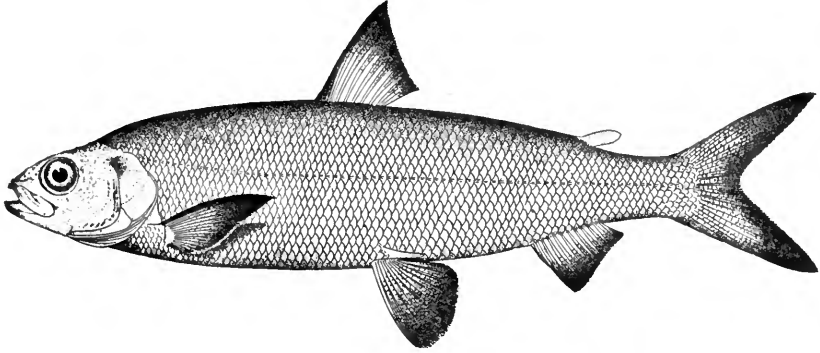


FIG. 53. BLACKFIN.  
*Argyrosomus nigripinnis* Gill. (After Evermann and Smith.)

Color bluish above, sides silvery, with dark punctulations; fins all blue black.

Lake Michigan and some of the lakes of Wisconsin and Minnesota.  
Lake Michigan, Chicago.

Genus **Salmo** (Artedi) Linnæus.

THE TROUT.

Body elongate, somewhat compressed; mouth large; jaws with teeth; vomer flat, its shaft not depressed; teeth on anterior part of vomer, followed by a double or irregular series of teeth; scales small.

**Salmo gairdneri** Richardson. STEELHEAD; SALMON TROUT.

Head 4.5; depth 4.3; D. 11; A. 12; scales 130 to 180.

Body elongate, more or less compressed; head short, slender, the upper surface convex; mouth large, the maxillary reaching middle of eye; lower jaw the shorter; teeth rather small, those on vomer in two long alternating series; gill rakers short and thick, 8 + 12 on first arch; lateral line complete.

Color olivaceous green above; sides silvery; head, back, and upper fins more or less covered with black spots; in the spring both sexes usually have a broad flesh-colored lateral band which rapidly fades.

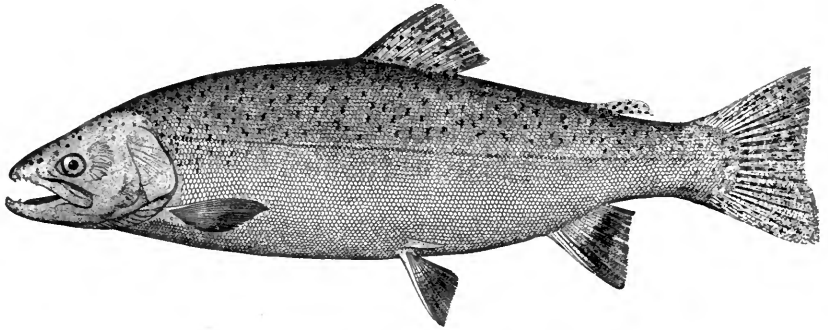


FIG. 54. STEELHEAD; SALMON TROUT.  
*Salmo gairdneri* Richardson. (After Goode.)

A Pacific Coast fish introduced into the Great Lakes; occasionally taken at Pine and Millers, Indiana.

Genus **Cristivomer** Gill & Jordan.

LAKE TROUT.

Body moderately elongate; mouth large, hyoid with a band of strong teeth; jaws with teeth; vomer boat-shaped, with a raised crest behind its head and free from its shaft; crest of vomer with teeth; scales small.

**Cristivomer namaycush** (Walbaum). LAKE TROUT; MACKINAW TROUT.

Head 3.8 to 4.2; depth 4 to 5.2; D. 11; A. 11; scales 185 to 210.

Body elongate, head large, its upper surface flattened; interorbital space 3.2 to 3.9 in head; snout 3.2 to 3.5; mouth large, the maxillary reaching beyond eye; its length about half that of head; teeth very strong; lateral line complete.

Color grayish green to brownish, to almost black; sides with round pale spots; head usually vermiculate above; dorsal and caudal reticulated with darker, the anal faintly so.

Length 3 feet.

This fish inhabits the colder lakes and streams of North America from Alaska, Northern Illinois to Maine and northward.

Lake Michigan, Millers, Indiana; Lake Michigan, Pine, Indiana.



## Order **Haplomi.**

### PIKE-LIKE FISHES.

Skeleton bony; anterior vertebræ distinct; ventral fins abdominal, rarely wanting; all of the fins of soft rays; no adipose fin; pectoral arch suspended from the skull; mesocoracoid wanting; opercular bones well developed; air bladder with a distinct duct.

- a. Lateral line present; jaws long and with large canine-like teeth. *Esocidæ*, 295
- aa. Lateral line wanting; jaws without canine-like teeth.
- b. Upper jaw not protractile. *Umbridæ*, 297
- bb. Upper jaw protractile. *Pæciliidæ*, 298

### Family **Esocidæ.**

#### THE PIKES.

Body elongate, somewhat compressed posteriorly; scales small, cycloid; top of head naked, its sides partly scaled; ventral fins abdominal; mouth large; premaxillaries not protractile; jaws, vomer, palatines, and tongue with teeth; stomach not cœcal; no pyloric cœca; air bladder simple, with distinct duct.

#### Genus **Esox** (Artedi) Linnæus.

#### THE PIKES.

Body very elongate; head depressed; lateral line present; branchiostegals 12 to 20; gill rakers short, toothed; gill membranes separate; most of margin of the upper jaw formed by the maxillary; supplemental maxillary present; some of the teeth on jaws and vomer large and canine-like, a few being hinged; dorsal fin above anal, on posterior part of the body.

- a. Cheeks and opercles entirely scaly; branchiostegals 11 or 12; dorsal rays 12; fewer than 110 scales in the lateral series. *vermiculatus*, 296
- aa. Cheeks entirely scaly; lower half of opercle without scales; branchiostegals 14 to 16; dorsal rays 14 to 16; about 125 scales in the lateral series. *lucius*, 296

aaa. Lower half of cheeks and opercles without scales; branchiostegals 17 to 19; dorsal rays 17; about 150 scales in the lateral series. *masquinongy*, 297

**Esox vermiculatus** Le Sueur. LITTLE PICKEREL; GRASS PIKE.

Head 3.0 to 3.4; depth 5.2 to 6.7; D. 12; A. 12; scales 103 to 108.

Body elongate, moderately compressed; head depressed; interorbital concave; mouth large, the maxillary reaching past anterior margin of eye, its length 2.0 to 2.4 in head; snout 2.4 to 2.7; eye situated in middle of the head, its diameter 5.5 to 6.8; branchiostegals 11 or 12; cheeks and opercles with scales; depth of caudal peduncle 2.0 to 2.6 in head; caudal fin forked.

Color grayish green with darker streaks and reticulations on sides, lighter below; a dusky streak from eye across cheek and opercle, and one below eye; caudal fin mottled near base; other fins plain, dusky.

Length 12 inches.

This fish inhabits ponds, lakes, and sluggish streams, whose vegetation is plentiful, from Wisconsin to Ohio, Mississippi, and Arkansas.

Fox River, McHenry, Illinois; Dead River, Beach, Illinois; Bull Creek, Beach, Illinois; Ravine, Glencoe, Illinois; Lagoon, Jackson Park, Chicago, Illinois; Des Plaines River, Berwyn, Illinois; Salt Creek, Lyons, Illinois; Hickory Creek, New Lenox, Illinois; Wolf Lake, Roby, Indiana; Lake George, Indiana; Lagoon, Buffington, Indiana; Lagoon, Pine, Indiana; Calumet River, Clark, Indiana.

**Esox lucius** Linnæus. COMMON PIKE; PICKEREL.

Head 2.9 to 3.6; depth 5.0 to 7.0; D. 15 or 16; A. 14 or 15; scales 122 to 125.

Body elongate, compressed; mouth very large, the maxillary reaching past orbit, its length 2.0 to 2.2 in head; snout 1.9 to 2.4; eye in middle of head, its diameter 5.8 to 9.5; branchiostegals 14 to 16; cheeks with scales; lower half of opercle without scales; depth of caudal peduncle 1.7 to 2.2; caudal fin forked.

Color of back and sides bluish or greenish gray, yellowish below and white on ventral surface; sides with irregular, light colored spots; dorsal, caudal, and anal fins with roundish black spots; ventrals with faint traces of spots; pectorals plain.

Length 3 feet.

This species inhabits the larger streams and lakes of Northern Europe, Asia, and North America.

Fox River, McHenry, Illinois; Jackson Park, Chicago, Illinois;

Des Plaines River, Chicago, Illinois; Thorn Creek, Thornton, Illinois; Calumet River, Clark, Indiana.

**Esox masquinongy** Mitchill. MUSKALONGE.

Head 3.6 to 4.0; depth 6; D. 17 to 18; A. 15 to 17; scales 150.

Body elongate, compressed; mouth very large, maxillary reaching past eye, its length 2 in head; snout 2.2; diameter of eye 10.6; branchiostegals 17 or 18; lower half of cheeks and opercles without scales; caudal fin forked.

Color dark-gray, sides with round dark spots, the young with bars; fins with black spots.

Length 3 to 6 feet, reaching a weight of 100 pounds.

This species inhabits the large lakes and streams of the Great Lake region and Upper Mississippi Valley.

Lake Michigan, Edgemoor, Indiana.

Family **Umbridae**.

THE MUDFISHES.

Body elongate, subcylindrical anteriorly, compressed posteriorly; head and body covered with cycloid scales; ventral fins abdominal; dorsal fin posterior, above anal; mouth rather small, premaxillary not protractile; lower jaw, vomer, and palatines with bands of villiform teeth; stomach without blind sac; air bladder simple, with distinct duct; no lateral line.

Genus **Umbra** (Krämer) Müller.

Body elongate, top of head flat, lateral line wanting; branchiostegals 6 to 8; gill rakers little developed; gill membranes little connected; lateral margin of the upper jaw formed by the maxillaries; supplemental maxillary absent.

**Umbra limi** (Kirtland). MUD MINNOW.

Head 3.3 to 3.8; depth 3.9 to 5.3; D. 14 or 15; A. 8 or 9; scales 35.

Body elongate; compressed posteriorly; head flat, covered with scales, those on opercles large and imbedded; mouth rather large, the maxillary reaching nearly to eye; interorbital space flat or flattish 4.3 to 5.4 in head; eye 3.8 to 5.2; snout 2.8 to 3.5; dorsal fin inserted behind ventrals and on posterior half of body, its distance from tip

of snout 1.3 to 1.8 in body; pectorals broad, 1.6 to 2.0 in head; ventrals small; caudal peduncle deep, 1.3 to 1.6 in its length; caudal fin rounded.

Color of upper parts dull brownish olive mottled with black; sides with about 14 indefinite narrow transverse bars of dark color, the interspaces bluish forward; breast, belly, and under sides of head

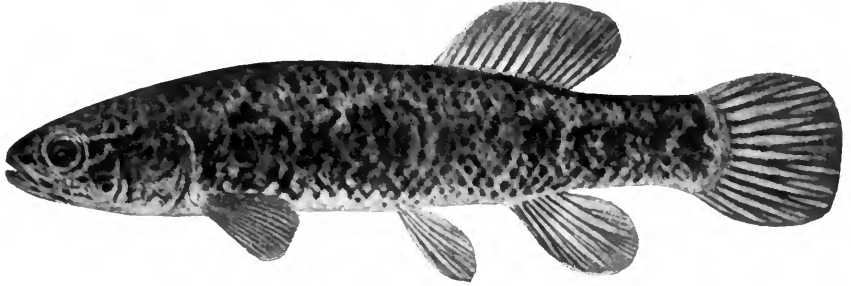


FIG. 55. MUD MINNOW.  
*Umbra limi* (Kirtland). (After Forbes and Richardson.)

yellowish; a large black blotch-like bar at end of caudal peduncle; a black stripe across cheek and through the eye to the snout; fins plain olive-green.

Length 4 inches.

This fish inhabits muddy ponds and streams from Minnesota to Quebec and the Ohio River.

Artesian Overflow, Beach, Illinois; Des Plaines River, Berwyn, Illinois; Lagoon, South Chicago, Illinois; Salt Creek, Lyons, Illinois; Willow Springs, Illinois; Hickory Creek, Alpine, Illinois; Lagoon, Buffington, Indiana; Lagoon, Clark Junction, Indiana; Lagoon, Edgemoor, Indiana.

## Family **Peciliidæ**

### THE KILLIFISHES.

Body elongate, the head depressed, the posterior half compressed; scales large, cycloid; head scaly; mouth small, terminal, the premaxillary extremely protractile; fins without spines; caudal fin not forked; gill membranes connected, free from the isthmus; branchiostegals 4 to 6; gill rakers short; dorsal fin single, on posterior half of body; ventral fins abdominal; stomach siphonal, without pyloric appendages; air bladder simple, often wanting; some species ovoviviparous; size small.

Genus **Fundulus** Lacépède.

## KILLIFISHES.

Body rather elongate, little elevated, compressed posteriorly; head broad flat above, scaly; mouth moderate, lower jaw projecting; jaws each with two or more series of pointed teeth; dorsal and anal fins similar in size; scales large.

a. Dorsal fin long, its rays 13 or 14; scales small, 43 to 45 in lateral series; color olivaceous with numerous dusky crossbars.

*menona*, 299

aa. Dorsal fin short, its rays 7 to 9; scales larger, 28 to 36 in lateral series.

b. Sides with numerous lengthwise streaks in female, the male with dark crossbars.

*dispar*, 299

bb. Sides with a single black band from head to tail; males with obscure crossbars.

*notatus*, 300

**Fundulus diaphanus menona** (Jordan & Copeland). MENONA TOP MINNOW.

Head 3.5 to 3.9; depth 4.5 to 5.3; D. 13 or 14; A. 11; scales 43 to 45.

Body rather slender, not much compressed; head flat above; mouth small, maxillary 3.6 to 4.0 in head; lower jaw slightly projecting; diameter of eye 3.0 to 3.5 in head; snout 2.9 to 3.7 in head; teeth in jaws, curved, the outer ones scarcely enlarged; dorsal inserted in front of ventrals; caudal fin rounded; cheeks and opercles covered with large scales.

Color of males light olivaceous, spotted with dusky on back and sides; 15 to 20 dark transverse bars on each side, broader than the silvery interspaces; females with dark bars shorter and narrower, the interspaces wider than the bars.

Length 3 inches.

This fish inhabits small streams and lakes with clear water from Wisconsin and Illinois to Maine.

Des Plaines River, Libertyville, Illinois; Wolf Lake, Roby, Indiana; Lake George, Indiana; Lake Michigan, Whiting, Indiana.

**Fundulus dispar** (Agassiz).

Head 3.5 to 4.3; depth 3.5 to 4.3; D. 7; A. 9 or 10; scales 34 to 36.

Body elongate, rather robust; head flat above; mouth small, the lower jaw scarcely projecting; maxillary 2.8 to 3.3 in head; diameter

of eye 2.8 to 3.4; snout 2.8 to 3.7; teeth in jaws pointed, rather weak; dorsal fin inserted behind ventrals; caudal fin rounded; cheeks and opercles covered with large scales.

Color light-olive, the males with about 10 narrow dusky transverse bars, females with 9 or 10 brown wavy longitudinal lines; adults of both sexes with a triangular bluish blotch below the eye.

Length  $2\frac{1}{2}$  inches.

This small fish inhabits quiet waters from Northern Illinois to Ohio and Mississippi.

Fox Lake, Illinois; Wolf Lake, Roby, Indiana; Lagoon, Edgemoor, Indiana.

**Fundulus notatus** (Rafinesque). TOP MINNOW.

Head 3.5 to 3.9; depth 4.4 to 5.3; D. 9; A. 11; scales 33 to 34.

Body elongate, compressed posteriorly; head much depressed; mouth moderate; maxillary 2.8 to 3.3 in head; upper jaw slightly the longer; diameter of eye 3.3 to 3.9; snout 2.8 to 3.4; teeth in a

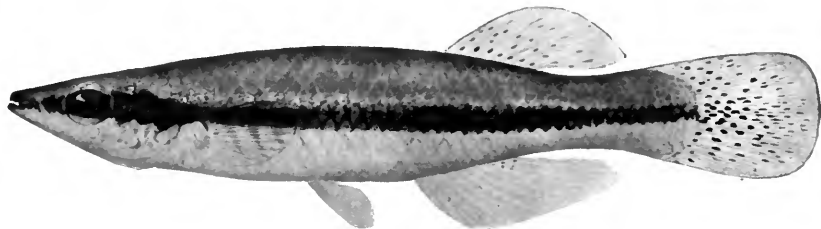


FIG. 56. TOP MINNOW.  
*Fundulus notatus* (Raf.) (After Forbes and Richardson.)

broad band, the outer series considerably enlarged; dorsal inserted behind ventrals; caudal fin rounded; cheeks and opercles covered with large scales.

Color brownish olive with a dark lateral band, which in males is crossed with 16 or 17 obscure dusky bars; vertical fins more or less speckled with dusky.

Length  $2\frac{1}{2}$  to 3 inches.

This species ranges from Iowa to Michigan, Alabama, and Texas. It usually swims near the surface in quiet clear waters.

Fox River, Illinois; Chicago, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois.

Order **Acanthopteri.**

## THE SPINY-RAYED FISHES.

Skeleton bony; the anterior vertebræ not modified; anterior rays of dorsal and anal fin usually spinous; opercular apparatus complete; border of the mouth formed by premaxillaries; maxillary present, and without teeth; ventral fins usually thoracic and usually formed of 1 spine and 5 soft rays; air bladder present, without duct in the adult; scales when present usually ctenoid.

- a. Ventral fins abdominal.
- b. Dorsal fin single preceded by 4 or more spines, not connected by a membrane; no adipose fin. *Gasterosteidæ*, 302
- bb. Dorsal fins 2; spines connected by a membrane.
- c. Anterior dorsal composed of one weak spine and soft rays; the second dorsal adipose. *Percopsidæ*, 303
- cc. Anterior dorsal composed of 3 to 8 slender spines connected by a membrane; the posterior fin composed of soft rays. *Atherinidæ*, 304
- aa. Ventral fins thoracic.
- d. Ventral rays of one spine and 6 or 7 soft rays; vent near the throat. *Aphredoderidæ*, 305
- dd. Ventral rays of one spine and 3 to 5 soft rays; vent near anal fin.
- e. Chin without a barbel; dorsal and anal fins of less than 30 soft rays; caudal fin homocercal.
- f. Body more or less covered by typical scales.
- g. Lateral line not extending on rays of caudal fin; jaws with teeth.
- h. Dorsal fin with spinous portion confluent with soft portion, or separated by a deep notch in which case the longest dorsal spine is but little more than  $\frac{1}{2}$  length of longest soft ray. *Centrarchidæ*, 306
- hh. Dorsal fins with spinous and soft portions separate, or if slightly confluent the longest dorsal spine is longer than longest soft ray.
- i. Anal fin with 1 or 2 spines. *Percidæ*, 317
- ii. Anal fin with 3 spines. *Serranidæ*, 332
- gg. Lateral line extending on rays of caudal fin; jaws without teeth. *Sciænidæ*, 334

- ff. Body naked or variously armed with prickles or bony plates. *Cottidæ*, 335
- ee. Chin with a barbel; dorsal and anal fins with more than 30 rays; caudal fin isocercal. *Gadidæ*, 338

### Family **Gasterosteidæ**.

#### THE STICKLEBACKS.

Body fusiform tapering to a slender caudal peduncle; skin naked or with bony plates; middle and sides of belly shielded by the pubic bones; mouth large, the cleft oblique; jaws with villiform teeth; dorsal fins with the spines not connected by a membrane; ventrals abdominal, composed of a stout spine and a rudimentary ray; pyloric cœca few in number; air bladder simple.

- a. Dorsal spines 4 or 5, in a straight line; tail deeper than broad, without keel. *Eucalia*, 302
- aa. Dorsal spines 8 to 11, not in a straight line; tail not deeper than broad, with a lateral keel. *Pygosteus*, 303

#### Genus **Eucalia** Jordan.

Body elongate, fusiform; skin without bony plates, dorsal spines 6 or fewer, in a straight line; tail deeper than broad, and without keel; pubic bones united forming a lanceolate plate with a single strong median keel.

#### **Eucalia inconstans** (Kirtland). BROOK STICKLEBACK.

Head 3.2 to 3.8; depth 3.8 to 4.4; D. IV to VI, 9 or 10; A. I, 9 or 10.

Body elongate, moderately compressed; caudal peduncle not keeled; mouth small and very oblique, the maxillary not reaching the

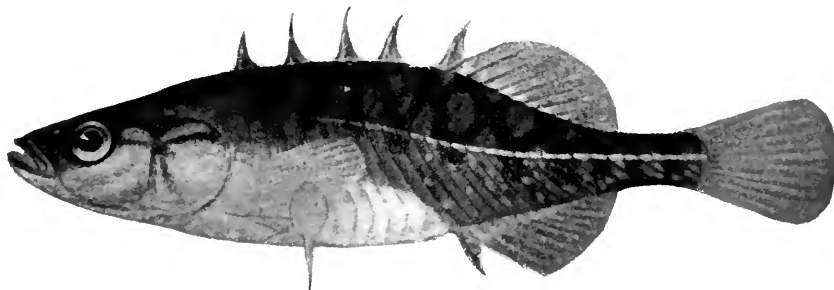


FIG. 57. BROOK STICKLEBACK.  
*Eucalia inconstans* (Kirtland). (After Forbes and Richardson.)



orbit; snout 4.0 to 5.0 in head; eye 3.2 to 3.4; caudal fin truncate or slightly emarginate.

Color olivaceous with faint lighter mottlings; lower parts silvery; spring males black with some red anteriorly.

Length  $2\frac{1}{2}$  inches.

This fish inhabits small streams and brooks from New York to Iowa and the Saskatchewan.

### Genus **Pygosteus** Brevoort.

#### NINE-SPINED STICKLEBACKS.

Body elongate; no scales; skin with bony plates along bases of dorsal and anal and on caudal keel; dorsal spines 8 or more; tail broader than deep, keeled; pubic bones weak, forming an elongate plate with a median longitudinal groove.

#### **Pygosteus pungitius** (Linnæus). NINE-SPINED STICKLEBACK.

Head 3.3 to 3.7; depth 5.1 to 5.6; D. IX or X, 9 or 10; A. 1, 8.

Body elongate, slender; caudal peduncle with a lateral bony keel; mouth larger and less oblique, the maxillary reaching nearly to orbit; snout 3.3 to 3.8 in head; eye 3; caudal fin rounded or pointed.

Color olivaceous above, with small spots and irregularly barred with darker; silvery below.

Length 3 inches.

This species inhabits northern Europe and northern North America.

### Family **Percopsidæ.**

#### THE TROUT PERCHES.

Body elongate, somewhat compressed; caudal peduncle long and slender; scales strongly ctenoid; head without scales; lateral line present; anterior vertebræ simple; ventral fins abdominal, of one spine and about 8 soft rays; anal with 1 or 2 spines; an adipose fin present; gill membranes separate, free from the isthmus; premaxillaries not protractile; stomach siphonal, with about 10 well developed pyloric cœca; air bladder with an open duct; ova large not falling into the abdominal cavity before extrusion.

### Genus **Percopsis** Agassiz.

Body elongate; dorsal spines weak; body quite translucent; preopercle not distinctly serrate; teeth present on jaws, small, villiform.

**Percopsis guttatus** Agassiz. TROUT PERCH.

Head 3.2 to 3.7; depth 3.9 to 4.5; D. I or II. 9 to 11; A. I, 5 to 7; scales 47 to 54.

Body elongate; not much compressed; mouth rather small, sub-inferior; maxillary not reaching orbit, its length 3.0 to 4.0 in head; snout 2.4 to 3.0; eye 3.5 to 4.0; dorsal fin inserted much nearer tip

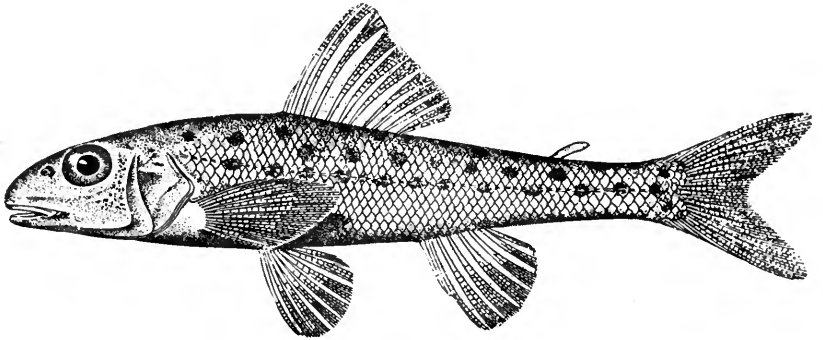


FIG. 58. TROUT PERCH.  
*Percopsis guttatus* Agassiz. (After Jordan and Evermann.)

of snout than base of caudal, nearly over ventrals; scales strongly ctenoid; caudal fin deeply forked.

Color pale olive-buff above; silvery below; scales faintly edged with black; 8 to 12 black spots on sides above lateral line; a dusky median lateral band.

Length 6 inches.

This species inhabits the larger streams and lakes from the Saskatchewan to Hudson Bay, Delaware, and Ohio River.

Lake Michigan, Chicago, Illinois; Lake Michigan, Pine, Indiana.

Family **Atherinidæ.**

THE SILVERSIDES.

Body elongate, somewhat compressed; scales usually cycloid; head usually with scales; lateral line absent or imperfect; ventral fins abdominal; two dorsal fins, the anterior consisting of 3 to 8 slender spines, the posterior of soft rays; anal fin with one weak spine; gill membranes not connected, free from isthmus; teeth usually present on jaws; no pyloric cœca; air bladder present.

Genus **Labidesthes** Cope.

Body elongate, compressed; head oblong; mouth small, oblique, the cleft curved, the jaws prolonged into a short depressed beak; lower jaw the longer; premaxillaries protractile; scales cycloid.

**Labidesthes sicculus** (Cope). BROOK SILVERSIDE

Head 4.1 to 4.6; depth 6 to 8; D. IV-I, 9 to 11; A. I, 21 to 24; scales 75 to 79.

Body elongate, very slender; head long and pointed; snout long and slender, the jaws prolonged into a short depressed beak; its length nearly twice diameter of eye; eye 3.5 to 4.0 in head; jaws

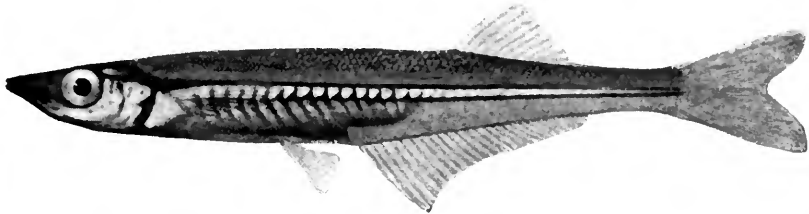


FIG. 59. BROOK SILVERSIDE.  
*Labidesthes sicculus* (Cope). (After Forbes and Richardson.)

equal, edge of the upper strongly curved; cheeks and opercles with scales; ventrals abdominal; caudal fin forked; lateral line represented on a few scales only.

Color pale olive-green, translucent; a distinct silvery lateral band, bounded above by a dark line; back dotted with black.

Length 3 inches.

This fish ranges from Iowa to New York, Florida, and Texas.

Fox River, McHenry, Illinois; Wolf Lake, Roby, Indiana; Lake George, Indiana.

Family **Aphredoderidae**.

THE PIRATE PERCHES.

Body moderately elongate, compressed; dorsal region elevated; caudal peduncle thick; body and sides of head with strongly ctenoid scales; ventral fins thoracic, with a small spine and more than 5 soft rays; dorsal fin single, with 3 or 4 small spines; anal fin with 2 slender spines; gill membranes slightly joined to isthmus; gill rakers short and thick, toothed; preopercle and preorbital sharply serrate; opercle with a spine; air bladder simple, duct not evident; pyloric cœca about 12.

Genus **Aphredoderus** Le Sueur.

Body elongate; dorsal region elevated; mouth terminal somewhat oblique; teeth in villiform bands on jaws, vomer, palatines, and pterygoids; alimentary canal ending in adult at the throat, the vent more posterior in the young, moving forward from just behind ventral fins.

**Aphredoderus sayanus** (Gilliams). PIRATE PERCH.

Head 2.3 to 3.2; depth 3.1 to 3.5; D. III, 9 to 12; A. II, 6; scales 49 to 59.

Body elongate, robust, the dorsal region elevated; head broad, depressed, the profile concave; mouth moderate, oblique, maxillary nearly reaching front of orbit, its length 2.7 to 2.9 in head; lower jaw projecting; snout 2.8 to 3.4 in head; eye 3.5 to 4.3; dorsal fin nearer tip of snout than base of caudal; caudal fin slightly forked; ventral fins jugular in adult; lateral fins developed anteriorly; cheeks and opercles with scales.

Color dark olivaceous to nearly black, with bluish tinge, speckled with black; breast and belly yellowish; two blackish bars at base of caudal.

Length 2 to 4 inches.

This fish inhabits lowland streams and ponds from Wisconsin to New York and Texas.

Salt Creek, Lyons, Illinois.

Family **Centrarchidæ**.

## THE SUNFISHES.

Body oval or ovate, compressed; anterior portion of dorsal fin of 5 to 13 spines; longest dorsal spine about  $\frac{2}{3}$  length of longest dorsal ray; body with weakly or scarcely ctenoid scales; sides of head with scales; mouth moderate or large; teeth in bands on jaws, vomer, usually also on palatines and tongue; no canine-like teeth; branchiostegals 6 or rarely 7; opercle ending in two flat points, or prolonged backward in a black or partially black flap; gill membranes separate from the isthmus; premaxillaries protractile; pyloric cœca 5 to 10; air bladder without duct; ventral fins thoracic; caudal fin emarginate or slightly forked; lateral line present.

a. Anal fin more than half length of dorsal, with 5 to 8 spines.

b. Dorsal fin with less than 10 spines, usually 5 to 8. *Pomoxis*, 307

- bb. Dorsal fin with more than 10 spines, usually 11. *Ambloplites*, 309
- aa. Anal fin less than half the length of the dorsal, with 3 spines.
- c. Body short and deep, its depth about  $\frac{2}{5}$  its length; dorsal fin not deeply divided; opercle prolonged in a bony process or flap; its posterior margin rounded.
- d. Mouth large, the maxillary reaching past the pupil; supplemental maxillary large, its length nearly equal to diameter of eye; tongue and pterygoids with teeth. *Chænobryttus*, 310
- dd. Mouth smaller, the maxillary not reaching past pupil; supplemental maxillary small or wanting, its length never equal to diameter of eye; no teeth on tongue or pterygoids.
- e. Opercular flap without roundish red spot on its lower posterior angle; pectorals not reaching beyond vertical from first anal spine; lower pharyngeals narrow, with pointed teeth. *Lepomis*, 311
- ee. Opercular flap with a roundish red spot on its lower posterior angle; pectorals reaching past first anal spine; lower pharyngeals broad, with bluntly rounded or paved teeth. *Eupomotis*, 314
- cc. Body elongate, its depth about  $\frac{1}{3}$  its length; dorsal fin deeply divided; opercle prolonged, ending in two points; mouth large, maxillary reaching posterior margin of orbit. *Micropterus*, 315

Genus **Pomoxis** Rafinesque.

CRAPPIES.

Body much compressed; dorsal region moderately elevated; mouth large, its gape extending to or beyond pupil; maxillary with a well developed supplemental bone; teeth on jaws, vomer, palatines, tongue, and pterygoids; opercle rounded; base of anal fin 1 to 1.4 in base of dorsal; anal spines 5 to 8; dorsal spines fewer than 10; preopercle and preorbital finely serrate; scales scarcely ctenoid; caudal fin emarginate.

- a. Dorsal spines usually 6; a line from posterior end of maxillary at right angles to margin of upper jaw passes in front of dorsal fin. *annularis*, 308
- aa. Dorsal spines usually 7 or 8; a line from posterior end of maxillary at right angles to margin of upper jaw passes through dorsal fin. *sparoides*, 308

**Pomoxis annularis** Rafinesque. CRAPPIE.

Head 2.8 to 2.9; depth 2.2 to 2.6; D. VI, 15; A. VI, 17 to 19; scales 43 to 48.

Body much compressed, somewhat elongate; profile concave above eyes; mouth large, maxillary reaching past middle of orbit, its length 2.1 to 2.3 in head; eye 4.5 to 5.0; snout 3.2 to 4.2; origin of dorsal to tip of snout 1.7 to 1.9 in body; pectorals 1.3 to 1.7 in head; lateral line present.

Color silvery mottled with dark-green above, becoming silvery below; anal fin with few markings.

Length 12 inches.

This fish ranges from the Great Lake Region to New York, Alabama, and Texas.

Dead River, Beach, Illinois; Lagoon, Jackson Park, Chicago, Illinois; Des Plaines River, Berwyn, Illinois; Wolf Lake, Roby, Indiana; Lagoon, Buffington, Indiana.

**Pomoxis sparoides** (Lacépède). CALICO BASS.

Head 2.8 to 3.0; depth 2.1 to 2.4; D. VII or VIII, 15; A. VI, 16 to 18; scales 38 to 44.

Body much compressed, moderately elongate; profile concave above eyes; mouth large, maxillary reaching middle of orbit, its length

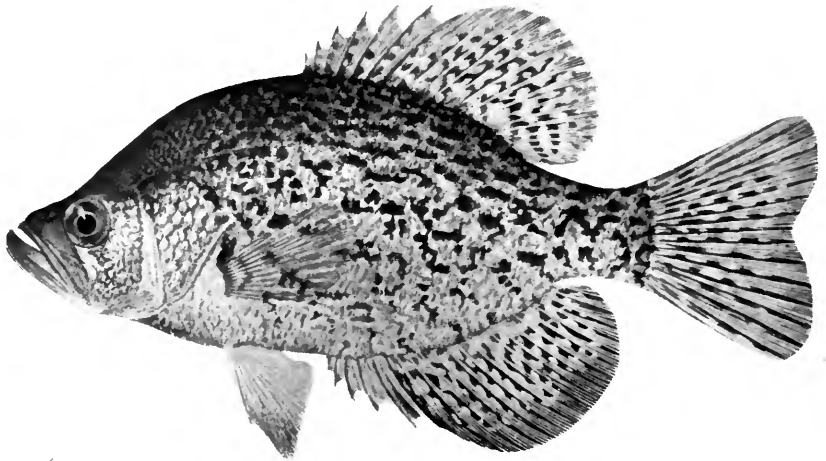


FIG. 60. CALICO BASS.  
*Pomoxis sparoides* (Lac.). (After Forbes and Richardson.)

2.1 to 2.5 in head; eye 4.0 to 4.5; snout 3.7 to 4.3; origin of dorsal from tip of snout 1.8 to 2.0 in body; pectorals 1.4 to 2.1 in head; lateral line present.

Color olivaceous above, silvery or yellowish below; body spotted or mottled with dark greenish or blackish; anal fin much mottled with darker.

Length 12 inches.

This fish inhabits the coastwise streams from New Jersey to Texas and the Great Lakes.

Lagoon, Jackson Park, Chicago, Illinois; Calumet Lake, Pullman, Illinois; Hickory Creek, New Lenox, Illinois; Wolf Lake, Roby, Indiana; Calumet River, Clark, Indiana.

Genus **Ambloplites** Rafinesque.

ROCK BASS.

Body oblong, compressed; dorsal region elevated; mouth large, its gape extending to pupil; maxillary with well developed supplementary bone; teeth on jaws, vomer, palatines, tongue, and pterygoids; opercle ending in 2 flat points; preopercle serrate at its angle; anal spines usually 5; branchiostegals 6 rarely 7; caudal fin slightly forked.

**Ambloplites rupestris** (Rafinesque). ROCK BASS; GOGGLE-EYE;

RED-EYE.

Head 2.6 to 2.8; depth 2.2 to 2.5; D. XI or XII, 10 to 12; A. VI, 10 or 11; scales 39 to 43.

Body oblong, compressed; dorsal region elevated; mouth large, maxillary reaching to middle of pupil, its length 2.1 to 2.4 in head; eye 3.5 to 4.0; snout 3.4 to 4.1; pectorals reaching first anal spine, 1.8 to 2.0 in head; opercle ending in 2 flat points.

Color olivaceous with black mottlings and brassy reflections; each scale on sides with black squarish spot, these forming broken lines along the rows of scales; median fins with brown mottlings and faint edgings of black; a dark opercular spot.

Length 8 to 10 inches.

This species inhabits clear water from Vermont to Manitoba and southward in the Mississippi Valley to Louisiana.

Fox River, McHenry, Illinois; Des Plaines River, Chicago, Illinois; Des Plaines River, Berwyn, Illinois; Salt Creek, Lyons, Illinois; Hickory Creek, New Lenox, Illinois.

Genus **Chenobryttus** Gill.

## WARMOUTH.

Body compressed, dorsal region elevated; mouth large, its gape extending to or beyond pupil; maxillary with well developed supplemental bone; teeth on jaws, vomer, palatines, tongue, and pterygoids; opercle rounded; the membranous portion narrow; preopercle entire; anal spines 3; branchiostegals 6; caudal fin slightly forked.

**Chenobryttus gulosus** (Cuvier & Valenciennes). WARMOUTH.

Head 2.4 to 2.6; depth 2.0 to 2.6; D. x, 9 or 10; A. III, 8 to 10; scales 39 to 43.

Body compressed, the dorsal region elevated; mouth large, the maxillary reaching pupil, its length 2.2 to 2.4 in head; eye 4.0 to 5.0; snout 3.3 to 4.4; membranous opercular flap narrow; anal fin short, its base 2 in base of dorsal; longest dorsal spine 3.5 to 4.0 in head;

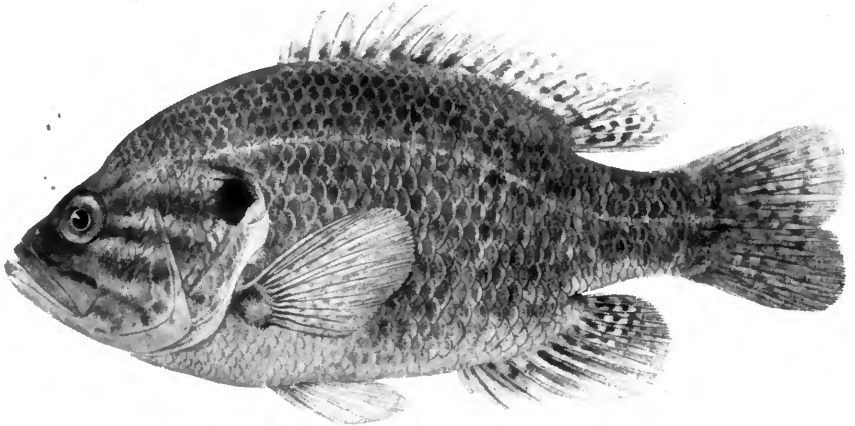


FIG 61. WARMOUTH.

*Chenobryttus gulosus* (C. and V.) (After Forbes and Richardson.)

cheeks with 6 to 8 rows of scales; pectorals not reaching anal, 1.5 to 1.8 in head; caudal fin lunate or very slightly forked; lateral line complete.

Color olivaceous to grayish, mottled and sometimes barred with bluish black; sides with golden reflections; belly and breast yellowish; three or four dusky streaks radiating from eye; vertical fins mottled with dusky; a black opercular spot.

Length 6 to 8 inches.



This species inhabits sluggish waters from the Great Lakes to North Carolina and Texas.

Jackson Park, Chicago, Illinois; Fox River, Berwyn, Illinois; Chicago River, Edgebrook, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois.

Genus **Lepomis** Rafinesque.

THE TRUE SUNFISHES.

Body deep, compressed, the dorsal region elevated; mouth small, its gape not reaching pupil; maxillary with small supplemental bone or none; teeth on jaws, vomer, and usually on palatines, none on tongue or pterygoids; opercle rounded, ending in a bony or osseomembranous process or flap; preopercle entire; anal spines 3; caudal fin emarginate.

- a. Moderately large; supplemental bone present; black spot on opercle on its stiff bony portion.
- b. Maxillary about 2.3 in head; cheeks with wavy bluishgreen lines. *cyanellus*, 311
- bb. Maxillary about 2.7 in head; cheeks without wavy bluishgreen lines. *euryorvus*, 312
- aa. Mouth small; supplemental bone very small or wanting; black spot of opercle on its thin flexible portion.
- c. Gill rakers short and weak, their length about 6 in eye; no black spot on base of last rays of dorsal fin. *megalotis*, 313
- cc. Gill rakers longer, their length about 3 in eye; a black blotch at base of last dorsal rays. *incisor*, 313

**Lepomis cyanellus** Rafinesque. GREEN SUNFISH; BLUE-SPOTTED SUNFISH.

Head 2.4 to 3.0; depth 2.1 to 2.5; D. IX or X, 10 to 12; A. III, 9 or 10; scales 45 to 49.

Body elongate, robust, moderately compressed; mouth moderate, maxillary reaching to about middle of orbit; supplemental bone well developed; maxillary 2.0 to 2.5 in head; lower jaw the longer; eye 3.8 to 5.2 in head; snout 3.3 to 4.0; teeth present on vomer and palatines; flexible margin of opercular flap fleshy, broader behind and below than above; spinous dorsal low, its spines 3.0 to 4.2 in head; pectorals short, rounded, 1.5 to 1.7 in head; scales on cheeks in 7 to 10 rows; caudal fin emarginate; gill rakers long and stiff, the longest 2 in eye.

Color olivaceous to greenish; each scale with a green spot, these forming lateral stripes along the rows of scales; sides with 7 or 8 dusky bars; 3 or 4 wavy lines of bluishgreen on cheek below eye; 2 or 3 of them continued backward across opercle; bony portion of opercular flap dark-green or black; the membranous portion coppery to purplish; fins all dusky; soft dorsal and anal with large black blotch at base of last rays.

Length from 4 to 7 inches.

This species inhabits still and sluggish waters from the Great Lake Region to Ohio and the Rio Grande Basin.

Fox River, Berwyn, Illinois; Chicago River, Edgebrook, Illinois; Butterfield Creek, Elliotts Park, Illinois; Des Plaines River, Libertyville, Illinois; Salt Creek, Lyons, Illinois; Thorn Creek, Thornton, Illinois; Hickory Creek, Alpine, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois; Lake George, Indiana; Lagoon, Buffington, Indiana.

**Lepomis euryorus** McKay. MCKAY'S SUNFISH.

Head 2.6 to 2.9; depth 2.0 to 2.3; D. X, 11 or 12; A. III, 9 or 10 scales 43 to 45.

Body moderately elongate, compressed; mouth moderate, maxillary reaching front of orbit; supplemental maxillary developed; maxillary 2.6 to 2.9 in head; jaws about equal; eye 3.8 to 4.3 in head; snout 3.7 to 4.2; teeth present on vomer and palatines; opercle produced backward, sharply rounded posteriorly, the fleshy margin wide; gill rakers well developed, the longest 3 in diameter of eye;

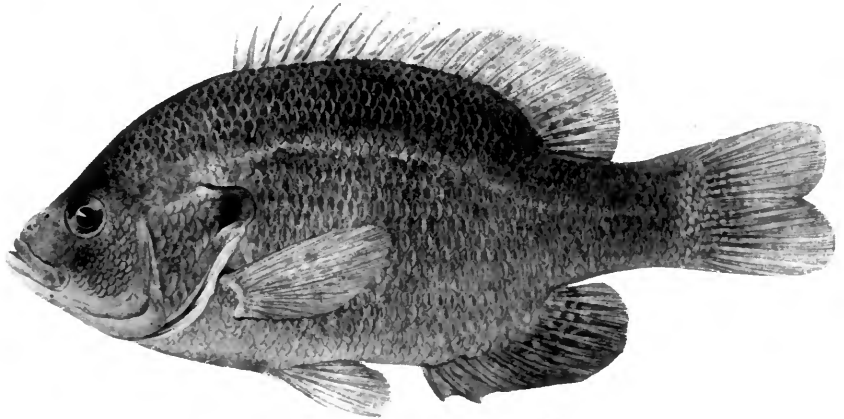


FIG. 62. MCKAY'S SUNFISH.  
*Lepomis euryorus* McKay. (After Forbes and Richardson.)

dorsal spines low, 2.2 to 2.7 in head; pectorals short, 1.3 to 1.4 in head; scales on cheeks in 6 to 8 rows.

Color dusky olive mottled with darker; fin membranes dusky with darker markings near base; opercular spot black, the margin paler, with some red or coppery color. In general appearance this species resembles the pumpkin-seed, *E. gibbosus*.

Length 6 to 8 inches.

This rare fish ranges from southern Minnesota to northern Indiana.

**Lepomis megalotis** (Rafinesque). LONG-EARED SUNFISH.

Head 2.8 to 3.3; depth 1.8 to 2.3; D. X, 11; A. III, 8 to 10; scales 37 to 39.

Body short and deep, compressed; dorsal region much elevated; mouth rather small; maxillary reaching orbit; no supplemental bone; maxillary 2.4 to 2.7 in head; jaws equal; no teeth on palatines; eye 3.0 to 4.0 in head; snout 2.5 to 3.2; opercular flap short in young, to very long in adults; usually broadened behind, with or without pale margin; gill rakers short, longest about 6 in diameter of eye; pectoral fins short, 1.0 to 1.2 in head; scales on cheeks in about 5 rows.

Color light to dark-olive; sides irregularly spotted with orange; cheeks with wavy streaks, opercular flap entirely black or with narrow pale margin.

Length  $3\frac{1}{2}$  to 4 inches.

This fish ranges from Minnesota to South Carolina and the Rio Grande.

Fox River, McHenry, Illinois; Des Plaines River, Berwyn, Illinois; Hickory Creek, New Lenox, Illinois; Lake George, Indiana.

**Lepomis incisor** (Cuvier & Valenciennes). BLUEGILL; BLUE SUNFISH.

Head 2.9 to 3.4; depth 1.9 to 2.2; D. X, 10 to 12; A. III, 10 to 12; scales 38 to 48.

Body short, compressed, dorsal region elevated; mouth small, maxillary scarcely reaching orbit; no developed supplemental bone; maxillary 2.9 to 3.3 in head; jaws equal; eye 2.9 to 3.9 in head; snout 3.0 to 3.5; no teeth on palatines; opercle prolonged backward in adults; its membranous margin narrow or wanting; spinous dorsal high, the longest spine 1.3 to 2.4 in head; pectorals long, pointed, about equal to length of head; scales on cheeks in 5 rows.

Color olivaceous above to yellowish below; sides with about 6 vertical bars, becoming inconspicuous in adults; opercular flap black,

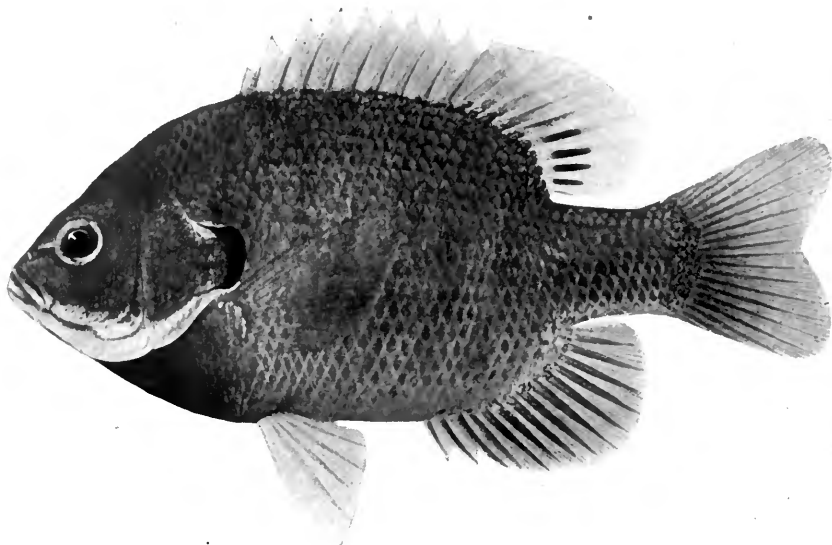


FIG. 63. BLUEGILL; BLUE SUNFISH.  
*Lepomis incisor* (C. and V.) (After Forbes and Richardson.)

without pale margin; dorsal with a black blotch on base of its last rays.

Length 5 to 8 inches.

This fish ranges from the Great Lake Region to Florida and Mexico.

Dead River, Beach, Illinois; Bull Creek, Beach, Illinois; Lagoon, Jackson Park, Chicago, Illinois; Des Plaines River, Chicago, Illinois; Des Plaines River, Berwyn, Illinois; Chicago River, Edgebrook, Illinois; Hickory Creek, Marley, Illinois; Wolf Lake, Roby, Indiana; Lake George, Indiana; Lagoon, Buffington, Indiana; Calumet River, Clark, Indiana; Deep River, Liverpool, Indiana.

### Genus **Eupomotis** Gill and Jordan.

#### PUMPKIN-SEED SUNFISH.

Body short, compressed; mouth small; no supplemental maxillary; lower pharyngeals deep and broad, the teeth bluntly rounded or paved; gill rakers short; fins long; a red roundish spot on lower posterior angle of opercle.

**Eupomotis gibbosus** (Linnæus). PUMPKIN-SEED; RED-EARED SUN-FISH.

Head 2.8 to 3.2; depth 2.0 to 2.5; D. X, 11 or 12; A. III, 10 or 11; scales 35 to 40.

Body short, compressed, the dorsal region elevated; mouth small, maxillary reaching front of orbit, its length 2.6 to 3.3 in head; no supplemental bone; eye 3.5 to 4.2 in head; about equal to length of the snout; opercle with bony portion distinct from the broad, paler, fleshy portion; gill rakers short and soft; pectorals rather long, 1.0 to 1.1 in head; 4 or 5 rows of scales on cheeks.

Color olivaceous to greenish; sides with yellowish or copper-colored roundish blotches; cheeks and opercles crossed by 4 or 5 wavy lines; opercular flap black with a roundish red or orange spot on lower posterior angle; dorsal fin irregularly barred with brownish to orange blotches.

Length 5 to 8 inches.

This fish ranges from the Great Lake Region to the Atlantic Coast streams and northern Mississippi Valley.

Fox River, McHenry, Illinois; Dead River, Beach, Illinois; Des Plaines River, Berwyn, Illinois; Calumet Lake, Pullman, Illinois; Wolf Lake, Roby, Indiana; Lake George, Indiana; Lake Michigan and Calumet River, Millers, Indiana; Lagoon, Buffington, Indiana; Lake Michigan and Lagoon, Pine, Indiana; Calumet River, Clark, Indiana.

Genus **Micropterus** Lacépède.

## BLACK BASS.

Body elongate, the dorsal region not much developed; mouth very large; maxillary with well developed supplemental maxillary; preopercle entire; opercle emarginate behind, ending in 2 flat points; teeth on jaws, vomer, and palatines; tongue usually without teeth; spinous and soft dorsals divided by a deep notch; anal spines 3.

a. Mouth moderate, the maxillary scarcely reaching posterior margin of orbit; 10 to 12 rows of scales between lateral line and dorsal fin. *dolomieu*, 316

aa. Mouth larger, the maxillary reaching past posterior margin of orbit; 8 to 9 rows of scales between lateral line and dorsal fin.

*salmoides*, 316

**Micropterus dolomieu** Lacépède. SMALL-MOUTHED BLACK BASS.

Head 2.9 to 3.7; depth 2.9 to 3.1; D. X, 13 to 15; A. III, 10 to 12; scales 66 to 78.

Body elongate, moderately compressed, mouth large, the maxillary not reaching posterior margin of orbit; its length 2.1 to 2.5; supplemental maxillary developed; eye 5.4 to 6.9 in head; snout 3.0 to 3.3; gill rakers long, spinous, dorsal low, its last spines much shorter than the longest ones; pectorals short, 1.9 to 2.1 in head; lateral line complete; scales on cheeks in 17 rows; 10 to 12 rows of scales between dorsal fin and lateral line.

Color green to nearly black, with faint vermiculations above lateral line and indistinct dark bars below it.

Length 12 to 15 inches.

This fish inhabits the clear streams and colder lakes from the Great Lake Region to Vermont, South Carolina, and Arkansas.

Fox River, McHenry, Illinois; Des Plaines River, Berwyn, Illinois; Hickory Creek, New Lenox, Illinois.

**Micropterus salmoides** (Lacépède). LARGE-MOUTHED BLACK BASS.

Head 2.8 to 2.9; depth 2.9 to 3.2; D. X, 12 to 13; A. III, 10 to 12; scales 62 to 68.

Body elongate, not much compressed; dorsal region little elevated; mouth large, the maxillary reaching past posterior margin of orbit, its length 1.9 to 2.1 in head; supplemental bone well developed; eye 5.8 to 7.6 in head; snout 3.1 to 3.9; gill rakers long; spinous dorsal low, its last rays much shorter than longest ones; pectorals short 2.0 to 2.4 in head; lateral line complete; scales on cheeks in 9 or 10 rows; 8 to 9 rows of scales between dorsal fin and lateral line.

Color dark-green, obscurely mottled with dark blotches; a dark lateral band, most conspicuous in smaller individuals.

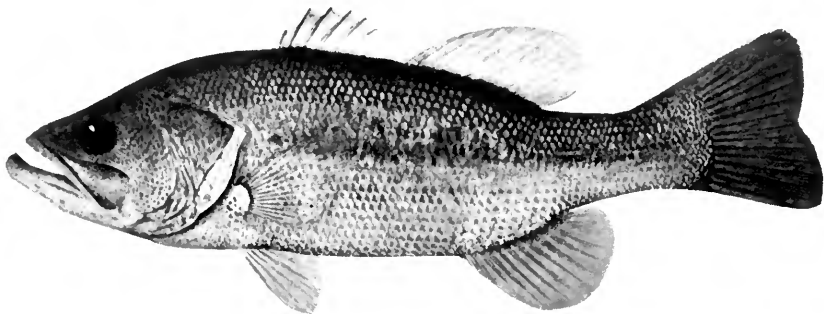


FIG. 64. LARGE-MOUTHED BLACK BASS.  
*Micropterus salmoides* (Lac.). (After Forbes and Richardson.)

Length 15 to 18 inches.

This fish inhabits the larger streams and lakes from the Great Lake Region to Florida and northeastern Mexico.

Fox River, McHenry, Illinois; Dead River, Beach, Illinois; Des Plaines River, Berwyn, Illinois; Wolf Lake, Roby, Indiana; Lagoon, Buffington, Indiana; Lagoon, Pine, Indiana; Deep River, Liverpool, Indiana.

### Family **Percidæ.**

#### THE PERCHES AND DARTERS.

Body more or less elongate, terete or compressed, covered more or less completely with rather small ctenoid scales; mouth large or small, terminal or inferior; teeth usually villiform in bands on jaws, occasionally with few canine-like teeth; vomer and palatines usually with teeth; pseudo-branchiæ small, glandular or concealed; opercle usually ending in a single flat spine; preopercle entire or serrate; dorsal fins 2, the first of 6 to 15 spines; gill rakers slender, toothed; gill membranes separate or joined, not connected with the isthmus; lower pharyngeals separate, with sharp teeth; pyloric cæca few; anal papillæ usually more or less developed; air bladder small and adherent, often wanting.

a. Preopercle distinctly serrate below and behind angle; pseudo-branchiæ well developed; branchiostegals 7; no anal papillæ, fishes of large size.

b. Canine teeth on jaws and palatines; body subterte.

*Stizostedion*, 318

bb. No canine teeth present; body compressed. *Perca*, 320

aa. Preopercle entire or nearly so; pseudo branchiæ small or wanting; anal papillæ usually present; fishes less than 6 to 9 inches in length.

c. Cranium broad between the eyes; interorbital space 4.0 to 4.7 in head; snout long, pig-like, and projecting beyond the inferior mouth; gill membranes separate. *Percina*, 320

cc. Cranium narrow between the eyes; interorbital space narrower 5 to 9 in head; snout pointed or blunt, projecting very little or none beyond the terminal or nearly terminal mouth.

d. Median line of belly with enlarged scales or plates, these falling off leaving a naked strip; separation of ventrals equal to or greater than their width at base.

e. Premaxillaries not protractile.

*Hadropterus*, 321

- ee. Premaxillaries protractile. *Cottogaster*, 322
- dd. Median line of belly with ordinary scales, or the entire ventral surface naked, never with large scales or plates; separation of ventrals less than their width at base.
- f. Maxillary adnate to the preorbital; premaxillary protractile downward; mouth small, overhung slightly by the blunt snout. *Diplesion*, 323
- ff. Maxillary free from the preorbital.
- g. Premaxillaries protractile.
- h. Body covered with scales; snout blunt or bluntish. *Boleosoma*, 324
- hh. Dorsal and ventral regions with few or no scales; snout pointed. *Ammocrypta*, 326
- gg. Premaxillaries not protractile.
- i. Lateral line more or less developed; scales small, more than 40 in lateral series.
- j. Lateral line straight. *Etheostoma*, 327
- jj. Lateral line arched anteriorly. *Boleichthys*, 330
- ii. Lateral line entirely wanting; scales larger, less than 40 in lateral series. *Microperca*, 331

### Genus **Stizostedion** Rafinesque.

#### PIKE-PERCHES.

Body elongate, fusiform; back broad; head large with pointed snout; preopercle with antrorse serræ; opercle with one or more spines; teeth on jaws and on palatines in villiform bands, a few enlarged and canine-like; pseudobranchiæ well developed; pyloric cœca 3 to 8; caudal fin lunate.

- a. Spinous dorsal with 2 or 3 rows of large black spots; pyloric cœca 5 to 8, unequal, the longest shorter than the stomach. *canadense*, 318
- aa. Spinous dorsal with a single large black spot on last two membranes; pyloric cœca 3, subequal and as long as stomach. *vitreum*, 319

**Stizostedion canadense.** (Smith) SAUGER; SAND PIKE; GRAY PIKE.

Head 3.4 to 3.6; depth 5.2 to 5.5; D. X to XIII—17 to 19; A. II, II or 12; scales 85 to 91.

Body elongate, slightly compressed; head large, depressed; interorbital space flat; mouth large, the maxillary reaching past pupil;



snout long, depressed, 3.2 to 3.7 in head; diameter of eye 4.6 to 5.1; upper jaw the longer; spinous and soft dorsals separate; cheeks fully scaled; lateral line usually complete; pyloric cœca 5 to 8; shorter than stomach.

Color olive-gray mottled with darker; spinous dorsal with 2 or 3 rows of round black spots; no large black blotch on posterior membranes; soft dorsal with 4 or 5 irregular rows of rather indistinct dusky blotches; a large black blotch at base of pectorals; caudal yellowish, barred with dusky.

Length 1 to 1½ feet.

This fish inhabits the larger streams and lakes from the Assiniboin River, through the Great Lake Region to Tennessee and Arkansas.

**Stizostedion vitreum** (Mitchill). WALL-EYED PIKE; JACK SALMON; PIKE.

Head 3.2 to 3.5; depth 4.3 to 5.2; D. XII or XIV—19 to 22; A. II, 12 to 14; scales 80 to 89.

Body slender, slightly compressed; head pointed, profile long and straight; interorbital space flat; mouth large, terminal, the maxillary reaching past pupil; snout 3.3 to 3.8 in head; diameter of eye 4.6 to 6.0; upper jaw slightly the longer; spinous and soft dorsals separated; cheeks usually sparsely scaled; lateral line usually complete; pyloric cœca 3, about as long as stomach.

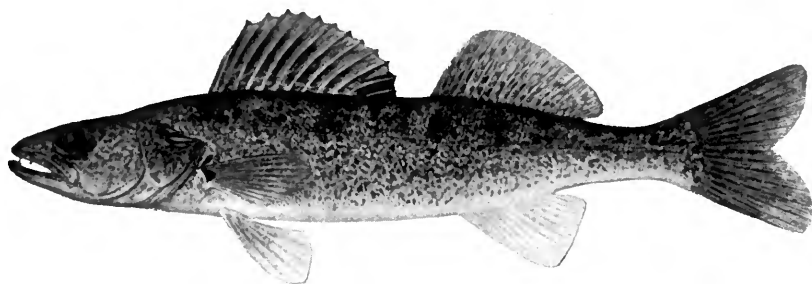


FIG. 65. WALL-EYED PIKE; JACK SALMON.  
*Stizostedion vitreum* (Mitch.). (After Forbes and Richardson.)

Color olive-buff to yellowish, everywhere mottled with black; sides with 5 large irregularly-shaped cross-blotches with smaller blotches between; spinous dorsal with a narrow black margin and with a dark spot on its last 2 membranes; soft dorsal indistinctly barred.

Length 3 feet.

This species ranges from Minnesota to Hudson Bay, Maryland, and Oklahoma.

Genus **Perca** (Artedi). Linnaeus.

## YELLOW PERCH.

Body elongate, considerably compressed; head large; mouth moderate; premaxillary protractile; preopercle serrate; opercle with a single spine; teeth in villiform bands on jaws; vomer and palatines; no canines; pseudobranchiæ small; pyloric cœca 3 to 7.

**Perca flavescens** (Mitchill). YELLOW PERCH.

Head 3.0 to 3.5; depth 3.3 to 3.8; D. XII to XIV—II or III, 12 or 13; A. II, 7 or 8; scales 57 to 62.

Body moderately elongate, compressed; head large, pointed; interorbital space nearly flat; mouth large, the maxillary reaching middle of orbit; snout pointed 3.4 to 3.7 in head; diameter of eye 3.6 to 4.8; preopercle strongly serrate; opercle ending in several points; spinous and soft dorsal separate; cheeks scaled in about 8 to 10 rows; gill rakers  $x+15$ ; pyloric cœca 3; lateral line complete or nearly so.

Color brassy green to golden yellow; sides with 7 dark or dusky bars; spinous dorsal gray, usually with a black spot on last 2 membranes; soft dorsal and caudal pale-green.

Length 1 foot.

This fish ranges from North Dakota to Nova Scotia, New York, and Iowa.

Fox River, McHenry, Illinois; Lake Michigan, Chicago, Illinois; Calumet Lake, Pullman, Illinois; Hickory Creek, New Lenox, Illinois; Wolf Lake, Roby, Indiana; Lake Michigan and Lagoons, Millers, Indiana; Lagoon, Buffington, Indiana; Lake Michigan and Lagoons, Pine, Indiana; Calumet River, Clark, Indiana; Lake Michigan and Lagoons, Edgemoor, Indiana.

Genus **Percina** Haldeman.

Body elongate, scarcely compressed; premaxillary not protractile; teeth on vomer and palatines; mouth small and inferior; pyloric cœca 6; ventral surface with a row of enlarged scale-like caducous plates.

**Percina caprodes** (Rafinesque). LOG-PERCH.

Head 3.6 to 4.8; depth 5.4 to 7.0; D. XII-15; A. II, 10 or 11; scales 83 to 93.

Body elongate, cylindrical; head long and pointed; interorbital area flat or slightly concave; mouth small, overhung by the pig-like snout; maxillary scarcely reaching to posterior nostril; cleft of mouth 3.4 to 4.0 in head; snout long, conical, 2.8 to 3.3 in head; eye high on head, 3.6 to 4.2 in head; spinous and soft dorsals very little separated;

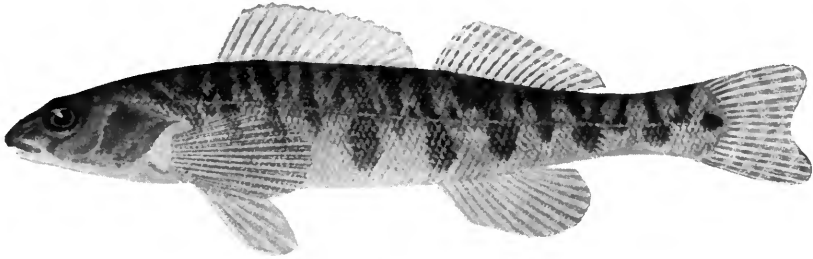


FIG. 66. LOG PERCH.  
*Percina caprodes* (Raf.). (After Forbes and Richardson.)

separation of ventrals about equal to their width at base; cheeks and opercles covered with scales; nape usually fully scaled; breast naked.

Color olive-buff to yellowish; sides of adults with 30 to 40 dark bars, alternate ones are half bars, these are usually absent in young; a small black caudal spot; dorsal and caudal fins barred, other fins plain.

Length 4 to 6 inches.

This fish ranges from the Great Lake Drainage to Alabama and Texas.

Fox River, McHenry, Illinois; Des Plaines River, Berwyn, Illinois; Wolf Lake, Roby, Indiana; Lake Michigan, Pine, Indiana; Lake Michigan, Edgemoor, Indiana.

### Genus **Hadropterus** Agassiz.

#### BLACK-SIDED DARTERS.

Body rather elongate, slightly compressed; premaxillary not protractile; teeth on vomer and usually on palatines; mouth rather large, terminal; pyloric cœca 2 to 4; ventral surface with a row of enlarged scales, caducous in some species, persistent in others; gill membranes united to the isthmus.

**Hadropterus aspro** (Cope and Jordan). BLACK-SIDED DARTER.

Head 3.8 to 4.0; depth 5.4 to 6.8; D. XIII to XV—II to 14; A. II, 8 to 11; scales 50 to 56.

Body elongate, slightly compressed; head pointed; interorbital space flat, narrow; mouth large, terminal, the maxillary reaching past front of orbit; cleft of mouth 3.0 to 3.4 in head; snout bluntly pointed, 3.6 to 4.1 in head; eye 3.4 to 4.0; spinous and soft dorsals usually separate; separation of ventrals about equal to their width at base; gill membranes united to the isthmus; cheeks and opercles

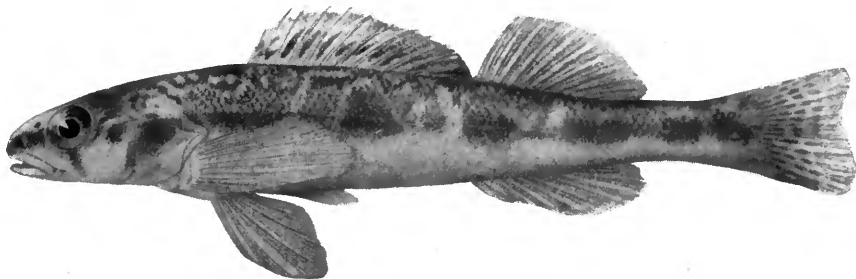


FIG. 67. BLACK-SIDED DARTER.

*Hadropterus aspro* (Cope and Jordan). (From Forbes and Richardson.)

covered with small scales; nape naked or with embedded scales; breast naked; middle line of ventral surface with enlarged caducous plates.

Color olivaceous; back with about 8 dark quadrate spots; 7 or 8 large dark blotches along side more or less confluent into a lateral band; head dark-olive with a dark streak before eye and one below it; spinous dorsal in males crossed by a dark band; pectorals faintly barred.

Length 3 to 4 inches.

This species ranges from Manitoba and the Great Lake Region to Arkansas.

Fox River, McHenry, Illinois; Des Plaines River, Berwyn, Illinois; Flossmore, Illinois; Thorn Creek, Thornton, Illinois; Salt Creek, Liberty, Illinois.

#### Genus *Cottogaster* Putnam.

Body rather robust, little compressed; premaxillary protractile, or with a narrow frenum; teeth on vomer; mouth small, subterminal; pyloric cœca 3, ventral surface naked or with caducous plates.

*Cottogaster shumardi* (Girard). SHUMARD'S DARTER.

Head 3.7 to 4.0; depth 5.2 to 6.9; D. IX to XI—13 to 15; A. II, 10 to 12; scales 50 to 56.

Body elongate, little compressed; head large, snout blunt; mouth

moderate, the maxillary reaching front of orbit; cleft of mouth 2.9 to 3.2 in head; snout bluntish, 2.9 to 3.7; eye 3.2 to 3.5; spinous and soft dorsals very little separate at base; separation of ventrals nearly equal to their width at base; gill membranes free from isthmus; cheek opercles and nape scaled; breast naked; ventral surface naked.

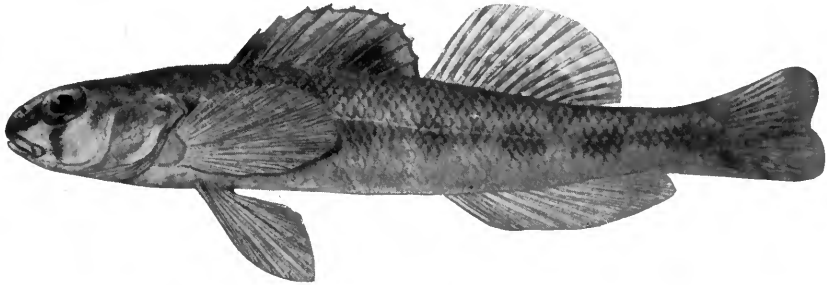


FIG. 68. SHUMARD'S DARTER  
*Cottagaster shumardi* (Girard). (From Forbes and Richardson.)

Color brownish olive, blotched and mottled with darker; sides with 15 to 18 dark blotches; a faint dark band in front of eye and one below it; a black blotch on front and one on back of spinous dorsal; soft dorsal and caudal barred.

Length  $2\frac{1}{2}$  to 3 inches.

This fish ranges from the Great Lakes through the Mississippi Valley to Arkansas.

### Genus **Diplesion** Rafinesque.

Body rather elongate, little compressed; mouth small, its gape nearly horizontal; premaxillaries protractile downwards; maxillary joined for most of its length to the skin of the preorbital; no teeth on vomer or palatines; ventral surface covered with ordinary scales; gill membranes broadly connected across the isthmus; pyloric cæca 4.

#### **Diplesion blennioides** Rafinesque. GREEN-SIDED DARTER.

Head 4.0 to 4.6; depth 5.3 to 6.3; D. XIII to XIV—13 to 14; A. II, 8 or 9; scales 57 to 64.

Body rather elongate, slightly compressed; head short with blunt snout; interorbital space flat, narrow; mouth small, its gape horizontal, the maxillary reaching front of orbit; cleft of mouth 3.1 to 4.0 in head; snout blunt, slightly overhanging the small mouth, 3.1 to 3.7 in head; eye 3.1 to 3.6; spinous and soft dorsals joined or

slightly separate; separation of ventrals less than their width at base; gill membranes connected to the isthmus; cheeks naked or with few more or less embedded scales; opercles and nape scaled; breast naked; ventral surface with ordinary scales; lateral line nearly straight, completed or nearly so.

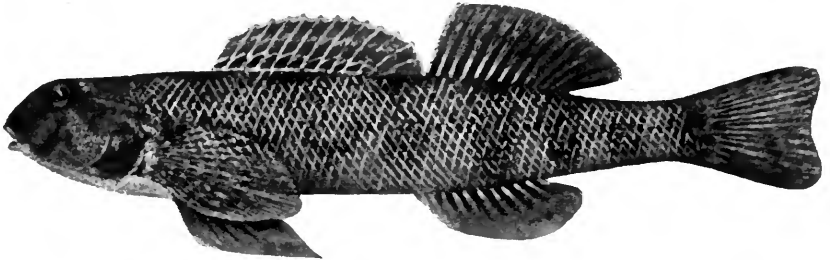


FIG. 69. GREEN-SIDED DARTER.  
*Diplesion blennioides* Raf. (After Forbes and Richardson.)

Color olive-green, sides with orange dots and with 5 to 8 double dark-green vertical bars, each pair forming a V-shaped figure, these sometimes united forming a wavy lateral band; spinous dorsal orange brown at base, blue above; soft dorsal and anal fins blue-green with some reddish; caudal greenish, faintly barred.

Length 3 inches.

This species ranges from South Dakota to Lake Ontario, Alabama, and Missouri.

### Genus *Boleosoma* DeKay.

#### JOHNNY DARTERS.

Body elongate, subcylindrical; mouth small, its gape horizontal; premaxillaries protractile; teeth on vomer; ventral surface covered with ordinary scales; gill membranes narrowly connected; pyloric cæca 3 to 6.

- a. Lateral line complete or nearly so; cheeks and breast usually without scales; pyloric cæca 6. *nigrum*, 324
- aa. Lateral line absent on posterior half of body; cheeks and breast usually closely scaled; pyloric cæca 3. *camurum*, 325

### *Boleosoma nigrum* (Rafinesque). JOHNNY DARTER.

Head 3.5 to 4.2; depth 4.7 to 6.9; D. VIII to X—10 to 12; A. 1, 6 to 9; scales 45 to 52.

Body elongate, slender, subfusiform; head short with decurved snout; interorbital space narrow, concave; mouth small, its gape

horizontal, maxillary reaching slightly past front of orbit; cleft of mouth 2.9 to 3.7 in head; snout blunt, slightly overhanging the mouth, 3.3 to 4.2 in head; eye 3.2 to 4.0 in head; spinous and soft dorsals slightly joined; separation of ventrals usually a little less than their width at base; gill membranes narrowly connected; cheeks naked or with trace of scales on upper portion; breast usually naked; nape scaled or not; lateral line complete or nearly so.

Color pale-olive or straw color; back much tessellated with brown; sides with numerous W-shaped or quadrate blotches; head speckled above, mostly black in males; fins barred.

Length  $2\frac{1}{2}$  inches.

This species ranges from the Assiniboin to Colorado and eastward.

Fox Lake, Illinois; Fox River, McHenry, Illinois; Pettibone Creek, North Chicago, Illinois; Ravine, Glencoe, Illinois; Chicago River, Edgebrook, Illinois; Salt Creek, Lyons, Illinois; Thorn Creek, Thornton, Illinois; Hickory Creek, Alpine, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois; Wolf Lake, Roby, Indiana; Lake George, Indiana.

**Boleosoma camurum** Forbes. BLUNT-HEADED DARTER.

Head 3.9 to 4.3; depth 6.5 to 7.2; D. VIII to X—10 or 11. A. 1, 7 or 8; scales 52 to 60.

Body elongate, slender, somewhat compressed; head short, narrow, snout decurved; interorbital flat; mouth small, its gape horizontal; maxillary reaching to front of pupil; cleft of mouth 3.1 to

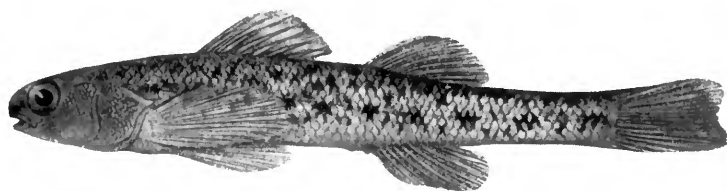


FIG. 70. BLUNT-HEADED DARTER.  
*Boleosoma camurum* Forbes. (From Forbes and Richardson.)

3.8 in head; snout blunt, 3.8 to 4.5 in head; eye 3.3 to 4.0; spinous and soft dorsals separated by a distance about equal to diameter of the eye; separation of ventrals less than their width at base; gill membranes not broadly connected; cheek opercles and breast fully scaled; nape with a median naked strip; ventral surface covered with ordinary scales; lateral line developed on about half the scales; pyloric cæca 3.

Color much as in the preceding, being less finely tessellated and

the W-shaped blotches less distinct, dorsals and caudal fins faintly barred.

Reaching a length of not more than  $1\frac{3}{4}$  inches.

This fish ranges from Iowa to Alabama and Texas.

### Genus *Ammocrypta* Jordan.

Body slender, elongate, fusiform; mouth rather wide, its gape horizontal; premaxillaries protractile; teeth on vomer; ventral surface without scales; gill membranes somewhat connected; pyloric cæca 4.

#### *Ammocrypta pellucida* (Baird). SAND DARTER.

Head 4.1 to 4.4; depth 8.2 to 10.1; D. IX to XI—9 to 11; A. I, 8 or 9; scales 67 to 78.

Body elongate, very slender; head with slightly decurved snout; interorbital space narrow, concave; mouth rather large, its gape horizontal, the cleft 3.1 to 4.4 in head; maxillary reaching slightly

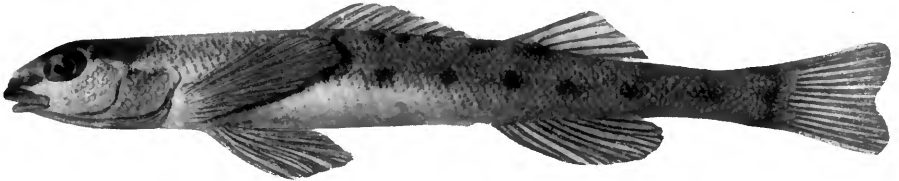


FIG. 71. SAND DARTER.  
*Ammocrypta pellucida* (Baird). (From Forbes and Richardson.)

past front of orbit; snout slightly decurved, pointed, 3.1 to 3.8 in head; eye 3.6 to 4.3; spinous and soft dorsals widely separated; separation of ventrals less than their width at base; gill membranes somewhat connected; cheeks and opercles scaled; nape scaled or not; throat, breast, and belly entirely naked; all of the scales more or less embedded and with slightly ctenoid edges, those on body confined to a strip or band of varying width on sides; lateral line usually complete.

Color white, translucent; scales with fine black dots; a series of squarish olive or bluish blotches along the back, and another along each side.

Length  $2\frac{1}{2}$  inches.

This fish ranges from Minnesota to Ohio and Texas.



Genus **Etheostoma** Rafinesque.

Body robust or elongate, considerably compressed; mouth large or small, terminal or subinferior; premaxillaries not protractile; teeth usually on vomer and palatines; ventral surface covered with ordinary scales; gill membranes connected or not; pyloric cæca 3 or 4.

- a. Lateral line usually complete, pores occasionally lacking on 2 to 6 scales; gill membranes broadly connected. *zonale*, 327
- aa. Lateral line incomplete, pores usually lacking on 10 or more scales.
- b. Gill membranes scarcely connected; lower jaw moderate, not projecting.
- c. Cheeks and opercles with scales.
- d. Body slender, little compressed, its depth 5.4 to 6.8; soft dorsal with 9 to 11 rays; scales 55 to 60 in lateral series; sides without crossbars. *iowa*, 328
- dd. Body compressed, its depth 4.8 to 5.4; soft dorsal with 12 to 13 rays; scales 49 to 57 in lateral series; sides with brown crossbars. *jessie*, 328
- cc. Cheeks naked, opercles with scales; body compressed, its depth 4.7 to 5.0; soft dorsal with 12 to 14 rays; scales 44 to 51 in lateral series; sides with crossbars, these red and blue in spring males. *cæruleum*, 329
- bb. Gill membranes broadly connected; lower jaw strongly projecting. *flabellare*, 330

**Etheostoma zonale** (Cope). BANDED DARTER.

Head 4.0 to 4.9; depth 4.7 to 6.0; D. X or XI—10 to 12; A. II, 7 or 8; scales 46 to 53.

Body robust, little compressed; head short with decurved snout; interorbital space convex; mouth small, its gape horizontal, its cleft

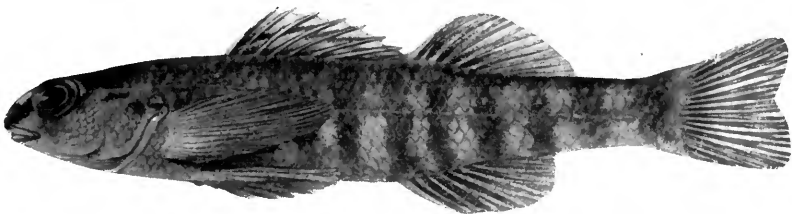


FIG. 72. BANDED DARTER.  
*Etheostoma zonale* (Cope). (From Forbes and Richardson.)

3.4 to 4.8 in head; maxillary scarcely reaching past front of orbit; snout blunt 3.2 to 4.0 in head; eye 2.9 to 3.7 in head; spinous and soft dorsals usually well separated at base; separation of ventrals less than  $\frac{2}{3}$  their width at base; cheeks, opercles, and nape fully scaled; breast usually scaled; lateral line usually complete.

Color greenish olive, dorsal surface with 6 dark bars, short and somewhat broken, these alternating with blotches of rusty red (in life); belly greenish yellow to almost white; upper half of spinous dorsal except tip, orange; soft dorsal and caudal fins barred; other fins nearly white.

Seldom reaching a length of 2 inches.

This fish ranges from Iowa to Ohio and Louisiana.

Hickory Creek, New Lenox, Illinois.

**Etheostoma iowæ** Jordan & Meek.

Head 3.7 to 4.0; depth 5.4 to 6.8; D. VIII to XI—9 to 11; A. II, 6 to 8; scales 55 to 60.

Body slender, little compressed; head rather large with bluntish snout; interorbital space narrow, convex; mouth small, nearly horizontal, its cleft 3.6 to 4.0 in head; lower jaw the shorter; maxillary reaching to front of orbit; eye 3.3 to 4.4 in head; spinous, and soft dorsal separated by a space greater than diameter of the eye; separation of ventrals less than half their width at base; gill membranes scarcely connected; cheeks, opercles, and nape fully scaled; breast naked; belly covered with ordinary scales; lateral line incomplete, lacking on about 25 scales.

Color greenish, finely blotched with darker; back with 9 to 11 dark-brown quadrate spots; sides with 11 or 12 narrow dark bars, those on posterior half of body most conspicuous and meeting those on opposite side on belly; soft dorsal, anal, and caudal with bars; spinous dorsal with row of dark spots near base and barred on upper half.

Length 2 inches.

This species ranges from the Assiniboin to Indiana.

Des Plaines River, Berwyn, Illinois.

**Etheostoma jessiae** (Jordan & Brayton).

Head 3.7 to 4.2; depth 4.8 to 5.4; D. X to XII—12 or 13; A. II, 7 or 8; scales 49 to 57.

Body robust, compressed; head large, tapering above and below to a bluntly pointed tip; interorbital space narrow, convex; mouth rather large, terminal, oblique; margin of upper lip on level with the

pupil; cleft of mouth 2.8 to 3.8 in head; maxillary reaching past front of orbit; snout pointed, 3.5 to 4.3 in head; eye 3.3 to 4.0; spinous and soft dorsal scarcely separate; separation of ventrals more than  $\frac{1}{2}$  their width at base; gill membranes narrowly connected; cheeks, opercles, and nape closely scaled; breast naked; belly covered with ordinary scales; lateral line with pores lacking on 3 to 15 scales.

Color brownish olive; back with 5 or 6 dark quadrate blotches; sides with 8 or 9 dark bars on sides, those before anal fin obscure; spinous dorsal tipped (in life) with pale blue or white, below which is a row of orange red spots; base of fins blue; soft dorsal irregularly spotted with orange; anal pale.

Length ordinarily a little less than 2 inches, occasionally reaching a length of  $2\frac{1}{2}$  inches.

This species ranges from Iowa to Indiana and Texas.

**Etheostoma cœruleum** Storer. RAINBOW DARTER; SOLDIER-FISH.

Head 3.2 to 4.0; depth 4.5 to 5.2; D. X or XI—12 to 14; A. II, 7 or 8; scales 44 to 51.

Body robust, compressed; head large, tapering above and below to a bluntly pointed snout; interorbital space flat; mouth moderate, terminal, somewhat oblique, the jaws about equal; cleft of mouth 3.0 to 3.5; maxillary reaching front of orbit; snout bluntly pointed, 3.2 to 4.1 in head; eye 5.8 to 7.2 in head; spinous and soft dorsals scarcely separate, or slightly connected; separation of ventrals

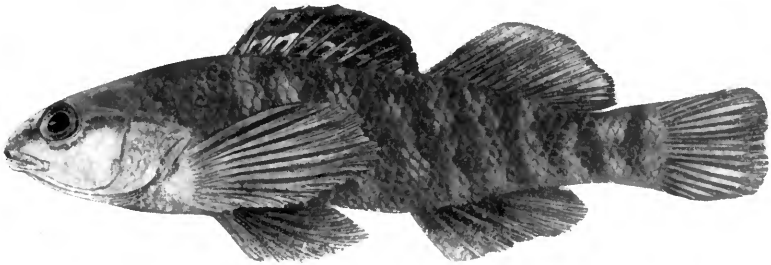


FIG. 73. RAINBOW DARTER; SOLDIER-FISH.  
*Etheostoma cœruleum* Storer. (From Forbes and Richardson.)

usually about  $\frac{1}{3}$  their width at base; cheeks naked; opercles scaled; nape scaled posteriorly; breast naked; belly covered with ordinary scales; lateral line incomplete, usually absent on 15 to 20 scales.

Color dark-olive, overlaid with dusky to bluish bars and blotches; back with 7 or 8 rather obscure quadrate blotches; sides with 11 to 12 dark bars, these most prominent on posterior third of body; in

life these bars in males, dark indigo-blue, the inter-spaces blood-orange; spinous dorsal crossed at its middle by a row of orange spots or an orange band, above and below this, pale to deep indigo-blue bands, at base of fin a narrower band of orange with orange red spots; female duller in color.

Length 2 inches.

This fish is a resident of the Ohio and Upper Mississippi Valleys.

Des Plaines River, Berwyn, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois.

**Etheostoma flabellare** Rafinesque. FAN-TAILED DARTER.

Head 3.6 to 4.2; depth 4.6 to 4.8; D. VII or VIII—12 to 14; A. II, 7 or 8; scales 51 to 63.

Body robust, compressed; head long, slender, somewhat depressed with slight angle at nape; interorbital space flat; mouth rather large, terminal, oblique, the lower jaw the longer; cleft of mouth 2.9 to 3.3 in head; margin of upper lip on level with upper third of pupil; maxillary reaching past front of orbit; gill membranes broadly connected; spinous and soft dorsals slightly joined at base; separation of ventrals about half their width at base; cheeks and opercles usually naked; nape naked or with deeply embedded scales; breast naked; belly covered with ordinary scales; lateral line incomplete, absent on 15 to 25 scales.

Color rather dark, with small dark spots and faint crossbars; each scale with a dark spot, forming lines along the rows of scales; a dark streak across opercles, and through eye to end of snout; males with 10 to 12 crossbars, these faint in the females; soft dorsal, caudal, and anal fins finely barred; spinous dorsal reddish, the spines in breeding males with fleshy knobs.

Length 2 to 2½ inches.

This fish ranges from Iowa to New York and South Carolina.

Des Plaines River, Berwyn, Illinois; Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois.

Genus **Boleithys** Girard.

Body elongate, little compressed; mouth small, its gape nearly horizontal; premaxillaries not protractile; ventral surface with ordinary scales; gill membranes scarcely connected; lateral line incomplete, slightly curved upward anteriorly.

**Boleichthys fusiformis** (Girard). SPINDLE-SHAPED DARTER.

Head 3.5 to 4.1; depth 5.8 to 7.1; D. IX or X--10 to 12; A. II, 6 or 7; scales 48 to 54.

Body elongate, slightly compressed; head with bluntly pointed snout; interorbital space narrow, convex; mouth small, horizontal, its cleft 3.1 to 3.8 in head; lower jaw the shorter; maxillary reaching past front of eye; snout blunt, 4.3 to 5.2 in head; margin of upper lip on level with lower margin of eye; eye 3.5 to 4.0 in head; gill membranes scarcely connected; spinous and soft dorsals usually separated by a distance nearly equal to diameter of eye; separation of ventrals about half their width at base; cheeks and opercles fully

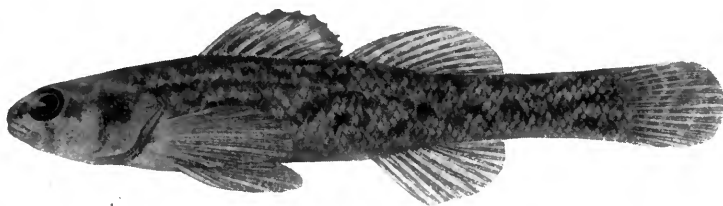


FIG. 74. SPINDLE-SHAPED DARTER.  
*Boleichthys fusiformis* (Girard). (From Forbes and Richardson.)

scaled; nape usually with scales; breast naked or nearly so; belly covered with ordinary scales; lateral line incomplete, absent on 25 or 35 scales.

Color olivaceous, much dotted and blotched with brown, the dark color in more or less definite W and X-shaped markings, or in zigzag streaks; spinous dorsal faintly dusky near base; soft dorsal and caudal faintly barred; males usually darker, with 9 or 10 transverse bars in breeding season, and with basal third of membrane of spinous dorsal jet-black, the fins edged with dusky.

Length 2 to 2½ inches.

This fish ranges from Minnesota to Massachusetts and the Rio Grande.

Genus **Microperca** Putnam.

THE LEAST DARTERS.

Body robust, slightly compressed; mouth small, its cleft nearly horizontal, premaxillaries not protractile; ventral surface covered with ordinary scales; gill membranes scarcely connected.

**Microperca punctulata** Putnam. LEAST DARTER.

Head 3.6 to 4.0; depth 4.6 to 5.2; D. VI-9; A. II, 5 or 6; scales 33 to 36.

Body robust, somewhat compressed; head bluntly rounded, interorbital space narrow, convex; mouth subterminal, its cleft slightly oblique, 3.5 to 4.0 in head; maxillary reaching to middle of eye; snout bluntish, 4.8 to 5.5 in head; eye 3.7 to 4.1; gill membranes scarcely connected; spinous and soft dorsals separated by a space



FIG. 75. LEAST DARTER.

*Microperca punctulata* Putnam. (From Forbes and Richardson.)

about equal to pupil; separation of ventrals less than half width of their base; cheeks, breast, and nape naked; opercles with few scales; lateral line absent.

Color olivaceous, sides closely speckled with vague bars and zig-zag markings; soft dorsal and caudal barred.

Length 1 to 1½ inches.

This fish ranges from Minnesota to Michigan and Arkansas.

Hickory Creek, Marley, Illinois; Hickory Creek, New Lenox, Illinois.

Family **Serranidæ.**

## THE SEA BASSES.

Body oblong, more or less compressed; head large, mouth large, with conical teeth on jaws, vomer, and palatines; ventral fins thoracic; dorsal fin with spinous and soft part connected or not; preopercle usually more or less serrate; air bladder small; stomach cœcal, with few or many pyloric appendages.

- a. Spinous dorsal separate from soft portion; sides with dark lateral stripes not interrupted; base of tongue with teeth.

*Roccus*, 333

- aa. Spinous dorsal joined to soft portion; sides with dark lateral stripes broken on posterior half of body; base of tongue toothless.

*Morone*, 333

Genus **Roccus** Mitchill.

STRIPED BASS.

Body deep, compressed; mouth large, lower jaw the longer; no supplemental maxillary; lower margin of preopercles serrate or entire; base of tongue with 1 or 2 patches of teeth; dorsal fins separate; anal spines 3.

**Roccus chrysops** (Rafinesque.) STRIPED BASS.

Head 3.1 to 3.4; depth 2.6 to 2.9; D. IX-1, 13 or 14; A. III, 11 to 13; scales 52 to 57.

Body rather deep, compressed; the back elevated; head subconical; interorbital convex, 3.4 to 4.1 in head; mouth terminal oblique, maxillary reaching middle of orbit; lower jaw the longer; gill rakers as long as the gill filaments; cheeks and opercles with 10 to 12 rows of scales; lateral line usually complete.

Color silvery, tinged with golden below; sides with narrow dusky lines, about 5 above lateral line, one coincident with it, and a variable number below it.

Length 12 to 18 inches.

This species inhabits the Great Lake Region and the Mississippi Valley north of Arkansas.

Genus **Morone** Mitchill.

Body rather short, deep, compressed; no supplemental maxillary; lower margin of preopercle serrate or entire; base of tongue without teeth; spinous and soft dorsals connected by a membrane; anal spines 3; scales ctenoid.

**Morone interrupta** Gill. YELLOW BASS; STRIPED BASS.

Head 3.0 to 3.2; depth 2.7 to 2.9; D. IX-1, 12; A. III, 10; scales 51 to 55.

Body deep and compressed, the back elevated; head subconical, pointed, jaws about equal; interorbital space slightly convex, 4.0 to 4.7 in head; snout 3.1 to 3.7; mouth terminal, the maxillary barely reaching to middle of the orbit; gill rakers longer than the filaments; snout 3.1 to 3.7; dorsal fins connected; cheeks and opercles with about 12 rows of scales; lateral line complete or nearly so.

Color olive-buff to silvery; 3 dark lateral stripes above lateral line,

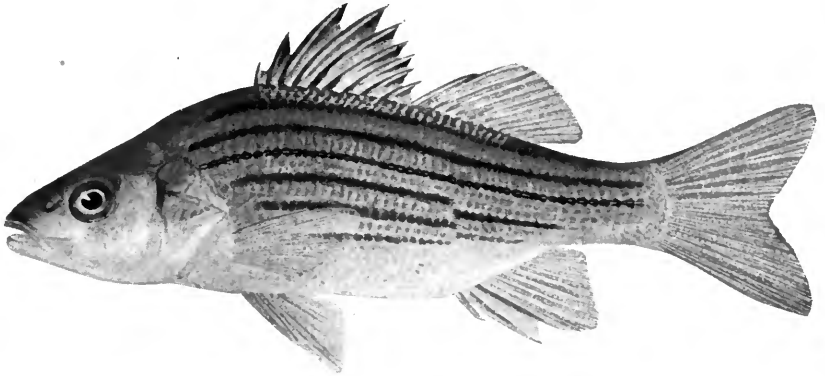


FIG. 76. YELLOW BASS; STRIPED BASS.  
*Morone interrupta* Gill. (After Forbes and Richardson.)

one coincident with it and 3 or 4 below it; stripes below lateral line interrupted on posterior part of the body.

Length 12 to 18 inches.

This fish inhabits the Mississippi Valley.

### Family **Sciaenidae.**

#### THE DRUMS.

Body compressed, more or less elongate; scales thin, usually ctenoid; head scaled; skeleton osseous; lateral line continuous, extending on caudal fin; gill membranes separate, free from the isthmus; premaxillary protractile; anal spines 1 or 2; ventral fins thoracic, its rays 1, 5; air bladder usually large and complicated.

#### Genus **Aplodinotus** Rafinesque.

Body oblong, compressed, the dorsal region elevated; mouth low, its gape horizontal; lower jaw the shorter; no barbels; preopercle slightly serrate; lower pharyngeals very large, fully united, with coarse, blunt, paved teeth; dorsal fins somewhat connected, the spinous dorsal with a scaly sheath at base; anal spines 2, the second very strong; caudal fin doubly truncate; air bladder large, without appendages.



**Aploidinotus grunniens** Rafinesque. CRAOKER; FRESH-WATER DRUM; SHEEPSHEAD; WHITE PERCH.

Head 3.3 to 3.6; depth 2.7 to 3.1; D. VIII or IX—1, 25 to 31; A. II, 7; scales 50 to 56.

Body elongate, compressed, the dorsal region elevated; head subconical, with blunt snout; interorbital space slightly convex, 3.2 to 3.7 in head; snout 3.1 to 3.7; mouth subinferior, the margin of upper lip below the eye; maxillary reaching middle of the eye; lower jaw the shorter; gill rakers stout and shortish; cheeks and opercles scaled; spinous dorsal continuous with soft portion; scales strongly ctenoid; lateral line complete, much arched anteriorly and parallel with dorsal outline.

Color plain silvery gray on sides and back, white on belly; fins plain except for smoky gray on membranes.

Length 2 to 4 feet.

This fish inhabits the larger streams and lakes from the Great Lake Region to Georgia, Texas, and Yucatan.

Lake Michigan, Millers, Indiana; Lake Michigan, Pine, Indiana; Deep River, Liverpool, Indiana.

### Family **Cottidae.**

#### THE SCULPINS.

Body moderately elongate, fusiform; head large, depressed; body without scales, usually with few prickles or scale-like plates; mouth broad; teeth on jaws villiform; premaxillary protractile; gill membranes broadly connected, often joined to the isthmus; dorsal fins 2, slightly connected; ventral fins with one spine and three or four soft rays; pseudo branchiæ present; air bladder usually absent; pyloric cœca 4 to 8; lateral line present.

a. Ventrals with a concealed spine and 4 soft rays. *Cottus*. 335

aa. Ventrals with a concealed spine and 3 soft rays. *Uranidea*, 337

### Genus **Cottus** (Artedi) Linnæus.

#### MILLER'S THUMBS.

Body fusiform, without scales; prickles, when present, not scale-like; head broad; mouth rather large, with villiform teeth on jaws; angle of preopercle with a spine, its tip curved upward; gill mem-

branes broadly connected with the isthmus; ventrals with 1 concealed spine and 4 soft rays; no slit behind fourth gill.

a. Preopercular spine short, its length less than  $\frac{1}{2}$  diameter of eye; caudal peduncle slender, its depth 1.5 to 2 in its length.

*ictalops*, 336

aa. Preopercular spine long, its length more than  $\frac{1}{2}$  diameter of eye; caudal peduncle slender, its length 3.3 in its length.

*ricei*, 336

**Cottus ictalops** (Rafinesque). COMMON SCULPIN; MILLER'S THUMB.

Head 3.0 to 3.5; depth 3.7 to 4.3; D. VIII to IX, 16 to 18; A. 13 to 15.

Body fusiform; head broad, convex above; interorbital space 3.8 to 5.5 in head; mouth wide, lips thick; maxillary reaching to middle of the orbit; snout 2.8 to 3.4 in head; preopercular spine short, its length less than half diameter of the eye; spinous dorsal

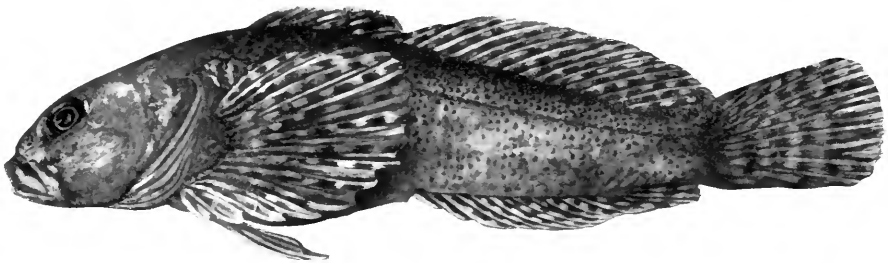


FIG. 77. COMMON SCULPIN; MILLER'S THUMB.  
*Cottus ictalops* (Raf.). (From Forbes and Richardson.)

about  $\frac{3}{8}$  height of soft dorsal; body without scales, a few prickles present behind pectorals; lateral line continuous or interrupted posteriorly.

Color olivaceous, more or less barred or blotched with darker, fins mostly barred or mottled.

Length 3 to 7 inches.

This fish inhabits clear streams from North Dakota to North Carolina and Oklahoma.

Lockport, Illinois; Lake Michigan, Chicago, Illinois.

**Cottus ricei** (Nelson.)

Head 3.2 to 3.6; depth 5.3 to 6.2; D. VII, 16; A. 13.

Body slender; head depressed, as wide as long; interorbital space narrow, 8.2 in head; mouth narrow, the maxillary scarcely reaching

past front of orbit; snout 3.6 in head; preopercular spine long, its length more than half diameter of eye; spinous dorsal about  $\frac{2}{3}$  height of soft dorsal; body without scales, prominent spinules behind pectorals and on top of head; lateral line continuous.

Color brownish olive, sides mottled; faint traces of two dusky bars on caudal peduncle; last membranes of second dorsal dusky.

Length  $2\frac{1}{4}$  inches.

Deep waters of Lake Michigan.

### Genus **Uranidea** DeKay.

Similar to *Cottus*, but with smaller preopercular spines, and ventrals with one concealed spine and 3 soft rays.

#### **Uranidea kumlienii** Hoy.

Head 3.1 to 3.4; depth 5.0 to 5.2; D. VII or VIII, 15 to 17; A. 12.

Body fusiform; head flattish above; interorbital space 7.5 to 8.6; mouth narrow, the maxillary reaching to middle of orbit; snout 3.3 to 3.6 in head; caudal peduncle slender, its depth 2.2 to 2.4 in its length; spinous dorsal  $\frac{3}{4}$  height of soft dorsal; preopercular spine about  $\frac{1}{2}$  diameter of eye; body without scales; prickles under pectoral and on top of head; lateral line present, usually interrupted.

Color brownish olive, faintly mottled; spinous dorsal with a prominent dusky blotch on anterior and posterior, 2 or 3 membranes; soft dorsal dusky toward base; pectorals reticulated with dusky.

Length  $2\frac{1}{2}$  inches.

This species inhabits the deeper waters of Lake Michigan.

## Order **Anacanthini.**

### The COD FISHES.

Skeleton bony; anterior vertebræ simple; fins without spines; ventral fins jugular, below or in front of the pectorals; tail isocercal; pectoral arch suspended from the skull; no mesocoracoid; air bladder without open duct.

Family **Gadidae.**

## THE COD FISHES.

Body more or less elongate, usually not much compressed; dorsal fin long, forming 1, 2, or 3 fins; ventral fins jugular; caudal fin distinct or confluent with the dorsal and anal; gills 4, a slit behind the fourth; mouth large; chin with a barbel; air bladder usually well developed.

Genus **Lota** (Cuvier), Oken

## BURBOTS.

Body long and low, compressed behind, covered with small embedded scales; head depressed; anterior nostrils each with a small barbel; chin with a long barbel; gill openings wide, the membranes free from the isthmus; jaws with broad bands of villiform teeth; dorsal fins 2, the first short, the second long and similar to the anal; caudal fin rounded, vertical fins scaly.

**Lota maculosa** (Le Sueur). BURBOT; LING; EEL-POUT.

Head 4.7 to 5.0; depth 5.8 to 7.6; D. 12 or 13, 70 to 75; A. 65.

Body elongate, compressed posteriorly, the back low; head broad, depressed; interorbital space flat, 3.4 to 3.6 in head; mouth large, its gape horizontal, the maxillary reaching past pupil; chin with a single barbel; dorsal fins 2, the second long, caudal fins rounded slightly separated from dorsal and anal.

Color dark-olive, thickly marbled, and reticulated with blackish, yellowish or dusky beneath; vertical fins with dusky margins.

Length about 2 feet.

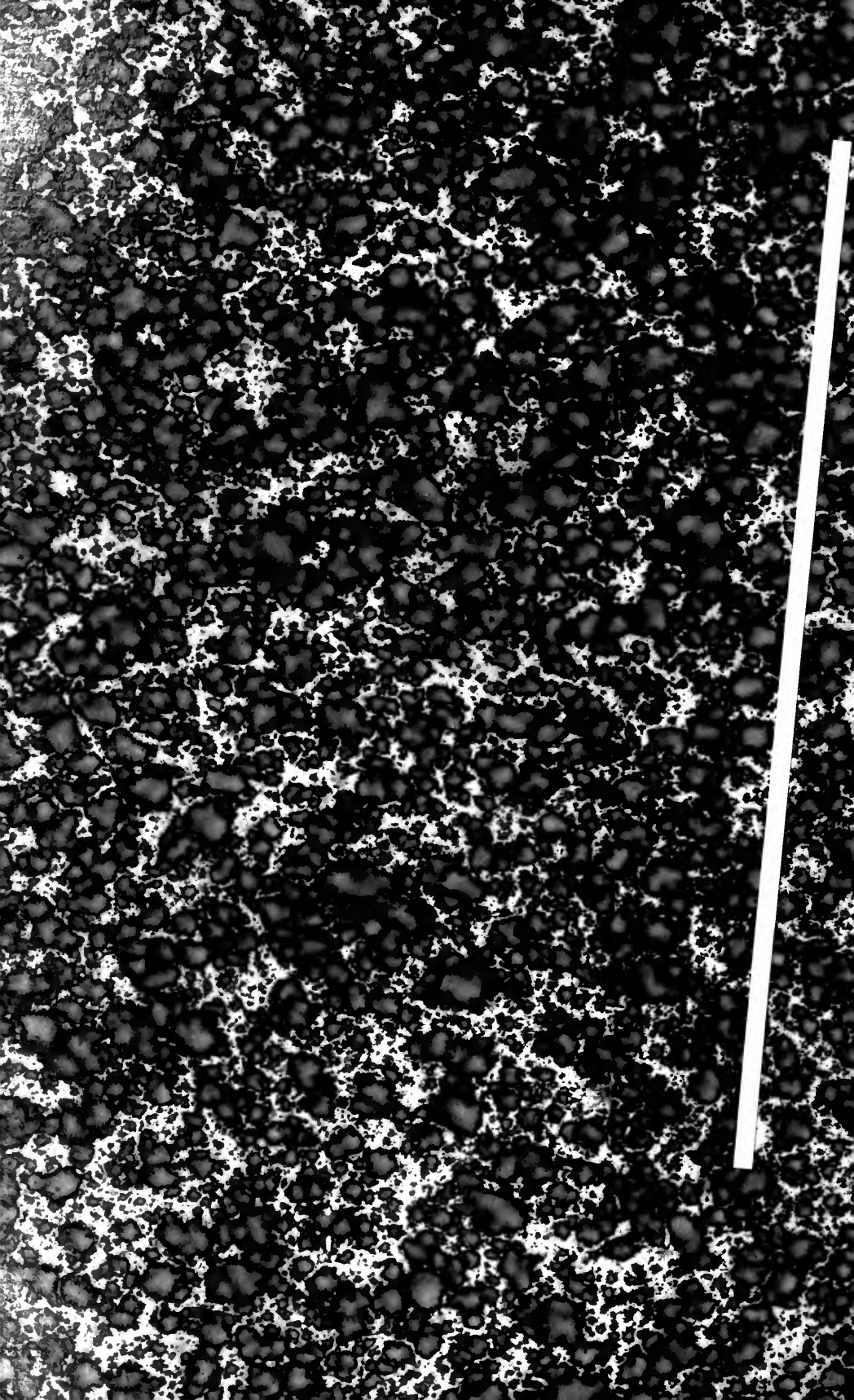
This species ranges from the Arctic Sea south to the Ohio River.

Lake Michigan, Chicago, Illinois; Lake Michigan, Millers, Indiana; Lake Michigan, Pine, Indiana.













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