

Key to Fishes of Wisconsin

By George C. Becker
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Keys to the Fishes of Wisconsin

Structure and Use of the Keys

Taxonomic keys are artificial devices. Species did not evolve from keys; rather, keys are man-made constructions designed to help in the identification of different species or forms.

The keys in this book are dichotomous; that is, the characteristics are grouped in pairs or couplets of contrasting statements. The user of the key chooses the statement which applies to the fish being identified, and then proceeds to the next couplet indicated. As inapplicable statements are progressively eliminated, it will eventually be possible to give the correct species label to the specimen.

The first of the keys that follow is the Key to the Families. Ten species in Wisconsin are the sole representatives of their families in the state. For these fishes, the family name is given, and a reference to the page in the book where the main species account is found. The families for which this occurs are the following: Paddlefishes, Bowfins, Freshwater Eels, Smelts, Mudminnows, Pirate Perches, Trout-perches, Codfishes, Silversides, and Drums. As an example, if the specimen keys out at 12a (PIRATE PERCHES, Aphredoderidae), the user of the key is referred directly to the pirate perch account on page 733 in the main text.

All other families of Wisconsin fishes are represented in the state by more than one species. For fishes in these 16 families, the family name is given, and a reference to a separate key to that family. These keys follow the Key to the Families. For instance, if the fish that is being keyed out is a minnow, the user of the key will be directed at 21a in the Key to the Families to a separate key—Key to the Minnows and Carps (page 107). In this key the 45 known species of Wisconsin minnows and carps are separated out and identified to species, and after careful searching it should be possible to arrive at the common and scientific names for the minnow specimen and the page number for that species

account in the main text. Here additional data are given for shoring up the identification.

The keys which are given here have been profusely illustrated to provide visual clarification for the choices which must be made. These illustrations and the diagrams and definitions of technical terms in the Glossary should be consulted until the language of the keys becomes thoroughly familiar.

In addition, to aid in the identification of specimens, certain tools should be secured and be ready for use if needed. Gross structures can be seen easily, but small structures, particularly those in small minnows or young fish only a few centimeters long, may require the aid of a hand lens or a broadfield scope. Also, a dissecting needle and a sharp-tipped forceps may be helpful in making it possible to view hard-to-see fin rays, barbels, and other near-microscopic structures properly. For stepping off body distances, a divider is useful, and for the examination of internal characteristics, a small pair of scissors will be handy.

For many species of fish the keying process will not be simple. Indeed, the identification of some specimens may prove to be a lengthy, tedious, and frustrating pursuit. For some suckers and minnows, correct identification is akin to solving a difficult puzzle. Solution of the puzzle may lead to a sense of joy and a feeling of accomplishment. If the specimen does not key out properly, however, help can be obtained from the nearest university or from a nearby agency of the Wisconsin Department of Natural Resources. And, there is always the possibility of finding a "first" for the state.

Key to the Families

- 1a. Mouth a sucking disc or hoodlike and without jaws. Pectoral fins absent. One median nostril. Gill openings 7 on each side.
LAMPREYS
 Petromyzontidae..... Page 77

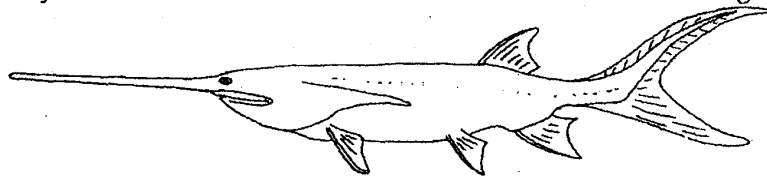


- 1b. Mouth with upper and lower jaws. Pectoral fins present. Two nostrils, 1 on each side. One gill chamber opening on each side of head 2
- 2a. Caudal fin forked with vertebral column turned upward and extending nearly to tip of upper lobe of fin..... 3

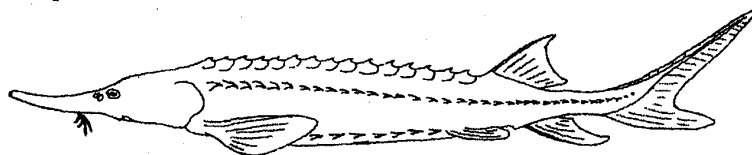


- 2b. Caudal fin unforked, or if forked, vertebral column not extending to upper lobe of fin 4

- 3a. Snout long and paddlelike. Scales absent, except for few on tail. Gill cover long and pointed posteriorly.
PADDLEFISHES
 Polyodontidae..... Page 231

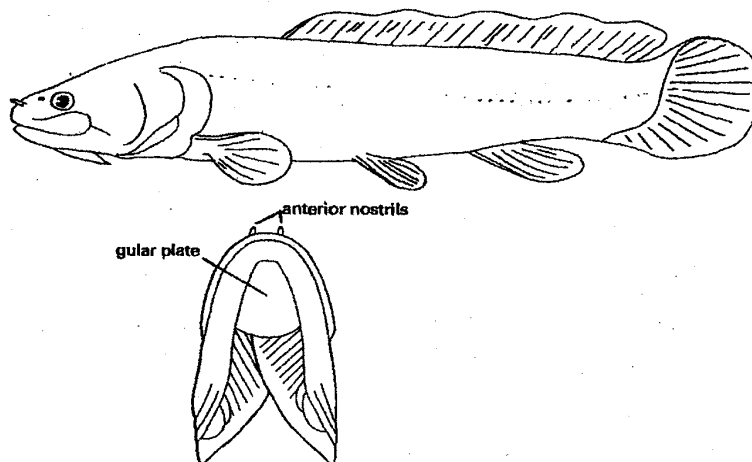


- 3b. Snout relatively short and rounded or shovel-shaped. Body with several rows of bony plates. Gill cover short and rounded.
STURGEONS
 Acipenseridae Page 83

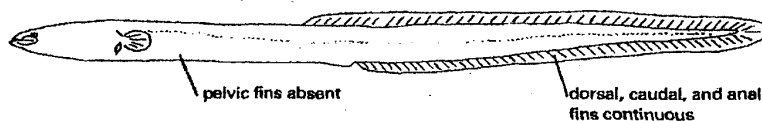


- 4a. Dorsal fin single, extending well over $\frac{1}{2}$ of total length. Anterior nostrils at tips of tubelike extensions. 5
- 4b. Dorsal fin single or double but, if single, extending less than $\frac{1}{2}$ of total length. Anterior nostrils not at tips of tubelike extensions 6

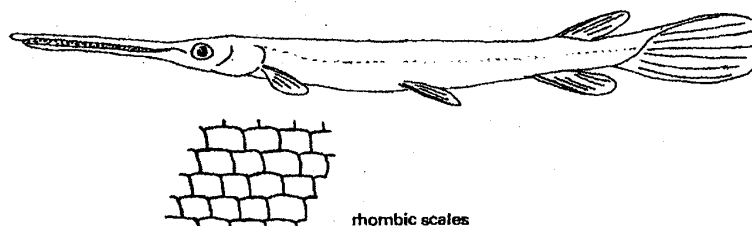
- 5a. Pelvic fins present. Gular plate present. Dorsal, caudal, and anal fins not continuous.
BOWFINS
Amiidae..... Page 249



- 5b. Pelvic fins absent. Gular plate absent. Dorsal, caudal, and anal fins continuous.
FRESHWATER EELS
Anguillidae..... Page 255

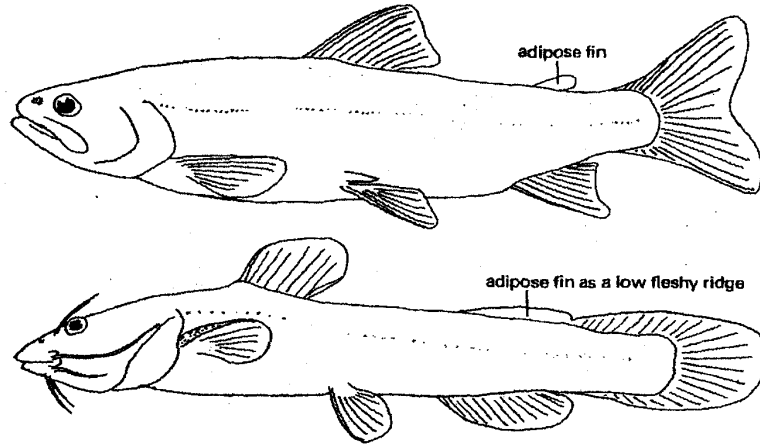


- 6a. Jaws prolonged into narrow, strongly toothed beak. Scales rhombic.
GARS
Lepisosteidae..... Page 85



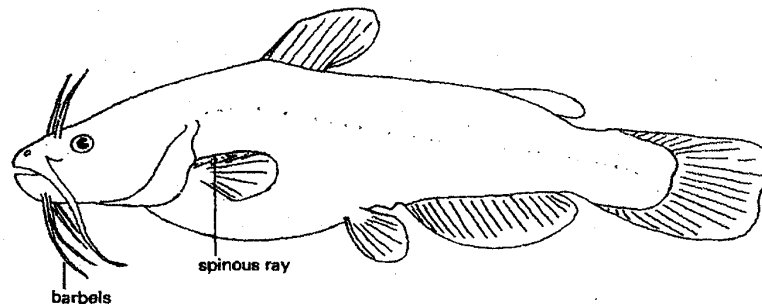
6b. Jaws not prolonged into narrow, strongly toothed beak. Scales, if present, not rhombic..... 7

7a. Adipose fin present, sometimes as a low fleshy ridge joined to caudal fin 8



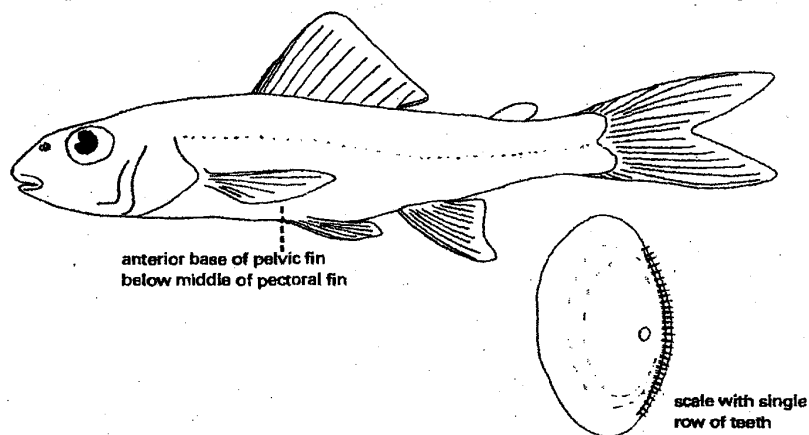
7b. Adipose fin absent..... 11

8a. Barbels present, usually 8. Body naked. Each pectoral fin with a strong spinous ray.
BULLHEAD CATFISHES
Ictaluridae Page 143



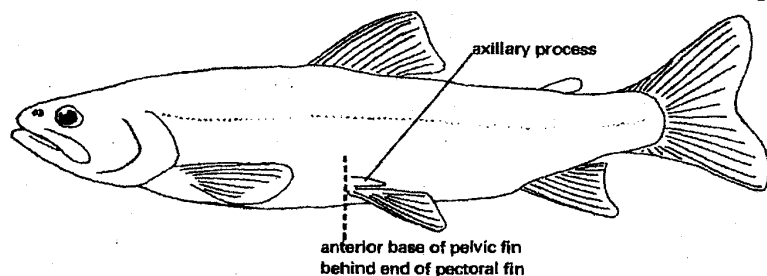
8b. Barbels absent. Body scaled. Pectoral fins entirely soft-rayed 9

- 9a. Scales with single row of teeth along posterior edge (ctenoid). Anterior base (origin) of pelvic fin below middle of pectoral fin.
TROUT-PERCHES
 Percopsidae Page 739

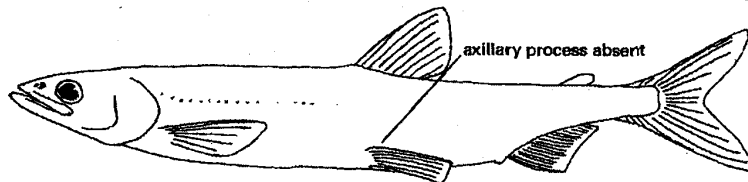


- 9b. Scales without teeth along posterior edge (cycloid). Anterior base (origin) of pelvic fin behind end of pectoral fin..... 10

- 10a. Pelvic axillary process present.
TROUTS
 Salmonidae Page 89



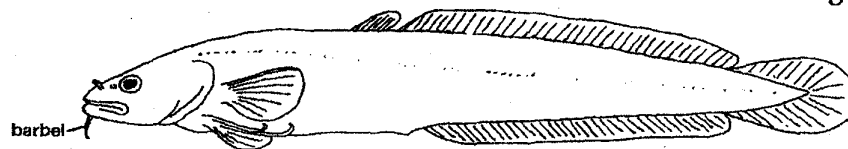
- 10b. Pelvic axillary process absent.
SMELTS
 Osmeridae Page 377



- 11a. One medial barbel under tip of chin.

CODFISHES

Gadidae Page 745

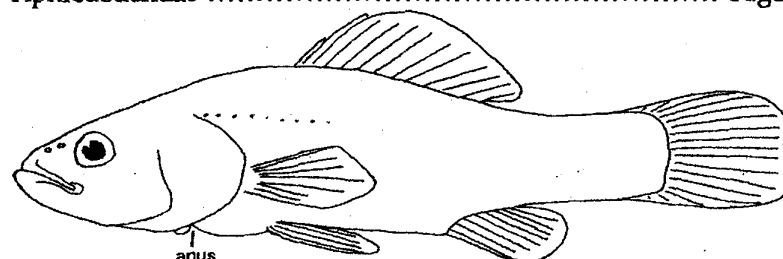


- 11b. Medial barbel on chin absent 12

- 12a. Anus far in front of anal fin, ahead of pelvic fins, except in young, where positioned at lesser distances in front of anal fin.

PIRATE PERCHES

Aphredoderidae Page 733

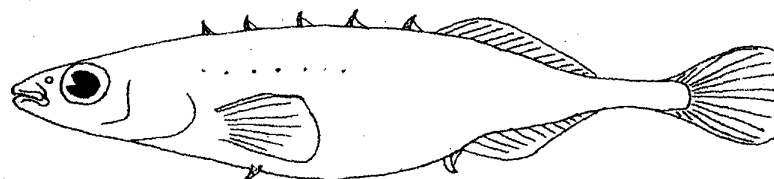


- 12b. Anus just in front of anal fin 13

- 13a. Four to 11 dorsal spines not connected to one another by membrane.

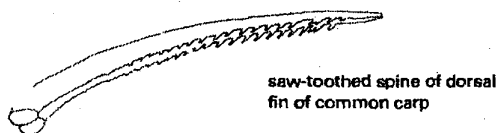
STICKLEBACKS

Gasterosteidae Page 149



- 13b. Dorsal spines, when present, connected to one another by membrane. 14

- 14a. Dorsal fin single, without spines or with 1 stout sawtoothed spine ... 15



saw-toothed spine of dorsal fin of common carp

- 14b. Dorsal fin divided into 2 distinct parts, or single and with 4 or more spines 22

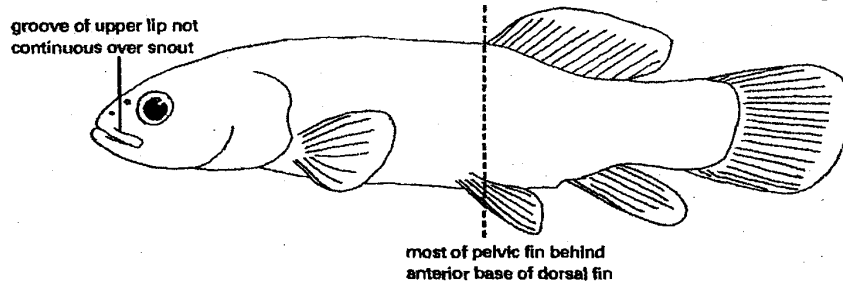
15a. Caudal fin rounded 16

15b. Caudal fin forked 17

16a. Most of length of pelvic fin behind anterior base (origin) of dorsal fin.
Groove of upper lip not continuous over snout.

MUDMINNOWS

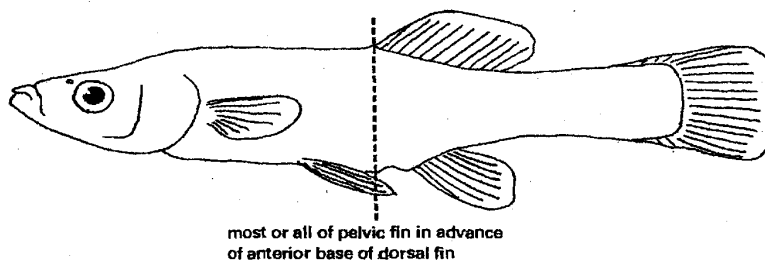
Umbridae..... Page 385



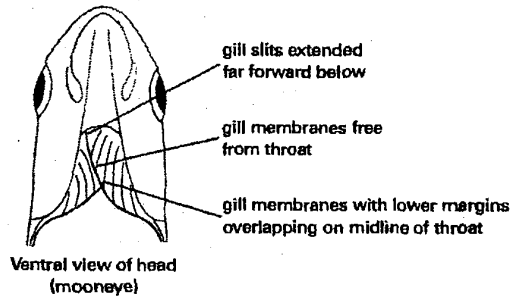
16b. Most or all of length of pelvic fin lying in advance of anterior base (origin) of dorsal fin. Groove of upper lip continuous over snout.

KILLIFISHES

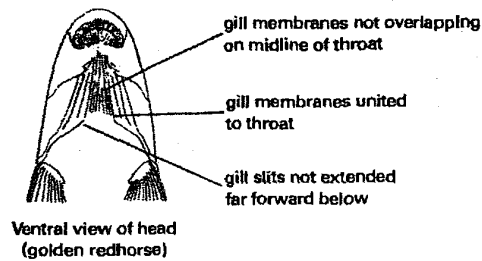
Cyprinodontidae..... Page 148



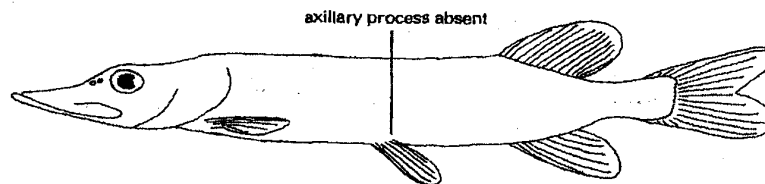
- 17a. Gill slits extended far forward below. Gill membranes free from throat with lower (anterior) margins overlapping on midline of throat 18



- 17b. Gill slits not extended far forward below. Gill membranes united to throat either narrowly or broadly with lower (anterior) margins not overlapping on midline of throat 20

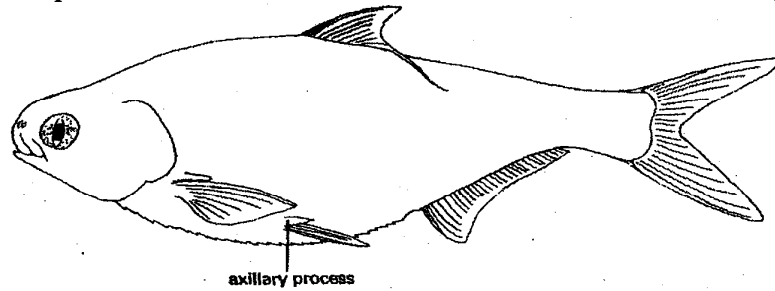


- 18a. Snout strongly flattened dorsoventrally (shaped like a duck's bill). Scales present on side of head. Pelvic axillary process absent.
PIKES
Esocidae Page 105

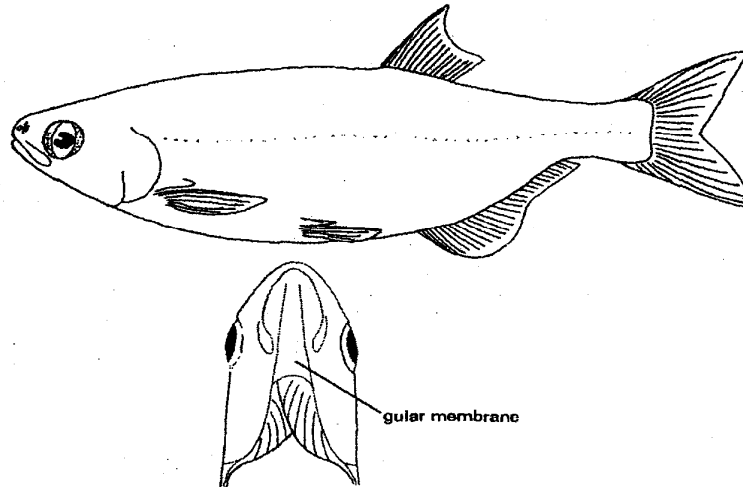


- 18b. Snout oval to rounded in cross section (not shaped like a duck's bill). Scales absent on side of head. Pelvic axillary process present 19

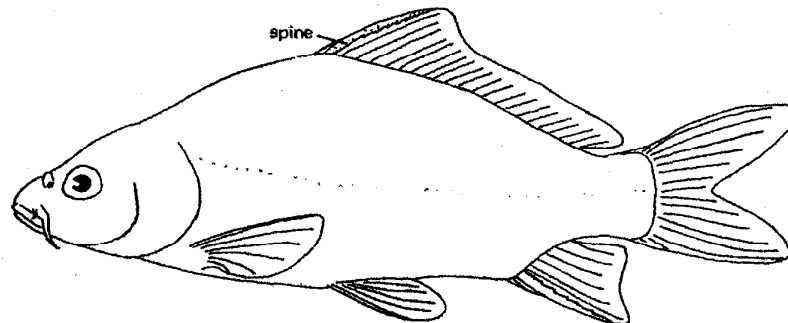
- 19a. Midline of belly with strong spiny scales forming a sawlike keel. Lateral line absent. Gular membrane absent.
HERRINGS
 Clupeidae..... Page 86



- 19b. Midline of belly without strong spiny scales. Lateral line present—at least in part. Gular membrane present.
MOONEYES
 Hiodontidae..... Page 88



- 20a. Dorsal fin with 1 stout spine doubly saw-toothed posteriorly (see illustration under 14a).
COMMON CARP and GOLDFISH
 Cyprinidae, in part..... Page 107

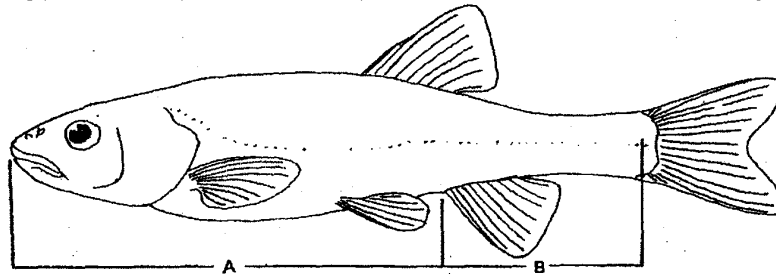


20b. One dorsal fin without spines 21

21a. Dorsal fin with 8 or 9 principal rays. Mouth not fitted for sucking. Anal fin placed forward; distance from front of anal fin to base of caudal fin (hypural notch) (B) contained less than 2.5 in distance from front of anal fin to tip of snout (A).

MINNOWS

Cyprinidae, in part Page 107

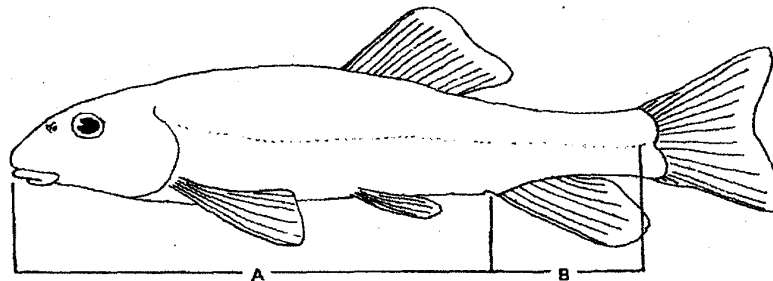


$\frac{B}{A}$ equals less than 2.5

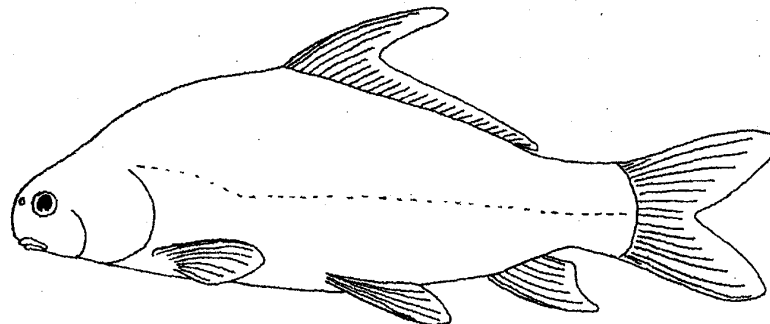
21b. Dorsal fin with 10 or more principal rays, or, if only 9, then lateral line absent or reduced to a few pores. Mouth generally inferior and fitted for sucking. Anal fin placed posteriorly; distance from front of anal fin to base of caudal fin (hypural notch) (B) contained more than 2.5 in distance from front of anal fin to tip of snout (A).

SUCKERS

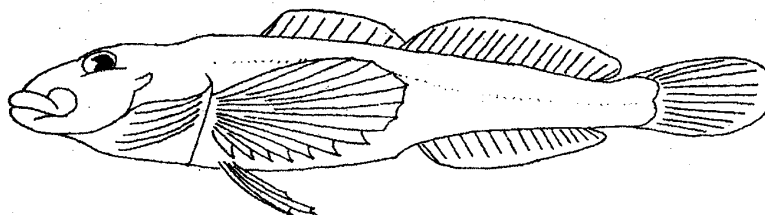
Catostomidae Page 130



$\frac{B}{A}$ equals more than 2.5

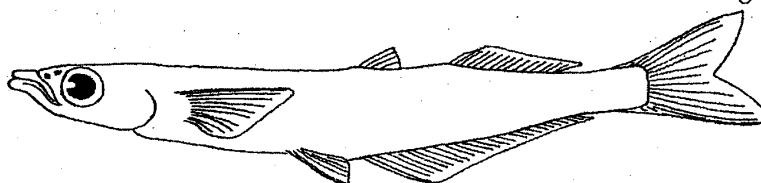


- 22a. Body scaleless, or with prickles only. Pelvic fin with 3 or 4 soft rays.
Anal fin spines absent.
SCULPINS
Cottidae..... Page 168



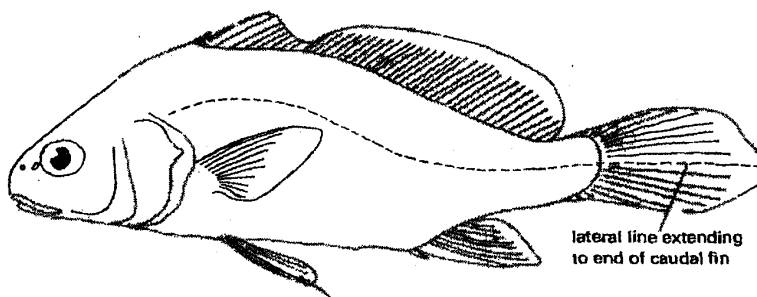
- 22b. Body scaled. Pelvic fin with 5 soft rays. Anal fin spines present, 1 or more..... 23

- 23a. Pelvic fin far back with anterior base below or behind end of pectoral fin. Mouthparts elevated and beaklike; mouth opening dorsally well above midline. Anal fin soft rays 20 or more.
SILVERSIDES
Atherinidae..... Page 767



- 23b. Pelvic fin far forward with anterior base below middle or anterior half of pectoral fin. Mouthparts neither elevated nor beaklike; mouth opening at or below midline. Anal fin soft rays 18 or fewer..... 24

- 24a. Caudal fin bluntly pointed, central rays moderately elongated. Dorsal fin soft rays 24 or more. Lateral line extending to end of caudal fin.
DRUMS
Sciaenidae Page 955

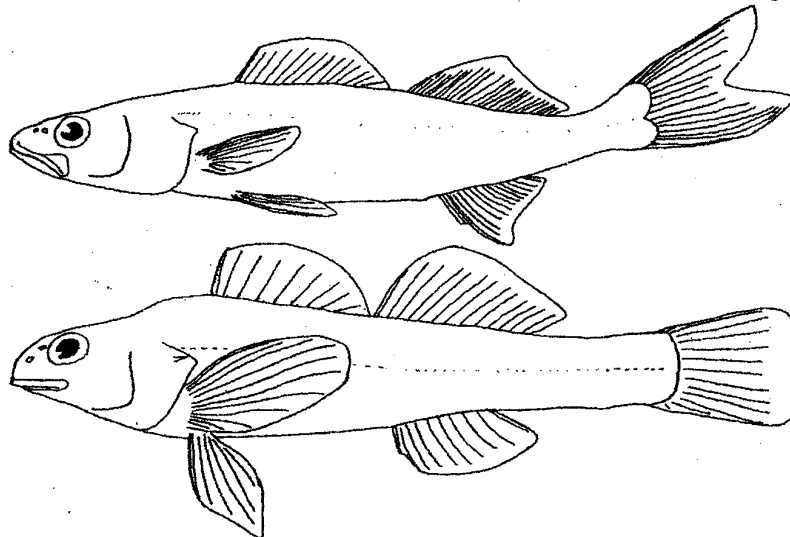


- 24b. Caudal fin forked, square, or rounded. Dorsal fin soft rays 21 or fewer. Lateral line scarcely or not extending onto caudal fin..... 25

25a. Anal fin spines 1 or 2.

PERCHES

Percidae..... Page 158

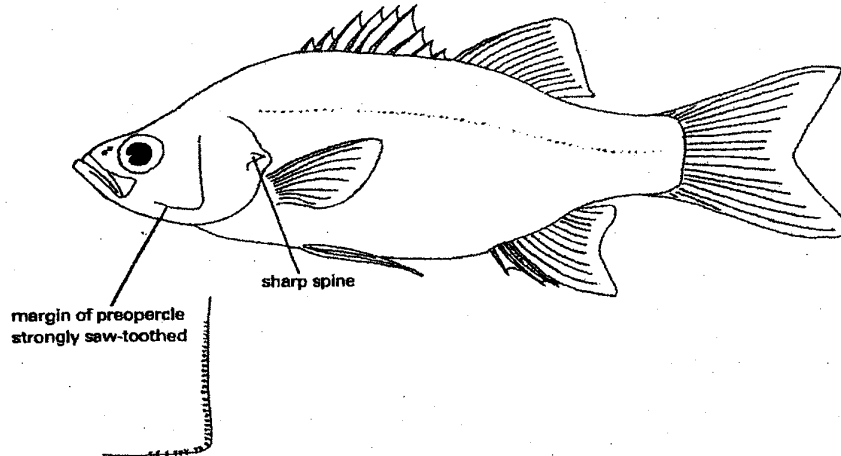


25b. Anal fin spines 3 or more..... 26

- 26a. Spinous dorsal fin and soft dorsal fin separate or only slightly connected. One sharp spine near back of gill cover. Margin of preopercle strongly saw-toothed.

TEMPERATE BASSES

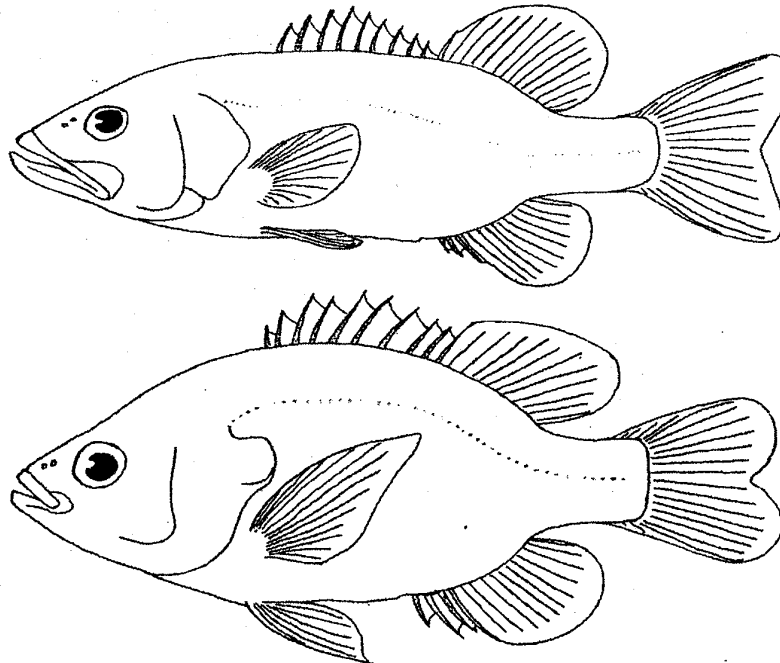
Percichthyidae Page 150



- 26b. Spinous dorsal fin and soft dorsal fin well connected with, at most, a deep notch between them. No sharp spine near back of gill cover. Margin of preopercle usually smooth; weakly saw-toothed in a few species.

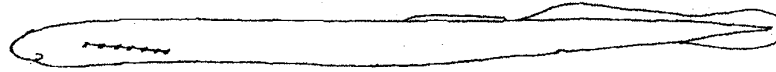
SUNFISHES

Centrarchidae Page 151

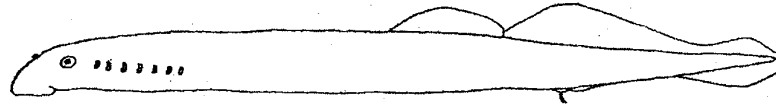


Key to the Lampreys

- 1a. Two distinct dorsal fins either close together or well separated. Trunk myomeres 65 or more..... 2

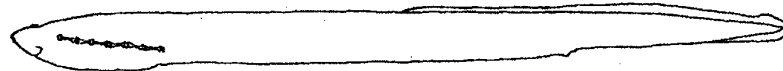


Ammocoete with 2 dorsal fins

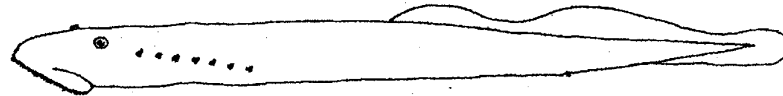


Adult with 2 dorsal fins

- 1b. One continuous dorsal fin sometimes shallowly notched. Trunk myomeres 62 or fewer 5

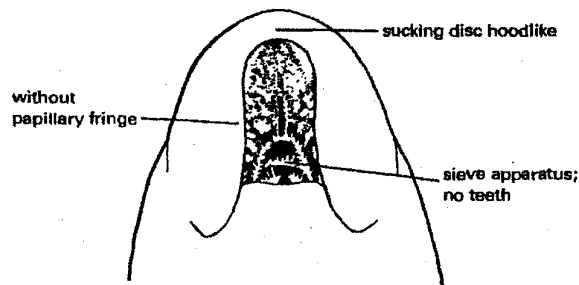


Ammocoete over 40 mm (1.5 in) TL with 1 dorsal fin

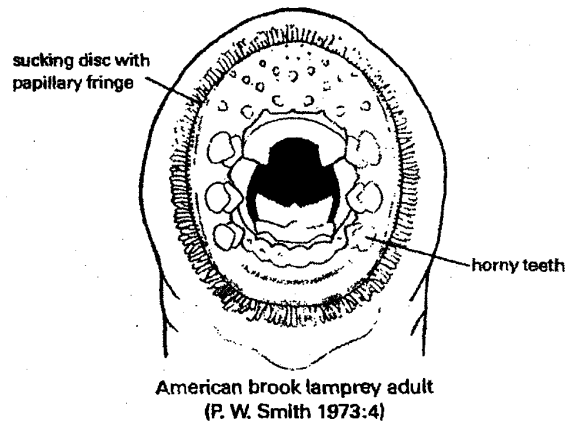


Adult with 1 dorsal fin

- 2a. Sucking disc hoodlike, without papillary fringe. Complexly branched papillae (sieve apparatus) filling mouth opening. No teeth. Eyes rudimentary. Ammocoete..... 3

American brook lamprey ammocoete
(P. W. Smith 1973:4)

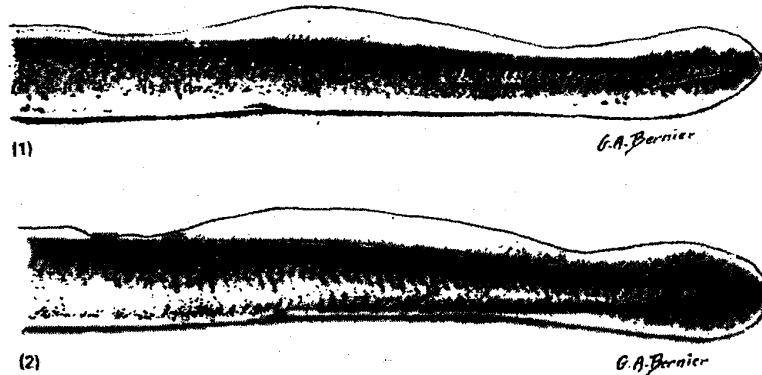
- 2b. Sucking disc round or oval with papillary fringe. No sieve apparatus within mouth opening. Horny teeth present. Eyes functional.
Adult..... 4



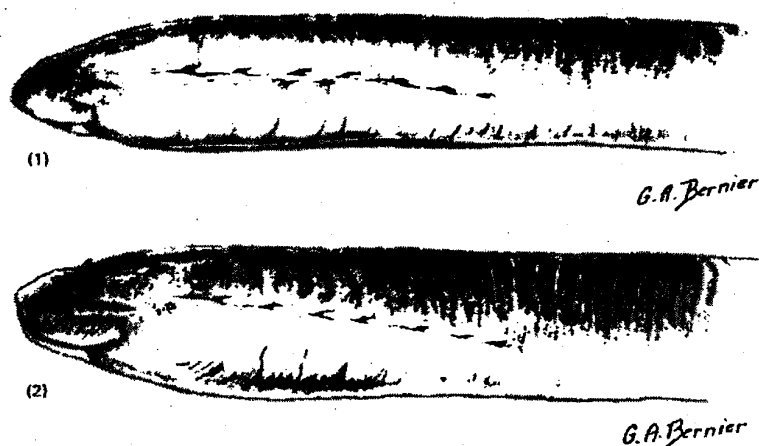
- 3a. Caudal fin spade-shaped (bluntly pointed), with pigmentation concentrated on and near notochord only. Lower edge of caudal peduncle unpigmented. Lower half of upper lip unpigmented. Suborbital area completely unpigmented. Unpigmented band above branchial groove equal to about 2 widths of branchial myomere. Precursor of tongue darkly pigmented, swollen at base.

AMERICAN BROOK LAMPREY (ammocoete)

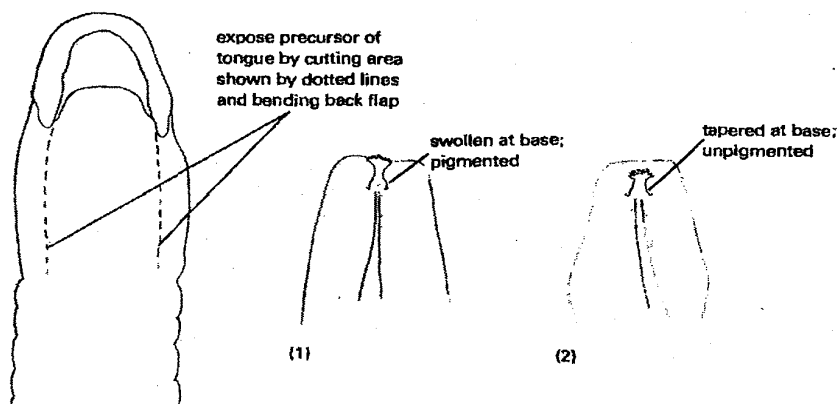
Lampetra appendix (DeKay)..... Page 216



Tail region of (1) American brook lamprey ammocoete, and (2) sea lamprey ammocoete. Note in (2) beaver-tail shape of pigment on tail and well-pigmented lower edge of caudal peduncle.
(Vladykov 1950:84)



Head region of (1) American brook lamprey ammocoete, and (2) sea lamprey ammocoete. Note in (1) absence of pigment on upper lip and suborbital and branchial regions. (Vladykov 1950:82)



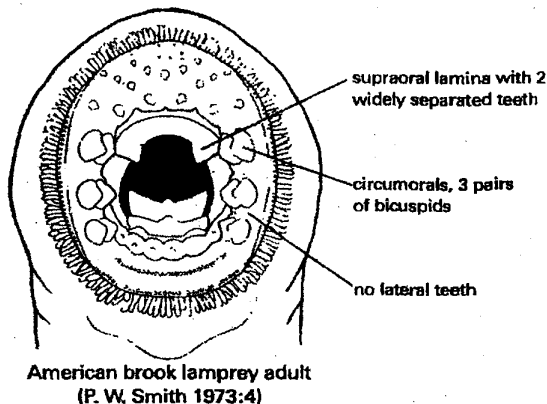
Precursor of tongue in (1) American brook lamprey ammocoete, and (2) sea lamprey ammocoete.

- 3b. Caudal fin typically rounded, with pigmentation from notochord toward extremity of caudal rays. Lower edge of caudal peduncle well pigmented. Lower half of upper lip pigmented nearly to lower edge. Suborbital area well pigmented. Unpigmented band above branchial groove less than width of single branchial myomere. Precursor of tongue unpigmented, tapered at base.

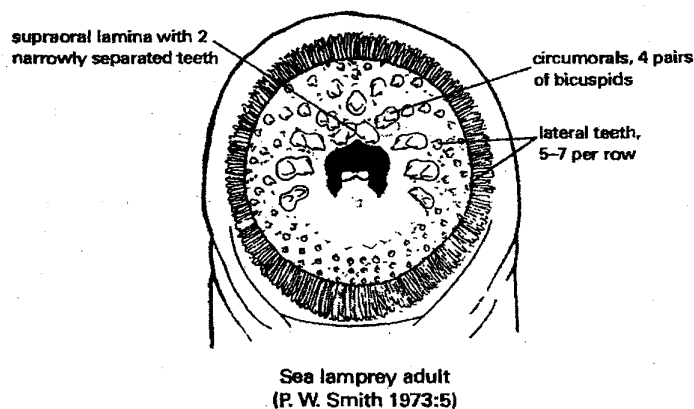
SEA LAMPREY (ammocoete)

Petromyzon marinus Linnaeus..... Page 211

- 4a. Supraoral lamina of sucking disc with 2 widely separated teeth; 3 pairs of bicuspid circumoral teeth, no lateral teeth beyond these.
AMERICAN BROOK LAMPREY (adult)
Lampetra appendix (DeKay)..... Page 216

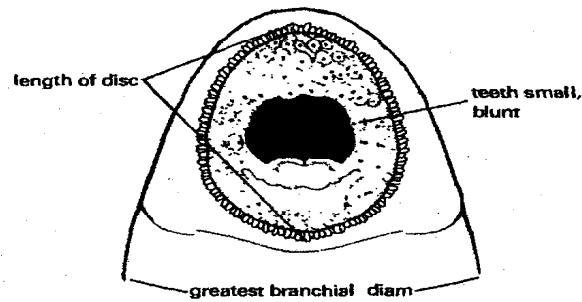


- 4b. Supraoral lamina of sucking disc with 2 narrowly separated teeth; 4 pairs of bicuspid circumoral teeth, 5-7 lateral teeth per radiating row.
SEA LAMPREY (adult)
Petromyzon marinus Linnaeus..... Page 211



- 5a. Sucking disc hoodlike, without papillary fringe. Complexly branched papillae (sieve apparatus) filling mouth opening. No teeth. Eyes rudimentary (see illustration under 2a).
Ichthyomyzon ammocoete. (Separation of the larval lampreys of this genus is not possible at this time.)
- 5b. Sucking disc round or oval with papillary fringe. No sieve apparatus within mouth opening. Horny teeth present. Eyes functional.
Ichthyomyzon adult 6

- 6a. Length of sucking disc into TL greater than 20. Disc small, greatest branchial diam into length of disc 0.4–0.9. Teeth degenerate—small, blunt.
 NORTHERN BROOK LAMPREY
Ichthyomyzon fossor Reighard and Cummins Page 204



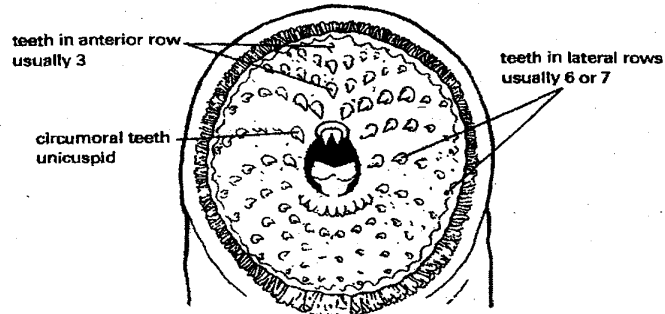
Northern brook lamprey adult
 (P. W. Smith 1973:5)

- 6b. Length of sucking disc into TL less than 20. Disc large, greatest branchial diam into length of disc 1.0–1.8. Teeth functional—large, sharply pointed..... 7

- 7a. Circumoral teeth (with rare exceptions) all unicuspid; teeth in anterior row 3 (2-4); teeth in lateral rows 6 or 7 (4-8). Length of sucking disc into TL 11.1 (8.2-14.8). Trunk myomeres 51 (46-53).

SILVER LAMPREY

Ichthyomyzon unicuspis Hubbs and Trautman Page 201

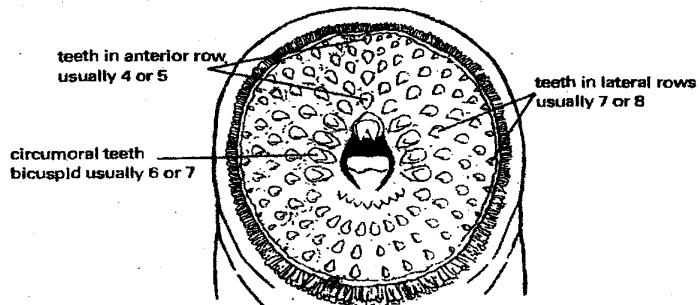


Silver lamprey adult
(P. W. Smith 1973:6)

- 7b. Circumoral bicuspid teeth 6 or 7 (3-8); teeth in anterior row 4 or 5 (3-6); teeth in lateral rows 7 or 8 (6-10). Length of sucking disc into TL 12.3 (10.3-16.2). Trunk myomeres 53 (51-56).

CHESTNUT LAMPREY

Ichthyomyzon castaneus Girard Page 208



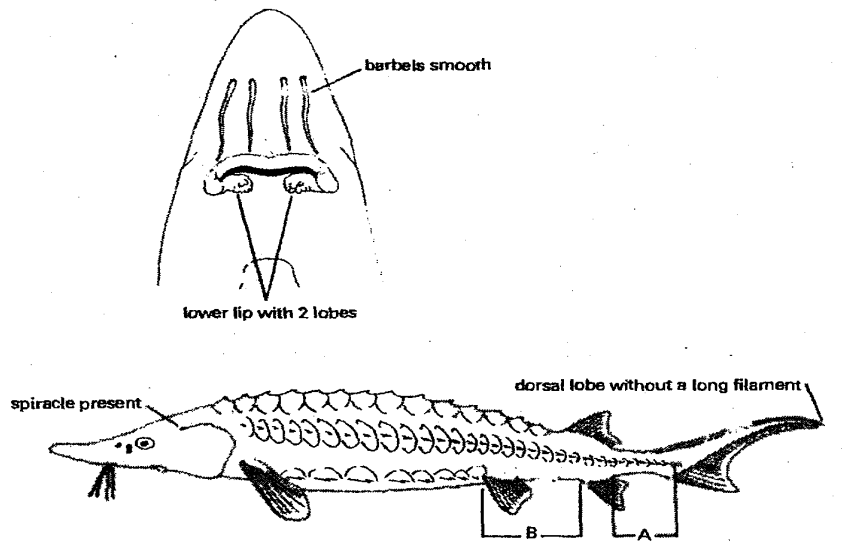
Chestnut lamprey adult
(P. W. Smith 1973:6)

Key to the Sturgeons

- 1a. Barbels smooth. Lower lip with 2 posterior lobes weakly to strongly papillose. Spiracle present at anterior end of the groove continuous with gill slit. Caudal peduncle partly naked; length of caudal peduncle (A) less than distance from origin of anal fin to insertion of pelvic fins (B). Dorsal lobe of caudal fin without a long filament.

LAKE STURGEON

Acipenser fulvescens Rafinesque..... Page 221

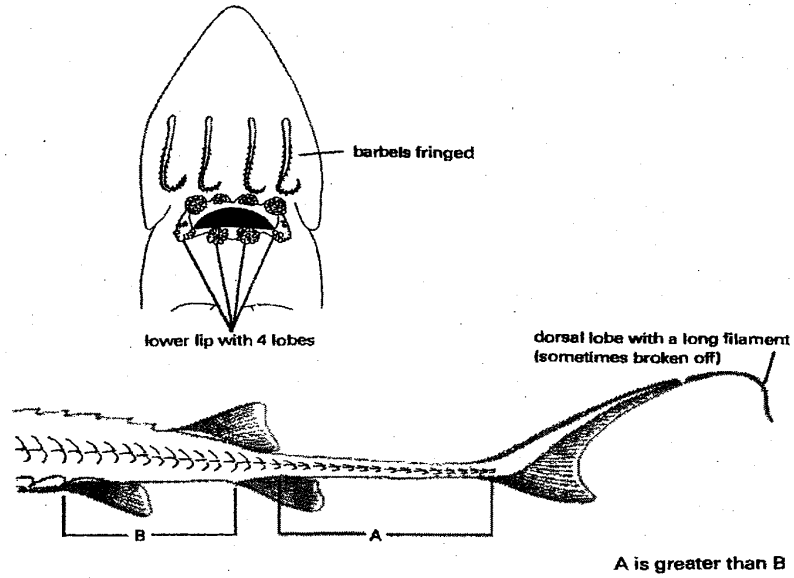


A is less than B

- 1b. Barbels fringed. Lower lip with 4 posterior lobes strongly papillose. Spiracle absent. Caudal peduncle covered with bony plates; length of caudal peduncle (A) greater than distance from origin of anal fin to insertion of pelvic fins (B). Dorsal lobe of caudal fin with a long filament (sometimes broken off).

SHOVELNOSE STURGEON

Scaphirhynchus platyrhynchus (Rafinesque) Page 227

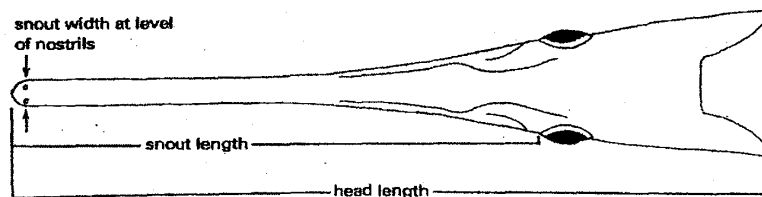


Key to the Gars

- 1a. Snout width at level of nostrils into snout length 15.6 (13.4–16.5); snout length into TL 4.7 (4.3–5.4). Head length into TL 3.3 (3.0–3.6).

LONGNOSE GAR

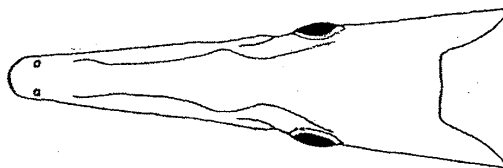
Lepisosteus osseus (Linnaeus)..... Page 244



- 1b. Snout width at level of nostrils into snout length 6.8 (5.3–10.5); snout length into TL 7.1 (6.0–7.9). Head length into TL 4.1 (3.8–4.4).

SHORTNOSE GAR

Lepisosteus platostomus Rafinesque Page 241

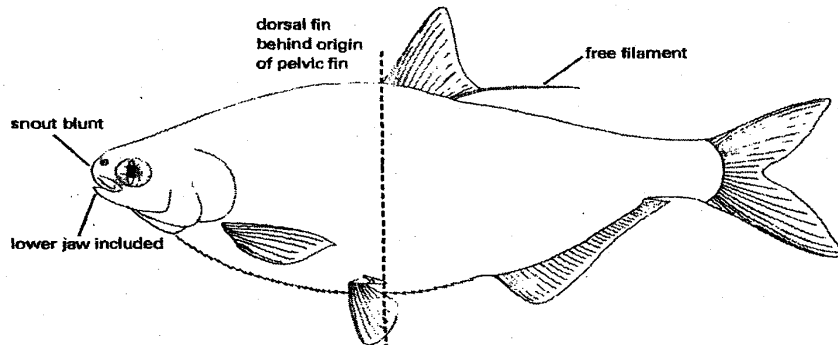


Key to the Herrings

- 1a. Snout blunt. Lower jaw included within upper jaw; mouth opening terminal or inferior. Last dorsal fin ray extending as a free filament, much longer than adjacent rays. Dorsal fin is behind origin of pelvic fin. Anal fin rays more than 20.

GIZZARD SHAD

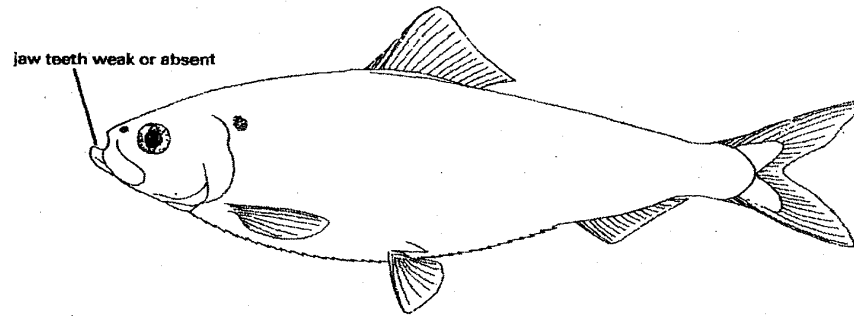
Dorosoma cepedianum (Lesueur)..... Page 273



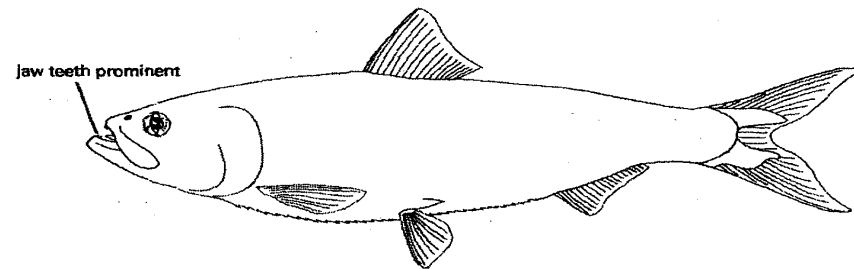
- 1b. Snout pointed. Lower jaw extends beyond upper jaw; mouth opening superior. Last dorsal fin ray about equal in length to adjacent rays. Dorsal fin is directly over or slightly in advance of pelvic fin. Anal fin rays fewer than 20

2

- 2a. Gill rakers on lower limb of first gill arch 41–44. Lateral series scales 42–50. Jaw teeth small, weak, and few; teeth on tongue absent.
(Great Lakes drainage)
ALEWIFE
Alosa pseudoharengus (Wilson) Page 265



- 2b. Gill rakers on lower limb of first gill arch 20–30. Lateral series scales 53–60. Jaw teeth prominent; teeth on tongue in 2–4 rows.
(Mississippi River drainage—extirpated in Wisconsin)
SKIPJACK HERRING
Alosa chrysochloris (Rafinesque) Page 270

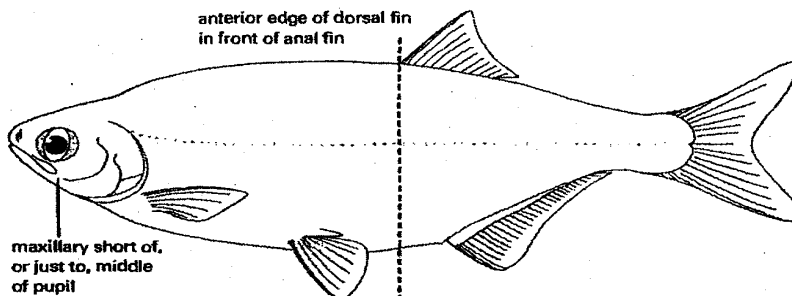


Key to the Mooneyes

- 1a. Anterior edge of dorsal fin in front of anal fin. Dorsal fin with 11 or 12 rays; its base about $\frac{1}{2}$ anal fin base. Fleshy midventral keel from base of pelvic fin to vent. Maxillary short of, or just to, middle of pupil. Iris of eye silvery.

MOONEYE

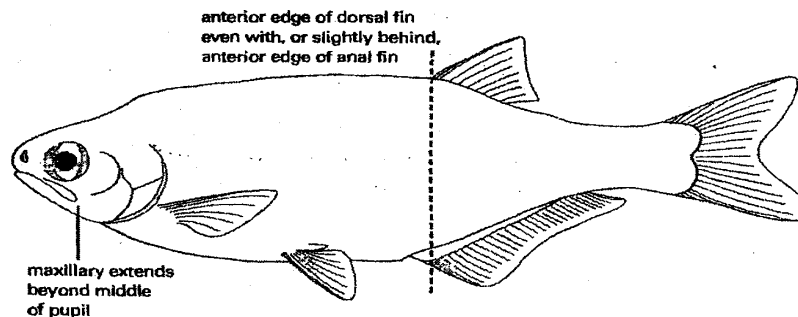
Hiodon tergisus Lesueur Page 284



- 1b. Anterior edge of dorsal fin even with or slightly behind anterior edge of anal fin. Dorsal fin with 9 or 10 rays; its base about $\frac{1}{3}$ anal fin base. Fleshy midventral keel from isthmus to vent. Maxillary extends beyond middle of pupil. Iris of eye yellow.

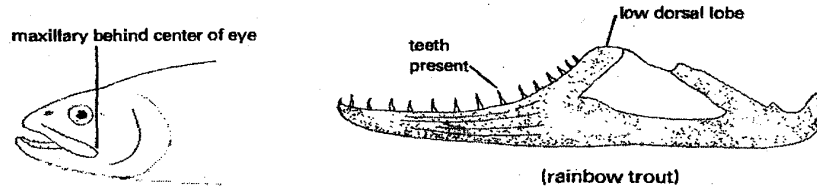
GOLDEYE

Hiodon alosoides (Rafinesque) Page 281



Key to the Subfamilies of the Trouts

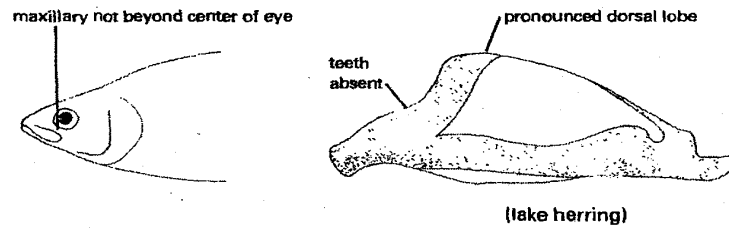
- 1a. Mouth large; maxillary extends behind center of eye. Lower jaw (dentary) with a low dorsal lobe. Teeth on lateral parts of upper and on lower jaws. Scales in lateral line more than 100.
TROUTS and SALMONS
 Salmoninae Page 90



(rainbow trout)

Head and dentary of Salmoninae

- 1b. Mouth small; maxillary does not extend beyond center of eye. Lower jaw (dentary) with a pronounced (often sail-like) dorsal lobe. Absence of teeth on lateral parts of upper and on lower jaws. Scales in lateral line fewer than 100.
WHITEFISH and CISCOES
 Coregoninae Page 98



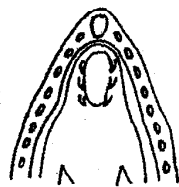
(lake herring)

Head and dentary of Coregoninae

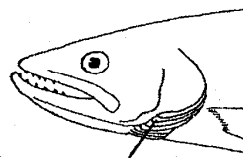
Key to the Trouts and Salmons (Salmoninae)

(See page 96 for young up to 125 mm)

- 1a. Mouth whitish in adults. Anal fin rays 8–12 (15). Branchiostegals usually 10–12 2

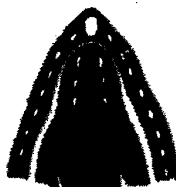


lower mouth whitish

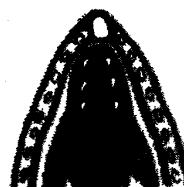


branchiostegals

- 1b. Mouth blackish in adults. Anal fin rays 13–19 (12). Branchiostegals usually 12–19.
Oncorhynchus spp. 7



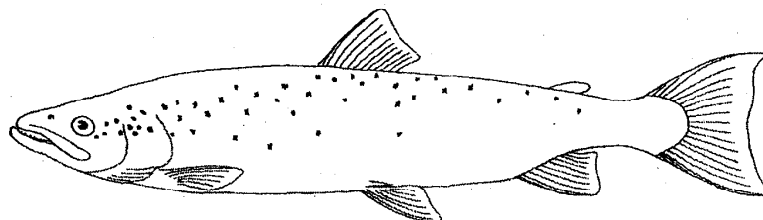
(chinook salmon)



(coho salmon)

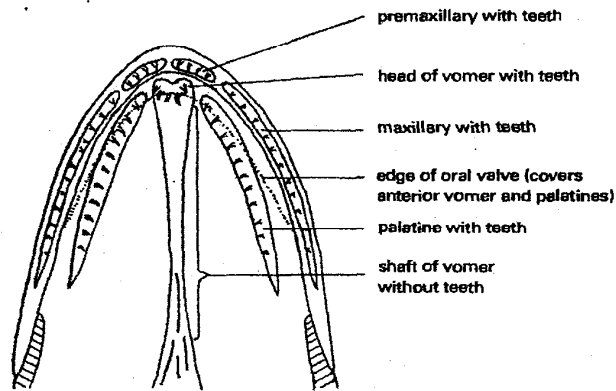
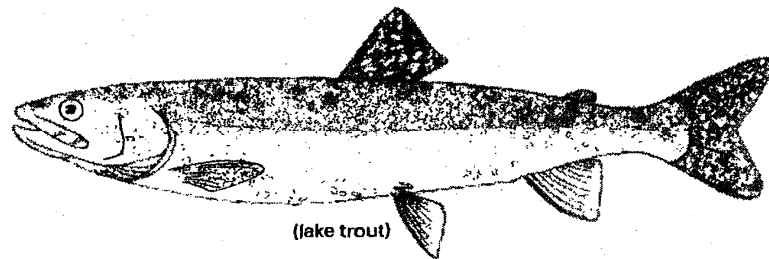
lower mouth blackish

- 2a. Body with black or brown spots on light background (spots sparse in *Salmo salar*). Scales in lateral series fewer than 160. Teeth on head and shaft of vomer (often concealed by oral valve; see illustration under 2b).
Salmo spp. 3



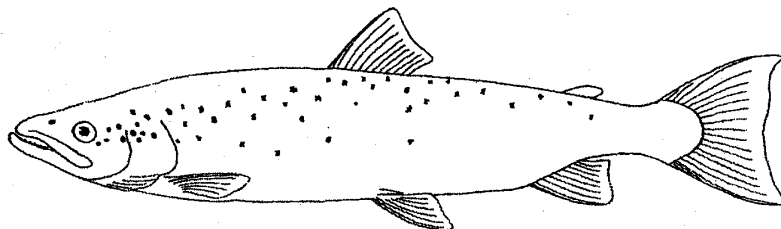
(Atlantic salmon)

- 2b. Body with light spots (occasionally red) on dark background. Scales in lateral series more than 160. Teeth on head of vomer only.
Salvelinus spp. 5



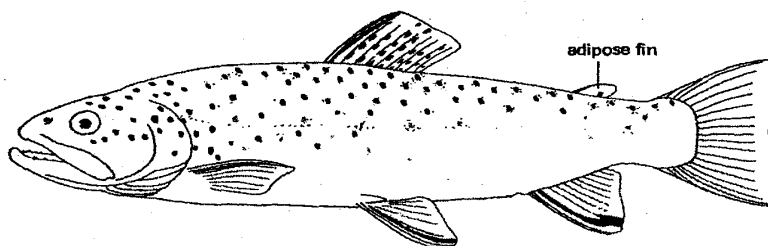
Dentition in roof of mouth
 (brook trout)

- 3a. Vomerine teeth little developed, those on the shaft of the bone few and deciduous. Anal fin rays 9. Adults with X-shaped spots on side.
ATLANTIC SALMON*
Salmo salar Linnaeus Page 290



- 3b. Vomerine teeth well developed, those on the shaft of the bone numerous, persistent, and arranged in 1 zigzag or 2 alternating rows. Anal fin rays usually 10-13. Side usually with round spots. 4

- 4a. Black (or brown) spots large and diffuse, scarcely developed on caudal fin; reddish spots more or less strongly developed (often surrounded by a light border). Adipose fin orange or red-orange, without dark margin or spots. No pink to rose stripe along side of body.
BROWN TROUT
Salmo trutta Linnaeus Page 291



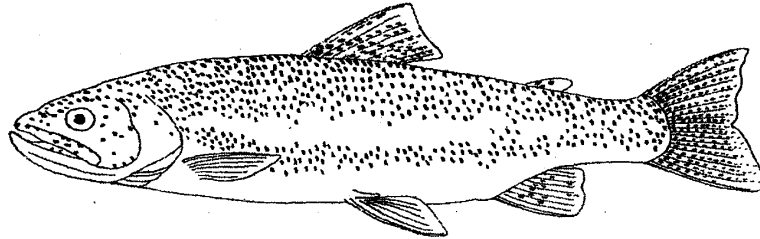
*The Atlantic salmon in spawning habit and the brown trout are confusing. Additional characters for separation are:

	Branchiostegal rays	Dorsal fin rays	Red-orange on adipose fin	Lateral line scales
Atlantic salmon	usually 11 or 12	11 or 12	none	109-121
Brown trout	usually 10	9-11	on margin	120-130

- 4b. Black (or brown) spots small and sharp, well developed on caudal fin; red spots totally absent. Adipose fin olive, with black margin or spots. Broad pink to rose stripe present along side of body.

RAINBOW TROUT

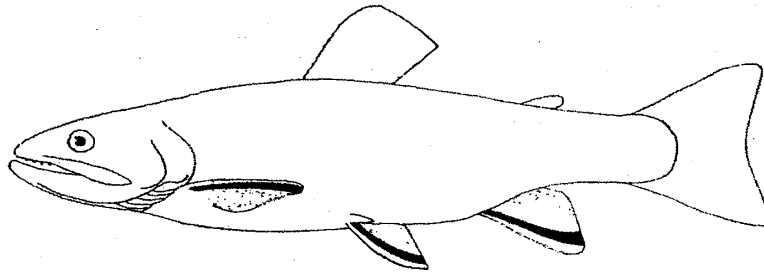
Salmo gairdneri Richardson Page 298



- 5a. Caudal fin little forked. Body red spotted in life. Lower fins each with black stripe near leading edge. Gill rakers 9-12. Mandibular pores usually 7 or 8 on each side.

BROOK TROUT

Salvelinus fontinalis (Mitchill) Page 316



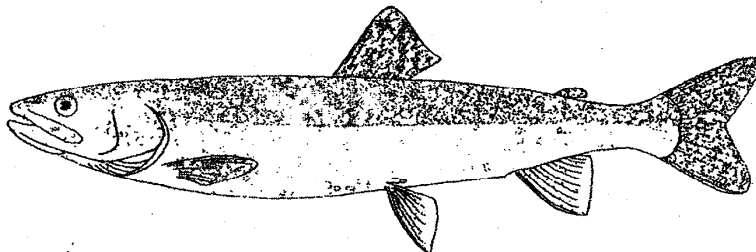
lower fins red with leading edge white followed by black stripe

- 5b. Caudal fin strongly forked. Body not red spotted in life. Lower fins without black stripe. Gill rakers 12-14. Mandibular pores usually 9 or 10 on each side 6

- 6a. Body depth into TL 3.8–5.5. Top of head describing a more-or-less straight line from back of head to tip of snout.

LAKE TROUT

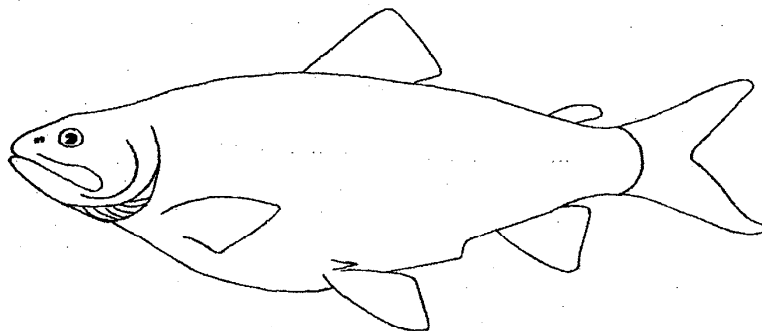
Salvelinus n. namaycush (Walbaum)..... Page 323



- 6b. Body depth into TL 3.1–3.8. Top of head a bent line above eye and a shortened snout.

SISCOWET

Salvelinus namaycush siscowet (Agassiz)* Page 330

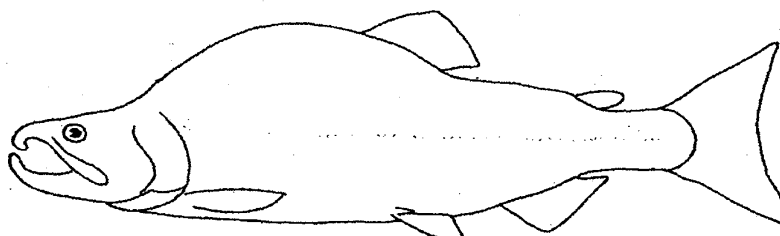
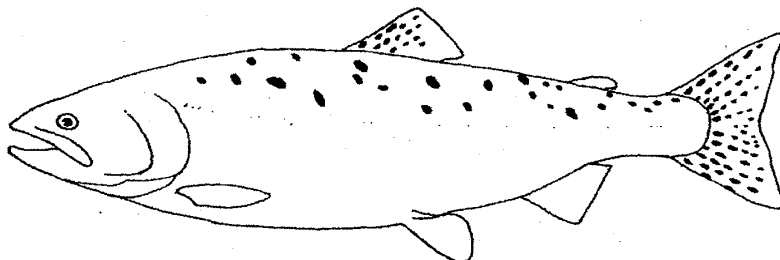


*Hubbs and Lagler (1964).

- 7a. Scales in lateral line 147–205. Large black spots on back and both lobes of caudal fin, largest as large as eye. Gill rakers on first arch 24–35. Breeding males with distinct humpback.

PINK SALMON

Oncorhynchus gorbuscha (Walbaum) Page 304



(breeding ♂)

- 7b. Scales in lateral line 112–165. Spots on back and caudal fin small, largest as large as pupil of eye. Gill rakers 16–26 on first arch. Breeding males without humpback. 8

- 8a. Entire mouth, including gums, black (see illustration under 1b). Anal fin rays 14–19. Pyloric caeca 140–185. Small black spots on both lobes of caudal fin.

CHINOOK SALMON

Oncorhynchus tshawytscha (Walbaum) Page 312

- 8b. Gums whitish (see illustration under 1b). Anal fin rays usually 11–15. Pyloric caeca 45–114. Small black spots, when present on caudal fin, on upper lobe only.

COHO SALMON

Oncorhynchus kisutch (Walbaum) Page 307

Key to Young Trout and Salmon up to 125 mm*

- 1a. Rays in anal fin 8–12. Dark spots on dorsal fin present or absent..... 2
- 1b. Rays in anal fin 12–19. Dark spots on dorsal fin absent..... 6

- 2a. Dorsal fin without dark spots, and first dorsal ray not black.
LAKE TROUT
Salvelinus n. namaycush (Walbaum)..... Page 323



- 2b. Dorsal fin with distinct dark spots, or with first dorsal ray black 3

- 3a. Red or yellow spots on lateral line between or on parr marks (may be missing in hatchery-reared fish and in preserved specimens); combined width of dark areas along lateral line about equal to or greater than width of light areas 4

- 3b. Red or yellow spots absent; width of dark areas along lateral line less than width of light areas.
RAINBOW TROUT
Salmo gairdneri Richardson Page 298



- 4a. Pectoral fins long, as long as depressed dorsal fin. Caudal fin deeply forked, center rays about ½ the length of longest.
ATLANTIC SALMON
Salmo salar Linnaeus Page 290



- 4b. Pectoral fins shorter than depressed dorsal fin. Caudal fin not deeply forked, center rays definitely more than ½ the length of longest..... 5

*After McPhail and Lindsey (1970:133–135) and Carl et al. (1967:56–58).

- 5a. No definite dark spots other than parr marks below lateral line; 8 or 9 wide parr marks, widest about equal to eye diam.

BROOK TROUT

Salvelinus fontinalis (Mitchill) Page 316



- 5b. Small black spots above and below lateral line in addition to parr marks; about 11 parr marks, none as wide as eye diam.

BROWN TROUT

Salmo trutta Linnaeus Page 291



- 6a. Parr marks absent.

PINK SALMON

Oncorhynchus gorbuscha (Walbaum) Page 304



- 6b. Parr marks present as dark vertical bars or oval blotches 7

- 7a. First rays of anal fin elongated, producing concave outer margin to fin; leading edge of fin with white stripe followed by dark stripe (best seen when fish is immersed in water against dark background). Tail reddish.

COHO SALMON

Oncorhynchus kisutch (Walbaum) Page 307



- 7b. First rays of anal fin not elongate; fins usually not colored.

CHINOOK SALMON

Oncorhynchus tshawytscha (Walbaum) Page 312

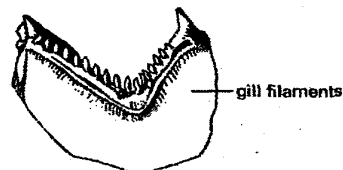


Key to the Whitefish and Ciscoes (Coregoninae)*

- 1a. Single flap between nostrils. Gill rakers fewer than 22..... 2



single flap between nostrils
(Koelz 1929:515)

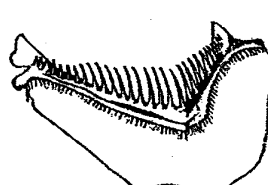


(round whitefish)
Anterior gill arches showing gill rakers
(Koelz 1929:327)

- 1b. Two flaps between nostrils. Gill rakers usually more than 22 3



2 flaps between nostrils
(Hubbs and Lagler 1964:51)



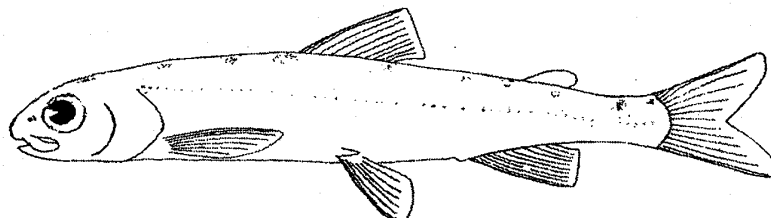
(lake whitefish)



(blackfin cisco)

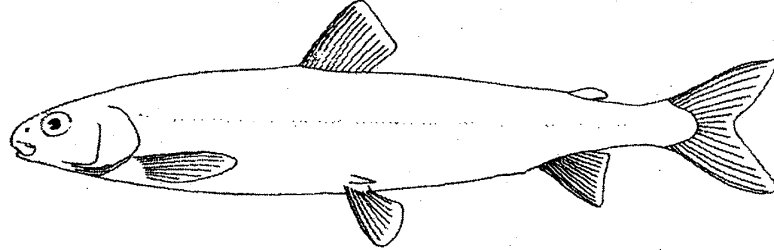
Anterior gill arches showing gill rakers
(Koelz 1929:327)

- 2a. Lateral line scales 55-70. Scale rows around body usually 33-37. Scales around caudal peduncle 18-20. Pyloric caeca 15-23.
PYGMY WHITEFISH
Prosopium coulteri (Eigenmann and Eigenmann)..... Page 369

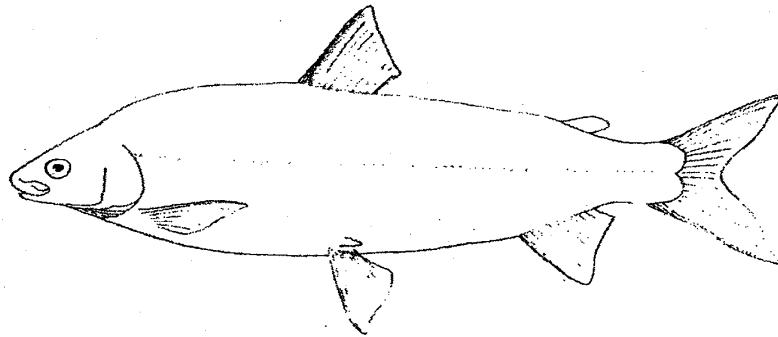


*Relative fin lengths for ciscoes are illustrated on page 104 below.
For additional aid in identifying Great Lakes ciscoes, consult Parsons and Todd (1974).

- 2b. Lateral line scales 80–100. Scale rows around body usually 42–46. Scales around caudal peduncle 22–24. Pyloric caeca 87–117.
ROUND WHITEFISH
Prosopium cylindraceum (Pallas) Page 372



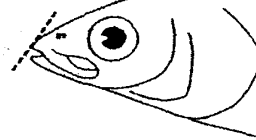
- 3a. Premaxillaries pointing backward, giving front of snout a rounded profile. Upper jaw usually contained 3 or more times in head. Gill rakers 19–33.
LAKE WHITEFISH
Coregonus clupeaformis (Mitchill) Page 335



premaxillaries
pointing backward



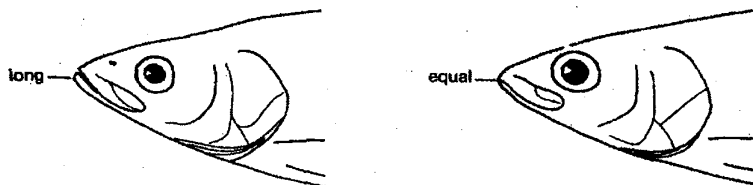
premaxillaries
pointing forward



- 3b. Premaxillaries point forward, giving front of snout a pointed profile. Upper jaw seldom contained more than 3 times in head. Gill rakers usually more than 31* 4

*Some authors give the generic name *Leucichthys* to the 8 species of cisco which follow. For details substantiating a *Coregonus*-*Leucichthys* separation, see Vladykov (1970).

- 4a. Tip of lower jaw jutting beyond upper jaw..... 5

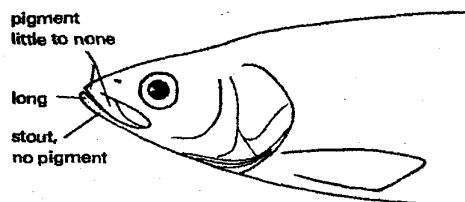


- 4b. Lower jaw equal to or shorter than upper jaw..... 7

- 5a. Lower jaw stout (ramus thick), no pigment; symphyseal knob usually absent.

LONGJAW CISCO

Coregonus alpenae (Koelz) Page 353



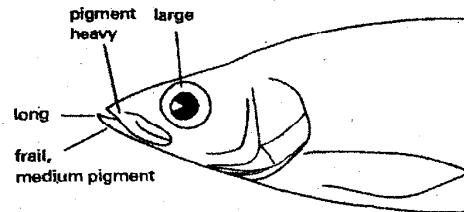
C. alpenae
 Spawn—fall, November
 Rakers—medium length and
 number, 36–43 (33–46)
 Fins—medium long
 Pigment—light

(Courtesy of S. H. Smith)

- 5b. Lower jaw frail (ramus thin), medium pigment; symphyseal knob present..... 6

- 6a. Gill rakers medium long, about length of gill filaments, and usually 36–41. Paired fins very long, pelvics usually reaching to anus or beyond. Body deeper forward than medially. Eye very large, equal or nearly equal to snout.

KIYI

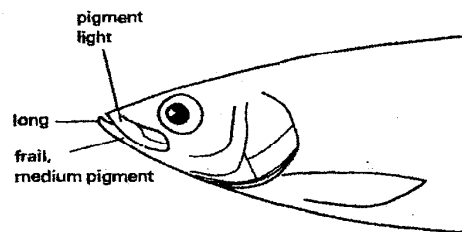
Coregonus kiyi (Koelz) Page 361

(Courtesy of S. H. Smith)

C. kiyi
 Spawn—fall, October
 Rakers—medium length and number, 36–41 (34–45)
 Fins—very long
 Pigment—medium
 Thin body; large eye

- 6b. Gill rakers long, longer than longest gill filaments, and usually 41–44 (40–47 in some deepwater races). Paired fins long, but pelvic fins seldom reach anus. Body deepest medially. Eye large, but less than length of snout.

BLOATER

Coregonus hoyi (Gill) Page 356

(Courtesy of S. H. Smith)

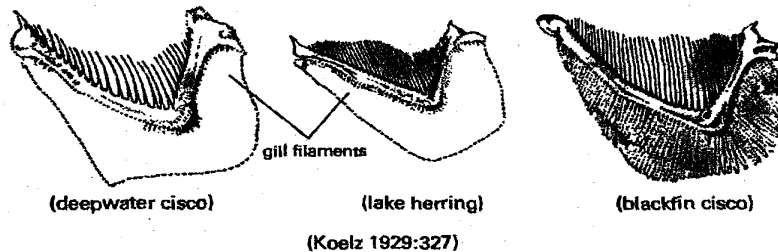
C. hoyi
 Spawn—spring, (?) March (?)
 Rakers—long and medium in number, 41–44 (37–48)
 Fins—medium to long
 Pigment—medium

- 7a. Lower jaw oblique and equal to upper jaw; posterior end of upper jaw usually reaching anterior edge of pupil 8
- 7b. Lower jaw underslung (ventral) and usually shorter than upper jaw; posterior end of upper jaw often reaching middle of pupil 10

- 8a. Gill rakers usually fewer than 33.

DEEPWATER CISCO

Coregonus johannae (Wagner)..... Page 367

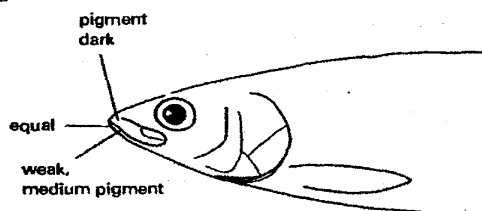


- 8b. Gill rakers usually 46-50..... 9

- 9a. Body deepest medially. Lower jaw weak; symphyseal knob present.
Body elongate and almost round in cross section.

CISCO or LAKE HERRING

Coregonus artedii Lesueur Page 341



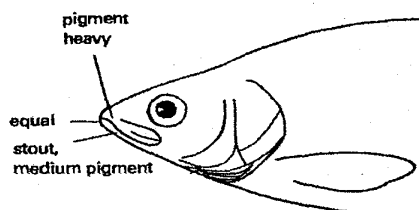
C. artedii
Spawn—fall, Nov-Dec
Rakers—long and many,
46-50 (41-51)
Fins—medium
Pigment—dark

(Courtesy of S. H. Smith)

- 9b. Body deeper forward than medially. Lower jaw stout; symphyseal knob absent. Body broad and very deep.

BLACKFIN CISCO

Coregonus nigripinnis (Gill)..... Page 364



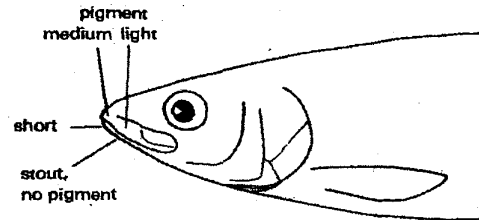
C. nigripinnis
Spawn—winter, Dec-Jan
Rakers—long and many
46-50 (41-52)
Fins—medium long
Pigment—very dark
Thick, deep body

(Courtesy of S. H. Smith)

- 10a. Snout long—snout into head length usually 3.3–3.6. Premaxillaries at angle of 60–70° with horizontal. Gill rakers usually 38–42 and approximately equal to length of gill filaments. Paired fins medium long.

SHORTJAW CISCO

Coregonus zenithicus (Jordan and Evermann) Page 350



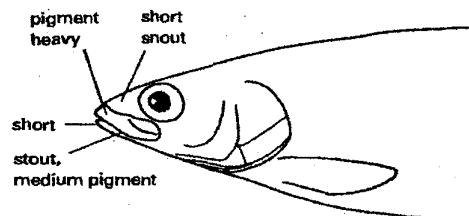
(Courtesy of S. H. Smith)

C. zenithicus
 Spawn—fall, November
 Rakers—medium length and number, 38–42 (35–44)
 Fins—medium
 Pigment—medium dark

- 10b. Snout short—snout into head length usually 3.4–4.0. Premaxillaries at large angle, often vertical (90°) with horizontal. Gill rakers usually 34–38 and shorter than gill filaments. Paired fins very short.

SHORTNOSE CISCO

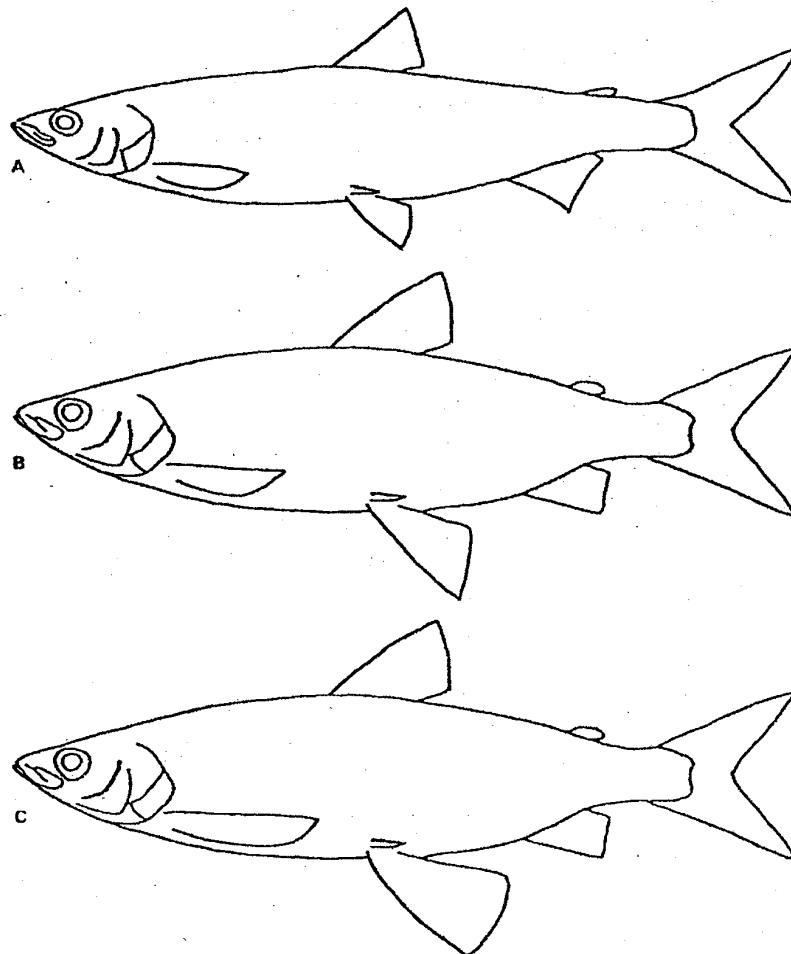
Coregonus reighardi (Koelz) Page 347



(Courtesy of S. H. Smith)

C. reighardi
 Spawn—spring, April–May
 Rakers—short and low in number, 34–38 (30–43)
 Fins—very short
 Pigment—dark
 Short snout; adult small

Relative paired fin lengths of Great Lakes ciscoes*



- A. Short fins: typical of *C. reighardi* and large *C. artedii*.
B. Intermediate fins: typical of *C. artedii*, *C. hoyi*, *C. zenithicus*, and some *C. nigripinnis*.
C. Long fins: typical of *C. kiyi*, some *C. hoyi*, and some *C. nigripinnis*.

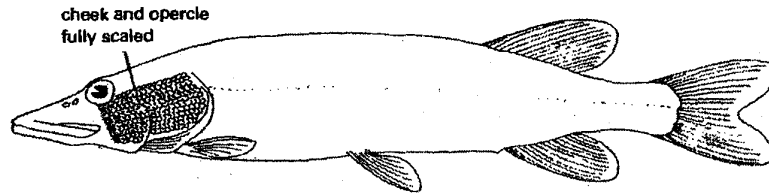
*After Parsons and Todd (1974).

Key to the Pikes

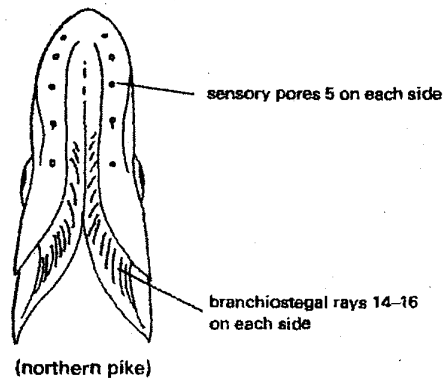
- 1a. Sensory pores on undersurface of jaw 4 on each side (rarely 3 or 5).
Cheek and opercle fully scaled.

GRASS PICKEREL

Esox americanus vermiculatus Lesueur Page 393



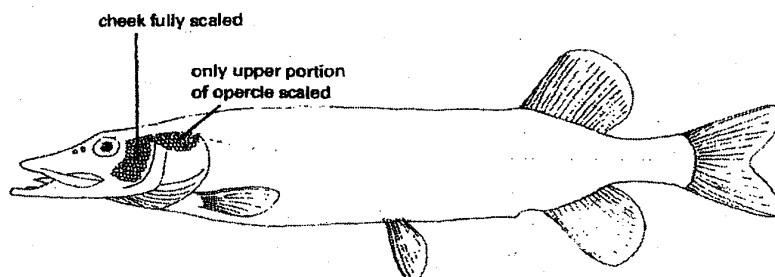
- 1b. Sensory pores on undersurface of jaw usually 5 or more on each side.
Cheek and opercle not fully scaled 2



- 2a. Sensory pores on undersurface of jaw 5 on each side (rarely 4 or 6). Cheek fully scaled; only upper portion of opercle scaled. Branchiostegal rays 14–16 on each side. Body a dark background color with horizontal rows of light-colored, bean-shaped spots in adults.

NORTHERN PIKE

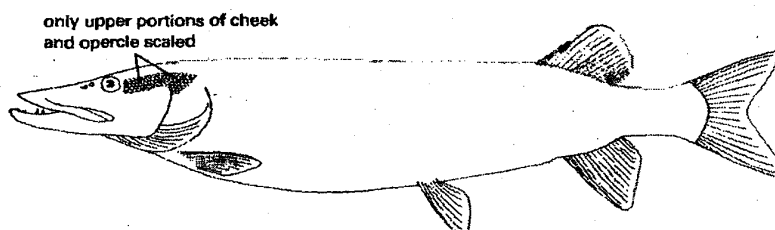
Esox lucius Linnaeus Page 398



- 2b. Sensory pores on undersurface of jaw 6–9 on each side. Only upper portions of cheek and opercle scaled. Branchiostegal rays 16–19 on each side. Body a light background color with dark spots or narrow vertical bars.

MUSKELLUNGE

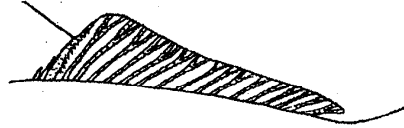
Esox masquinongy Mitchill..... Page 405



Key to the Minnows and Carps

- 1a. Dorsal fin with more than 11 soft rays. Dorsal and anal fins each with a strong, serrated, spinous ray..... 2

serrated spinous ray



(goldfish)

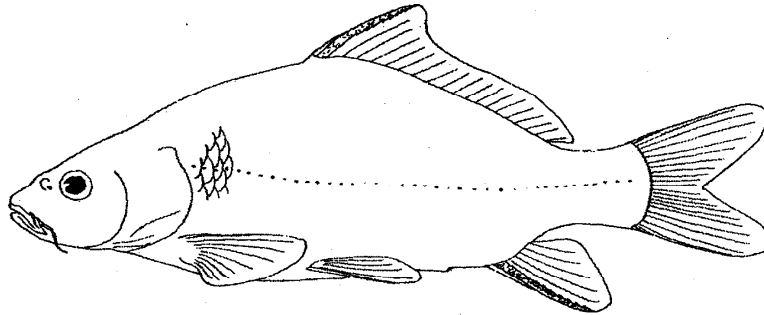
no spinous ray



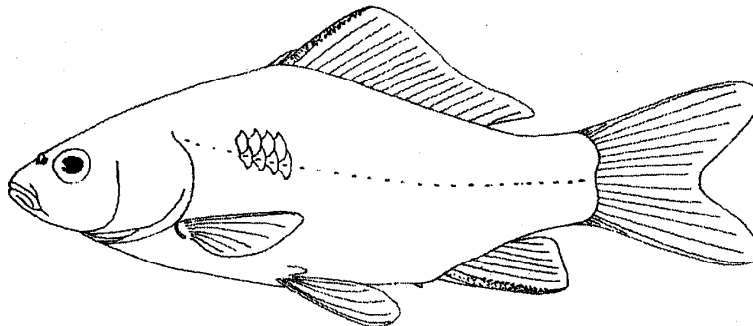
(golden shiner)

- 1b. Dorsal fin with fewer than 10 soft rays. No spinous ray in dorsal or anal fins..... 3

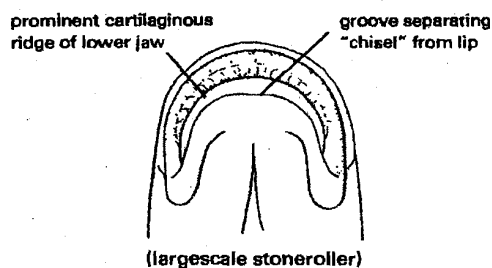
- 2a. Upper jaw with 2 fleshy barbels on each side. Lateral line scales more than 32 (except in "leather" or "mirror" types). Gill rakers on first arch 21-27. Teeth 1,1,3-3,1,1.
COMMON CARP
Cyprinus carpio Linnaeus..... Page 419



- 2b. No barbels on upper jaw. Lateral line scales fewer than 32. Gill rakers on first arch 37-43. Teeth 4-4.
GOLDFISH
Carassius auratus (Linnaeus)..... Page 428

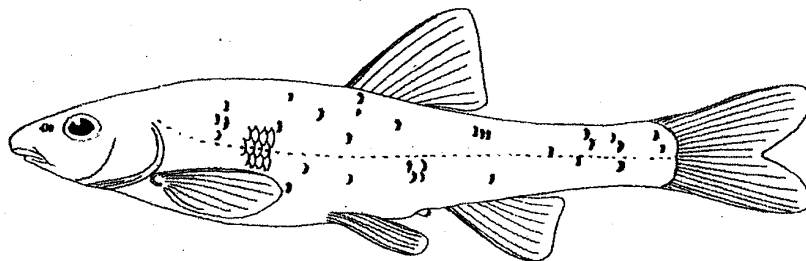


- 3a. Cartilaginous ridge ("chisel") of lower jaw prominent and separated from lower lip by definite groove. Intestine wrapped around swim bladder. Teeth 4-4 4

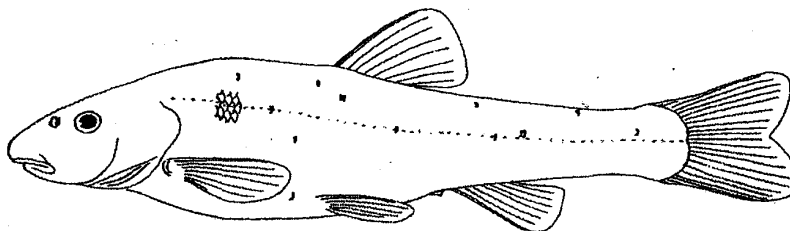


- 3b. Cartilaginous ridge of lower jaw hardly evident and not separated by definite groove from lower lip. Intestine not wrapped around swim bladder. Teeth in 1 or 2 rows 5

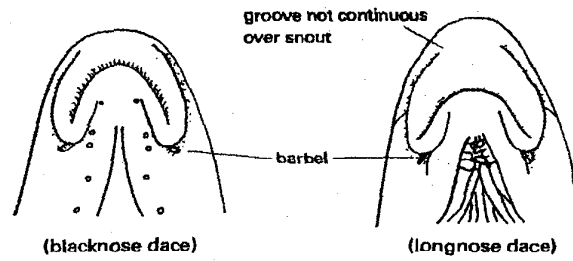
- 4a. Scale rows around body just in front of dorsal fin usually 31-36. Lateral line scales usually 43-47.
LARGESCALE STONEROLLER
Campostoma oligolepis Hubbs and Greene..... Page 481



- 4b. Scale rows around body just in front of dorsal fin usually 39-46. Lateral line scales usually 49-55.
CENTRAL STONEROLLER
Campostoma anomalum (Rafinesque)..... Page 476

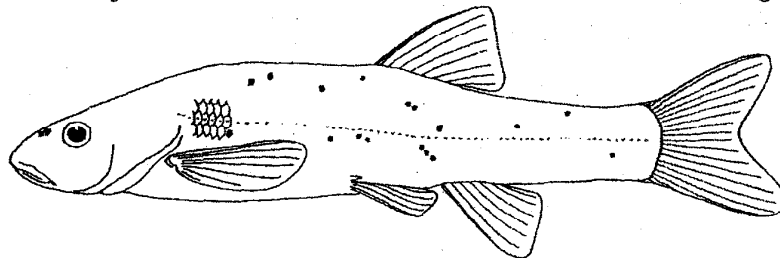


- 5a. Upper lip connected to snout by bridge of tissue (i.e., groove of upper lip is not continuous over snout) 6

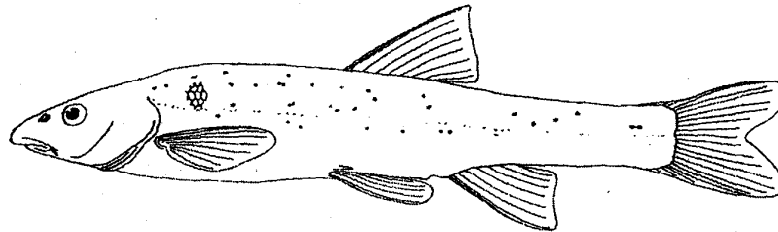


- 5b. Groove of upper lip continuous over snout (see illustration under 7a). . . 7

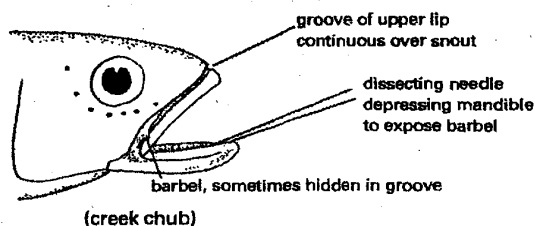
- 6a. Snout projecting beyond lower lip less than 1 mm. Mouth slightly oblique.
BLACKNOSE DACE
Rhinichthys atratulus (Hermann)..... Page 467



- 6b. Snout projecting beyond lower lip 1-3 mm or more. Mouth horizontal.
LONGNOSE DACE
Rhinichthys cataractae (Valenciennes)..... Page 472



- 7a. Barbel flat or round, appearing in lip grooves at corners of lips or in groove of upper lip at a short distance anterior to corners 8

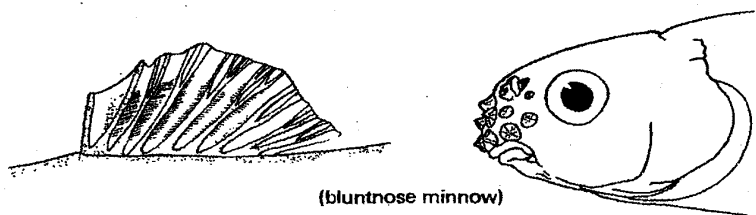


- 7b. Barbel absent 16

- 8a. Barbel in lip grooves at corners of lips (as in blacknose dace; see illustration under 5a) 9

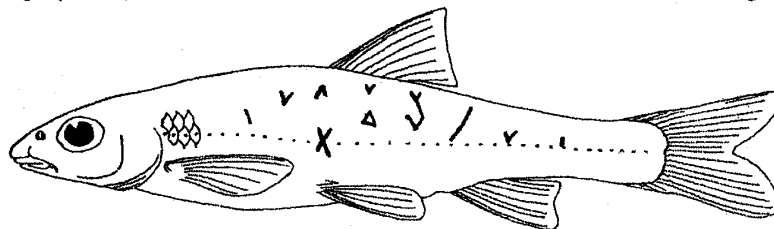
- 8b. Barbel in groove of upper lip at a short distance anterior to corners (as in creek chub; see illustration under 7a)..... 14

- 9a. Dorsal fin membranes well pigmented, especially on midportion of membranes between first and fourth rays. Approximately 16 large tubercles in 3 rows on snout.
Breeding male of the
BLUNTNOSE MINNOW (See illustration under 32a.)
Pimephales notatus (Rafinesque) Page 595



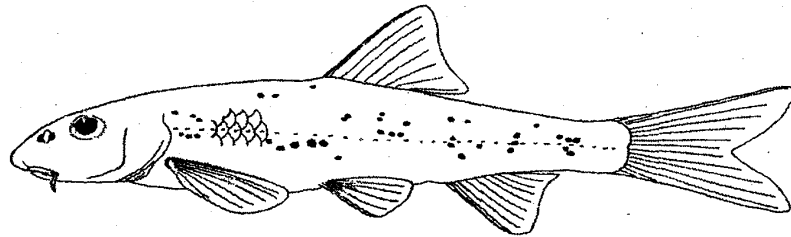
- 9b. Dorsal fin membranes pigmented poorly or not at all. Tubercles, if present, scattered on other parts of head as well as snout..... 10

- 10a. Body with X-, V-, Y-, and variously shaped dark marks. Peritoneum black. Teeth 4-4.
GRAVEL CHUB
Hybopsis x-punctata Hubbs and Crowe..... Page 489



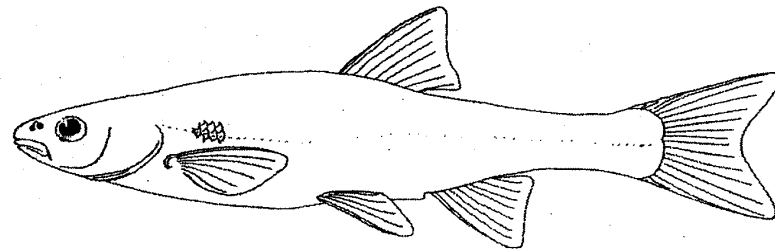
- 10b. Body not marked or with rounded spots on sides. Peritoneum silvery to dusky..... 11

- 11a. Length of protruding portion of barbel about equal to diam of pupil of eye. Prominent dark speckles on body. Teeth 4-4.
SPECKLED CHUB
Hybopsis aestivalis (Girard) Page 495



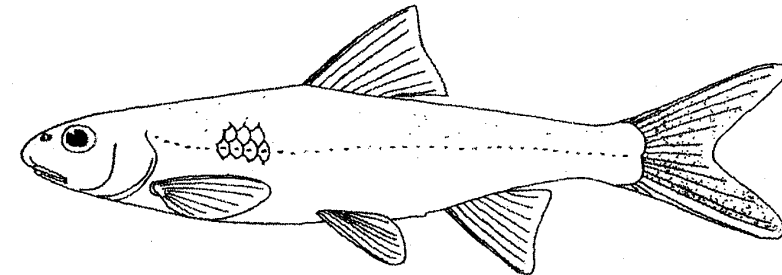
- 11b. Length of protruding portion of barbel considerably less than diam of pupil of eye. No dark speckles on body..... 12

- 12a. Lateral line scales more than 55. Teeth usually 2,4-4,2 but variable.
LAKE CHUB
Couesius plumbeus (Agassiz) Page 463



- 12b. Lateral line scales fewer than 45. 13

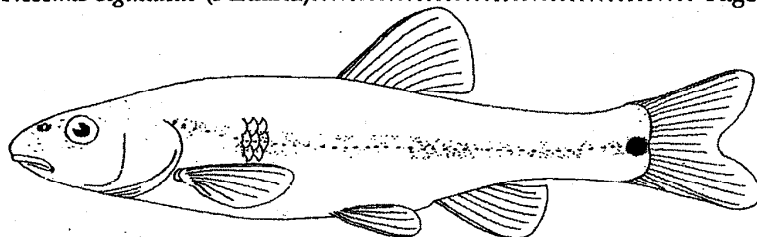
- 13a. Caudal fin length greater than head length. Caudal fin pigmented on rays and membranes except on last 2 ventral rays and membranes, hence showing a distinct white ventral edge. Teeth 1,4-4,1.
SILVER CHUB
Hybopsis storeriana (Kirtland) Page 492



- 13b. Caudal fin length less than head length. Caudal fin, if pigmented, not showing a distinct white ventral edge. Teeth usually 1,4-4,1 (occasionally 4-4).

HORNYHEAD CHUB

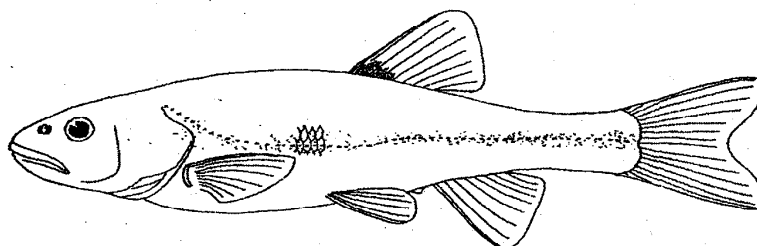
Nocomis biguttatus (Kirtland)..... Page 485



- 14a. Mouth large, upper jaw extending at least to below front of eye. Lateral line scales usually 50-60 (occasionally more). Black spot on dorsal fin near front of base (indistinct in young). Teeth 2,5-4,2.

CREEK CHUB

Semotilus atromaculatus (Mitchill)..... Page 437

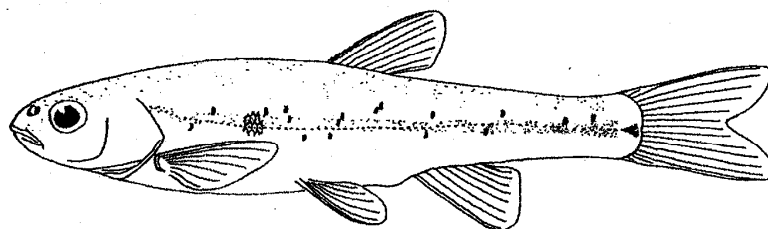


- 14b. Mouth small, upper jaw not extending to below front of eye. Lateral line scales usually 65 or more. Spot absent or indistinct on dorsal fin near base..... 15

- 15a. Lateral line scales usually 65-75. Sides frequently mottled by specialized dark scales. Teeth usually 2,5-4,2.

PEARL DACE

Semotilus margarita (Cope)..... Page 442



- 15b. Lateral series scales usually 80 or more (occasionally fewer). Sides not mottled by specialized dark scales. Teeth 5-5.

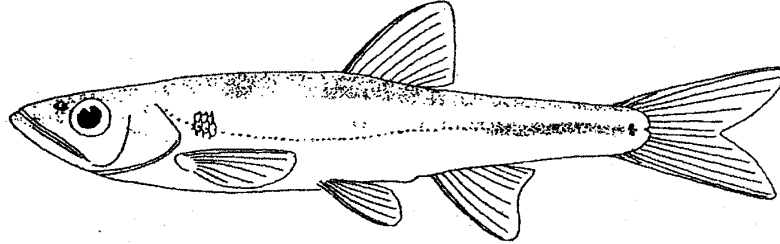
SOUTHERN REDBELLY DACE (See illustration under 20b.)

Phoxinus erythrogaster (Rafinesque) Page 455

- 16a. Mouth very large; distance from anteriormost edge of lower lip (mandible) to corner groove almost $\frac{1}{2}$ of head length. Teeth usually 2,5-4,2 (occasionally 1, 4-3,1).

REDSIDE DACE

Clinostomus elongatus (Kirtland) Page 446

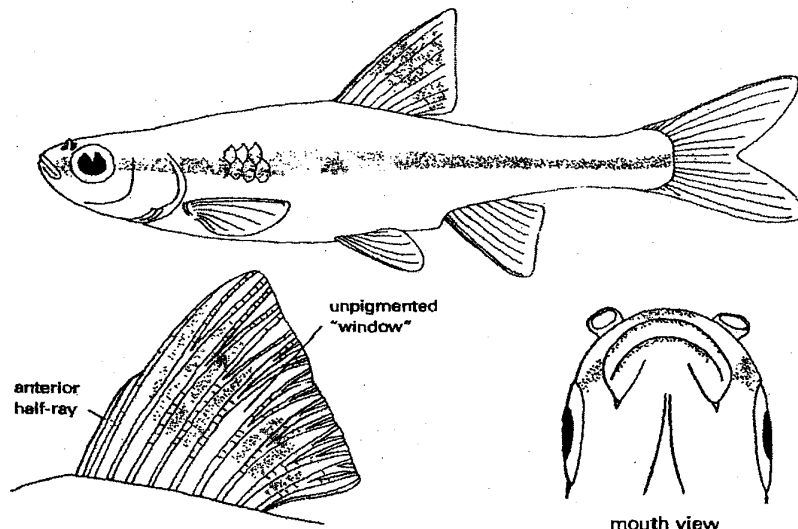


- 16b. Mouth smaller; distance from anteriormost edge of lower lip to corner groove about $\frac{1}{3}$ of head length or less 17

- 17a. Principal rays of dorsal fin typically 9 (anterior half-rays are not included in the count). Interradial membranes of dorsal fin dusky to dark, except for membrane between rays 5 and 6 and parts of adjacent membranes which are clear and generally devoid of pigment. Teeth 5-5.

PUGNOSE MINNOW

Notropis emiliae (Hay) Page 575



- 17b. Principal rays of dorsal fin typically 8 (anterior half-rays are not included in the count). Interradial membranes of dorsal fin clear or exhibiting different color pattern from above..... 18

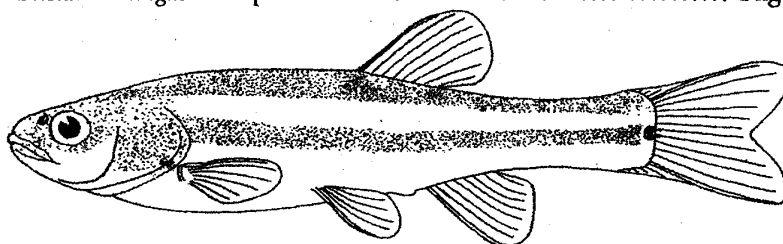
18a. Lateral line scales (or lateral series scales) more than 65 19

18b. Lateral line scales (or lateral series scales) fewer than 60 21

19a. Body with single dusky lateral stripe; back with dark brown cape.
Teeth 2,5-4,2.

FINESCALE DACE

Phoxinus neogaeus Cope Page 451

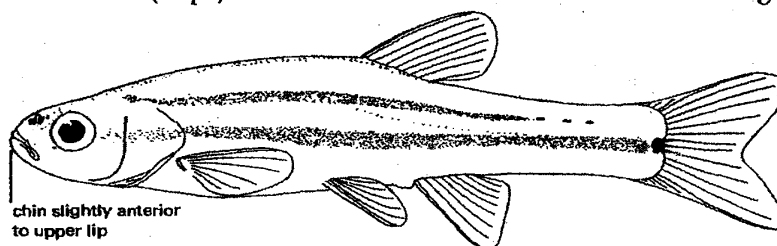


19b. Body with 2 dark lateral stripes; back without dark brown cape. Teeth 5-5 20

20a. Chin slightly anterior to upper lip. Mouth sharply oblique, usually more than 45° with horizontal, and more curved. Length of upper jaw less than, about, or a little more than ¼ length of head.

NORTHERN REDBELLY DACE

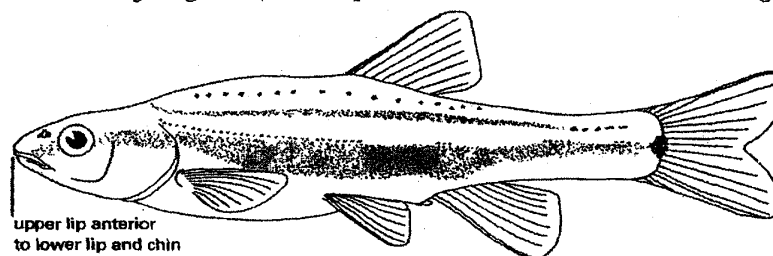
Phoxinus eos (Cope) Page 459



20b. Upper lip anterior to lower lip and chin. Mouth slightly oblique, usually less than 45° with horizontal, and little curved. Length of upper jaw from about ¼ to considerably more than ¼ length of head.

SOUTHERN REDBELLY DACE

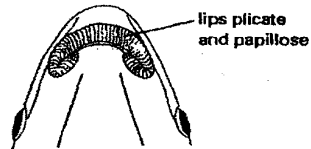
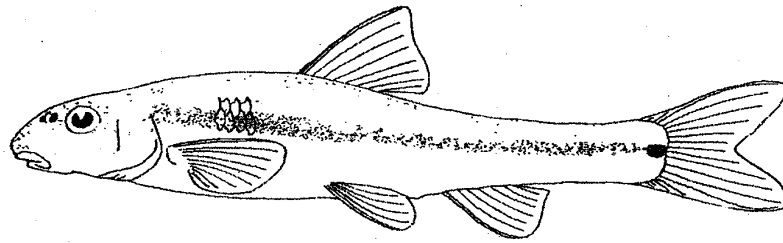
Phoxinus erythrogaster (Rafinesque) Page 455



- 21a. Lower lip with thickened lateral lobes which, with upper lip, gives scroll-like or fiddlehead appearance. Teeth 4-4.

SUCKERMOUTH MINNOW

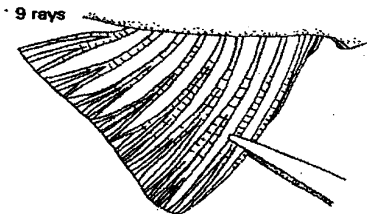
Phenacobius mirabilis (Girard) Page 499



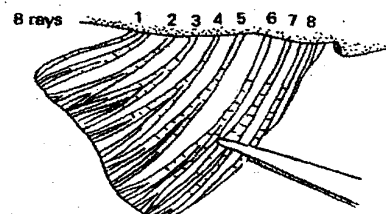
(suckermouth minnow)

- 21b. Lower lip normal, without thickened lateral lobes 22

- 22a. Anal fin rays typically 9-13..... 23



(common shiner)

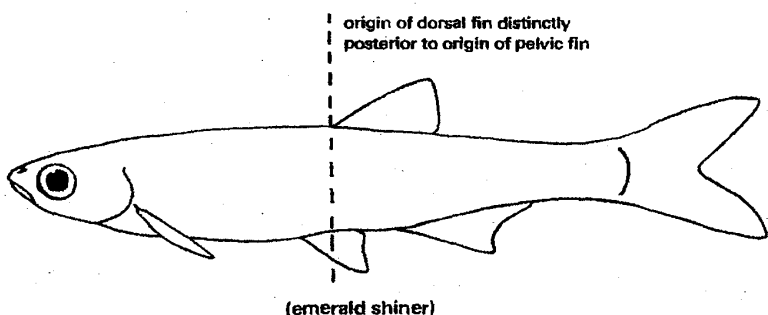
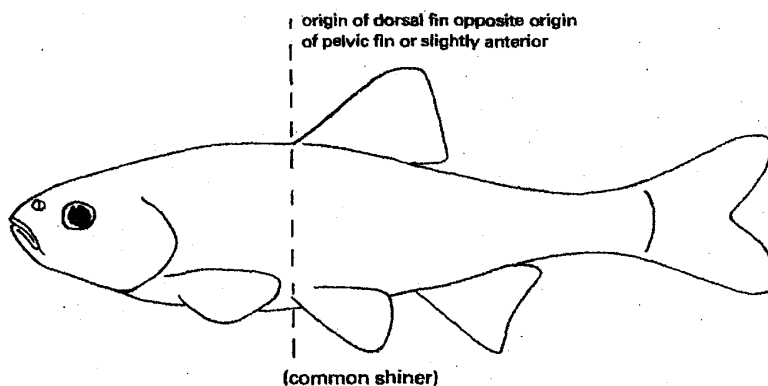


(bigmouth shiner)

Note that the last ray of the fin, ray #1, is split to the base and appears as 2 closely spaced rays. It is identified as a single ray by the small space between the ray elements—a much smaller space than the spaces between the other fin rays

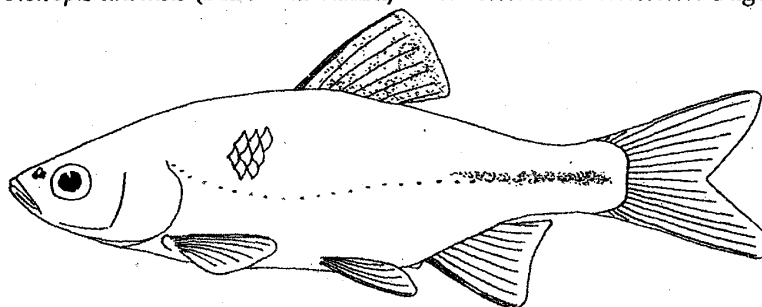
- 22b. Anal fin rays typically 7 or 8 29

- 23a. Origin of dorsal fin opposite origin of pelvic fin or slightly anterior. Anal fin rays typically 9 or 10 24



- 23b. Origin of dorsal fin distinctly posterior to origin of pelvic fin. Anal fin rays typically 11-13 (rarely 9, commonly 10) 26

- 24a. Dorsal fin membranes pigmented. Teeth 4-4 to 1,4-4,1.
RED SHINER
Notropis lutrensis (Baird and Girard) Page 554

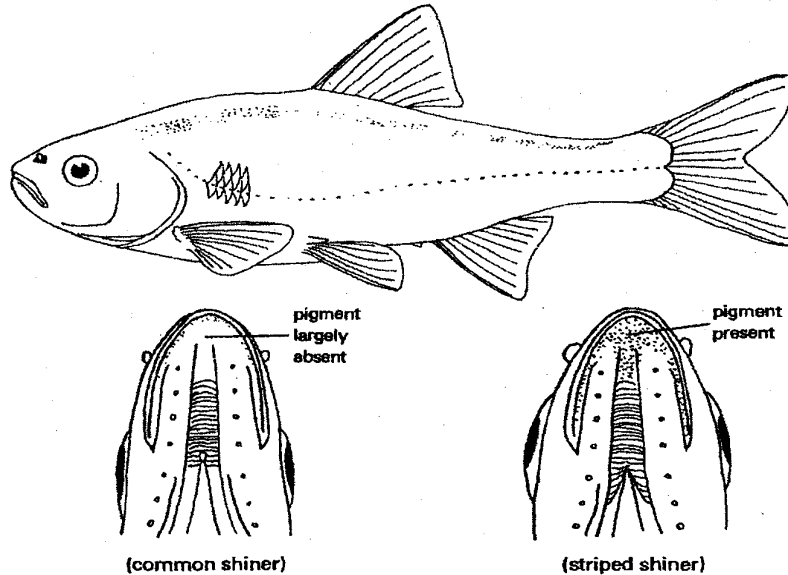


- 24b. Dorsal fin membranes unpigmented. Teeth 2,4-4,2 25

- 25a. Anterior dorsolateral scale count (from point below dorsal fin origin to head, along any row from third to sixth above lateral line) 18–24 (16–30). No dark stripes on back meeting in Vs posteriorly. Pigment on chin largely absent (a few chromatophores may be seen along edge of lower lip).

COMMON SHINER

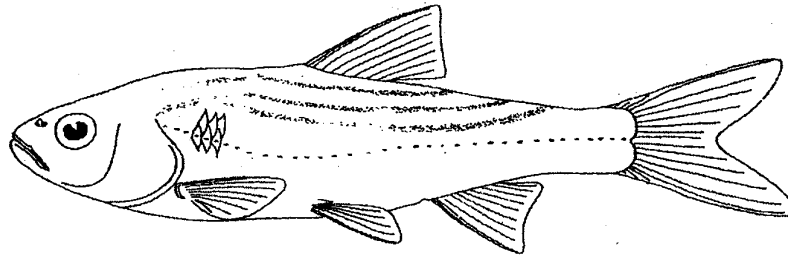
Notropis cornutus (Mitchill) Page 518



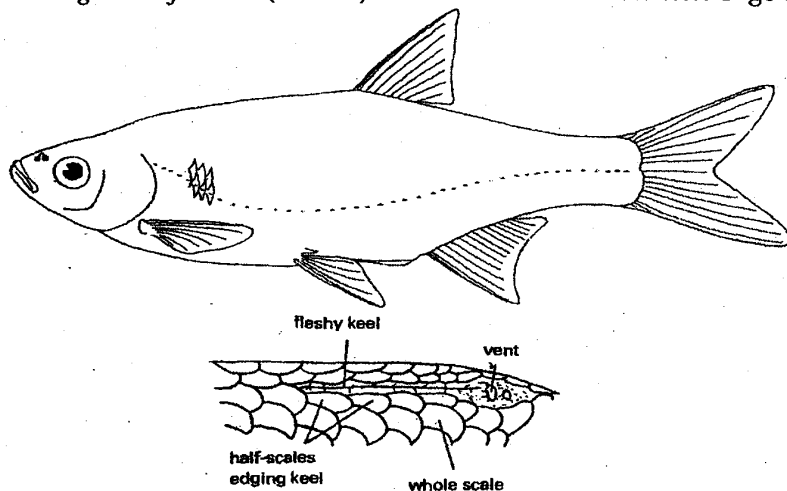
- 25b. Anterior dorsolateral scale count 13–16 (12–19). Dark stripes running between scale rows on back, meeting in Vs posteriorly. Pigment on anterior third of chin.

STRIPED SHINER

Notropis chrysocephalus (Rafinesque) Page 523

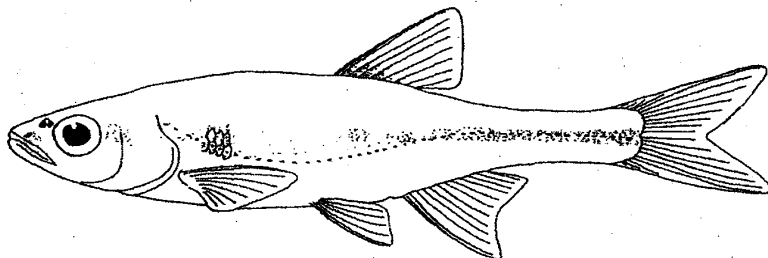


- 26a. Abdomen before vent with fleshy keel over which scales do not pass.
Keel edged with half-scales. Teeth 5-5.
GOLDEN SHINER
Notemigonus crysoleucas (Mitchill) Page 432



- 26b. Abdomen before vent rounded and scaled. Teeth 2,4-4,2 27

- 27a. Dorsal fin with black spot at its extreme base anteriorly. Lateral line scales 41-48.
REDFIN SHINER
Notropis umbratilus (Girard) Page 514

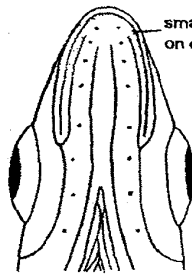
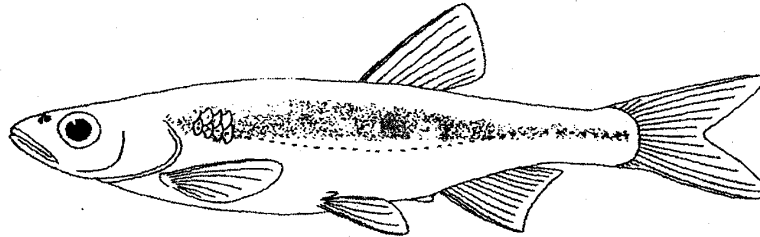


- 27b. Black spot at base of dorsal fin absent. Lateral line scales 36-41 28

- 28a. Head length in adult greater than $\frac{1}{4}$ SL. Snout elongated and sharp, its length greater than $\frac{3}{4}$ distance from posterior margin of eye to posterior margin of head. Small chromatophores on chin usually confined to outside margin of chin.

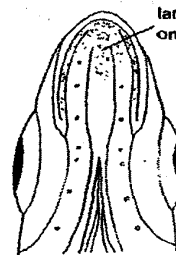
ROSYFACE SHINER

Notropis rubellus (Agassiz) Page 510



(rosyface shiner)

small chromatophores
on outside margin of chin



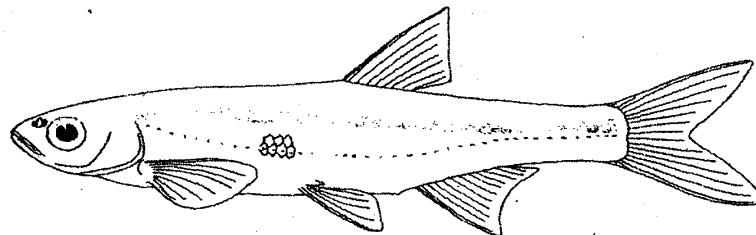
(emerald shiner)

large chromatophores
on midportion of chin

- 28b. Head length in adult less than $\frac{1}{4}$ SL. Snout short and blunt, its length less than $\frac{3}{4}$ distance from posterior margin of eye to posterior margin of head. Large chromatophores on anterior half of chin, particularly on midportion.

EMERALD SHINER

Notropis atherinoides Rafinesque Page 505



- 29a. Anal fin rays typically 7..... 30
- 29b. Anal fin rays typically 8..... 35

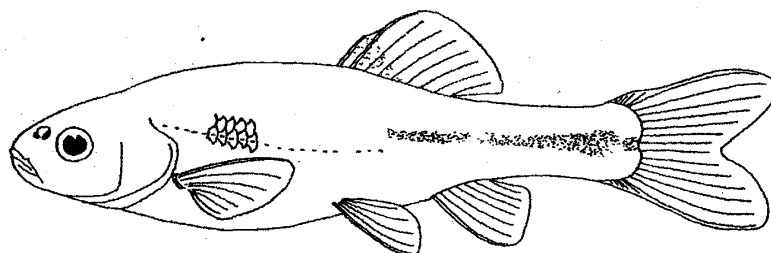
30a. Scales of back anterior to dorsal fin tightly crowded. Lateral scales 40 or more. Frequently a dark blotch on anterior membranes of dorsal fin near its base. First half-ray of dorsal fin separated from first full ray by membrane. Peritoneum silvery, blackish, or black. Teeth 4-4... 31

30b. Scales anterior to dorsal fin normal, not crowded. Lateral scales fewer than 40. Membranes of dorsal fin clear. First half-ray of dorsal fin closely attached to first full ray. Peritoneum silvery. Teeth in 1 or 2 rows..... 33

31a. Body deep, its depth into SL less than 4. Mouth almost vertical. Digestive tract long, 1.4-1.7 TL. Peritoneum black.

FATHEAD MINNOW

Pimephales promelas Rafinesque..... Page 600

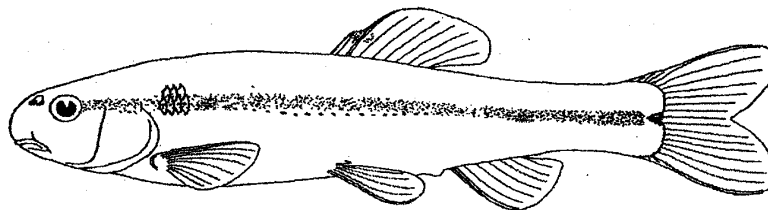


31b. Body almost cylindrical, its depth into SL greater than 4. Mouth slightly oblique to almost horizontal. Digestive tract less than 1.3 TL. Peritoneum silvery or black..... 32

32a. Snout protruding anterior to mouth. Mouth subterminal and almost horizontal. Body usually with distinct lateral stripe. Digestive tract moderately long, 1.0-1.2 TL. Peritoneum black.

BLUNTNOSE MINNOW

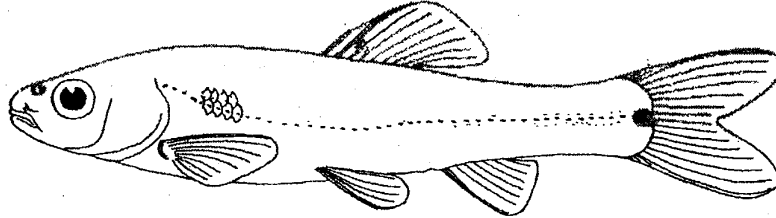
Pimephales notatus (Rafinesque)..... Page 595



- 32b. Snout slightly protruding to even with upper lip. Mouth slightly sub-terminal to terminal and slightly oblique. Lateral stripe absent to faint. Digestive tract short, 0.6–0.7 TL. Peritoneum silvery.

BULLHEAD MINNOW

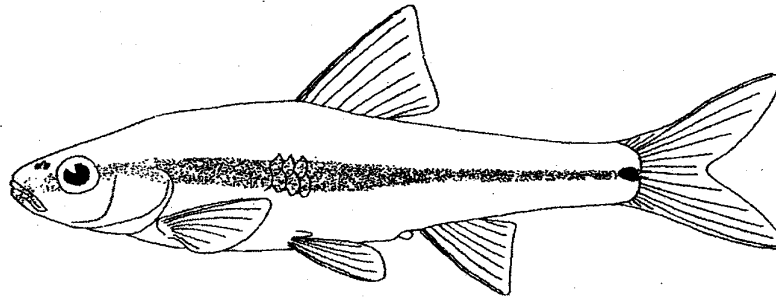
Pimephales vigilax (Baird and Girard) Page 591



- 33a. Lateral stripe black, extending through eye and around upper and lower lips. Conspicuous black caudal spot. Breast naked. Teeth usually 2,4–4,2.

WEED SHINER

Notropis texanus (Girard) Page 534

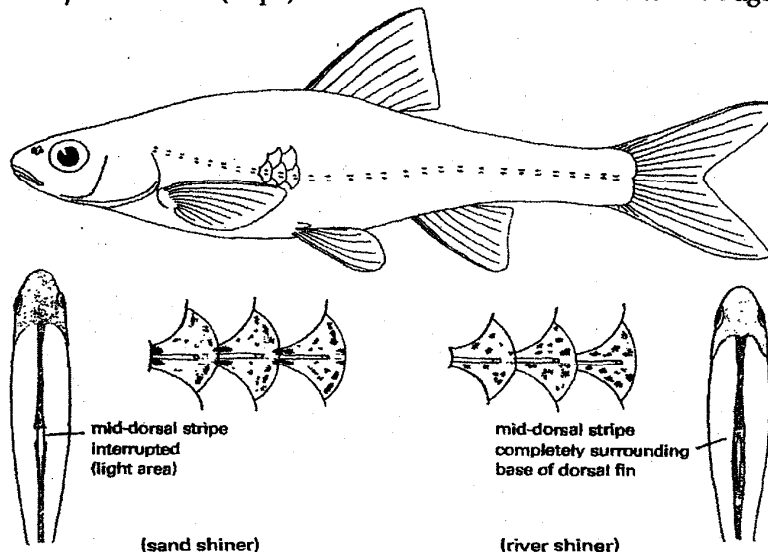


- 33b. Lateral stripe scarcely evident or absent. Caudal spot faint or absent. Breast scaled, at least in part 34

- 34a. Mid-dorsal stripe expanded in front of dorsal fin and interrupted at front of dorsal fin base. Pores of lateral line scales bounded above and below by paired dark chromatophores. Teeth 4-4.

SAND SHINER

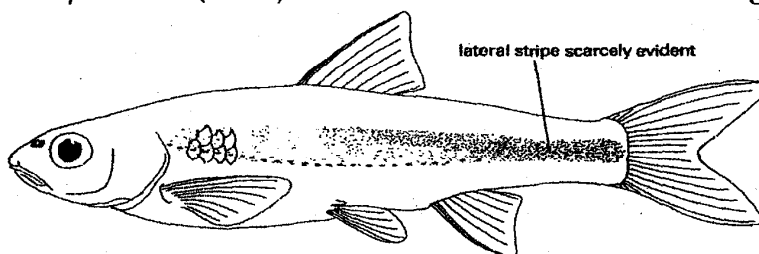
Notropis stramineus (Cope) Page 562



- 34b. Mid-dorsal stripe distinct and uniform in width, completely surrounding base of dorsal fin; stripe is not or is only slightly expanded immediately in front of dorsal fin origin. Pores of lateral line scales bounded irregularly by chromatophores or not at all. Teeth 2,4-4,2.

RIVER SHINER

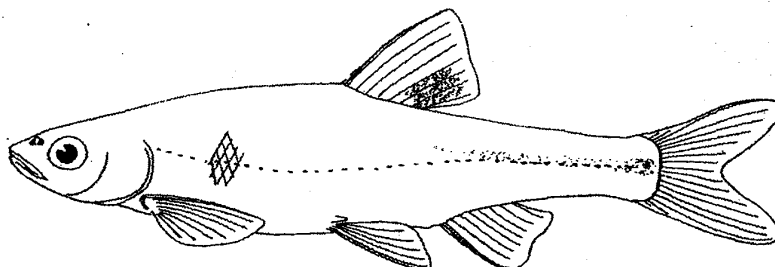
Notropis blennioides (Girard) Page 527



- 35a. Lateral scales 50 or more. (Either creek chub or pearl dace; see *Semotilus*, 14a and 15a.)

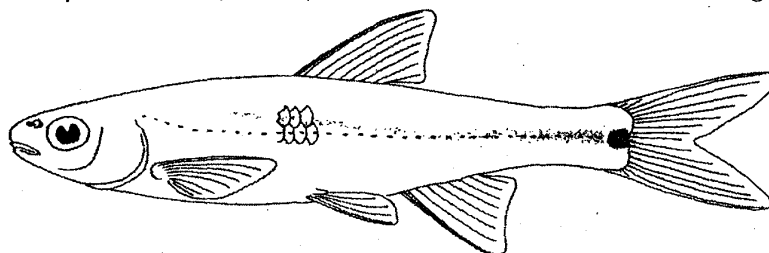
- 35b. Lateral scales fewer than 50 36

- 36a. Membranes of dorsal fin pigmented particularly between last 3 fin rays, or entirely pigmented 37
- 36b. Membranes of dorsal fin clear or otherwise pigmented..... 38
- 37a. Membranes of dorsal fin pigmented between last 3 fin rays; small young with at least a few chromatophores; in breeding males all membranes pigmented with last 3 especially black. Body depth into SL more than 3.5. Teeth 1,4-4,1.
SPOTFIN SHINER
Notropis spilopterus (Cope)..... Page 549



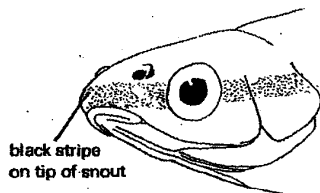
- 37b. Membranes of dorsal fin generally evenly pigmented. Body deep, its depth into SL usually 3.5 or less. Teeth 4-4 to 1,4-4,1.
RED SHINER
Notropis lutrensis (Baird and Girard)..... Page 554

- 38a. Prominent black spot (approximately diam of pupil of eye) at base of caudal fin (occasionally diffuse in Lake Michigan form). Teeth usually 2,4-4,2 (variable in outer row).
SPOTTAIL SHINER
Notropis hudsonius (Clinton)..... Page 540

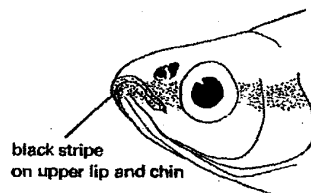


- 38b. Black spot at base of caudal fin absent or, if present, small..... 39

- 39a. Lateral stripe blackish (sometimes indistinct in life), continuing forward through eye and around muzzle 40
- 39b. Lateral stripe dusky or absent, usually not continuing forward through eye and around muzzle..... 44
- 40a. Black stripe continuing forward through eye primarily around tip of snout and to lesser degree upon upper lip, lower lip, and chin (as in blacknose shiner). Teeth 4-4 41



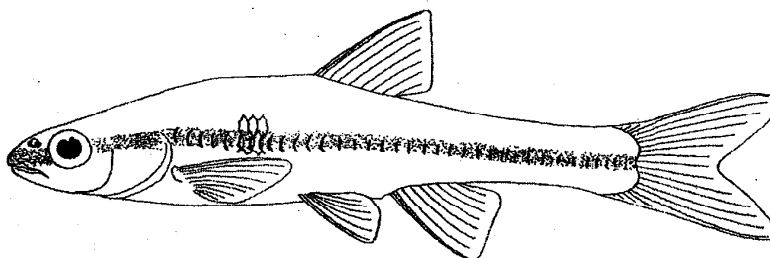
(blacknose shiner)



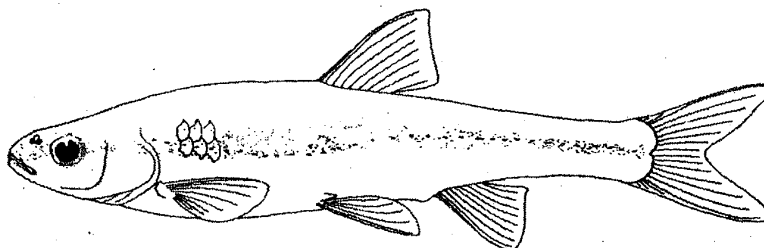
(blackchin shiner)

- 40b. Black stripe continuing forward through eye, onto upper lip, lower lip, and chin, scarcely if at all around tip of snout (as in blackchin shiner). Teeth in 1 or 2 rows..... 42

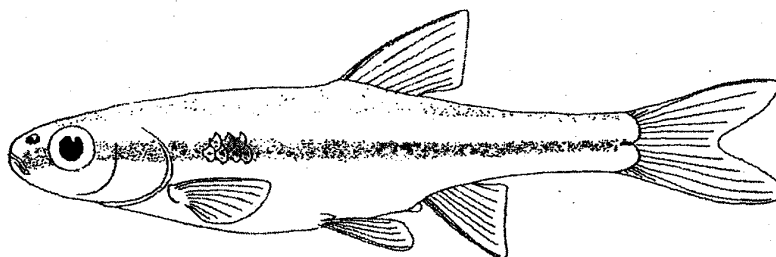
- 41a. Lateral line scales with black crescent-shaped marks, the tips of which point backwards. Peritoneum silvery. Intestine S-shaped; when extended, reaching to caudal fin.
BLACKNOSE SHINER
Notropis heterolepis Eigenmann and Eigenmann Page 572



- 41b. Lateral line scales without crescent-shaped marks. Peritoneum black.
Intestine much elongated and coiled; when extended, reaching to about
twice TL.
OZARK MINNOW
Notropis nubilus (Forbes) Page 578

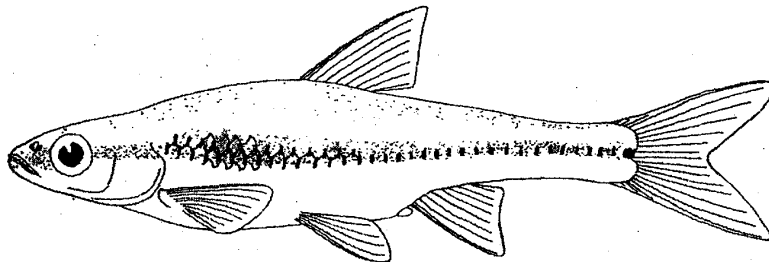


- 42a. Mouth vertical, about 80° with horizontal. Upper jaw extending only
to below anterior nostril. Peritoneum dark brown to black. Teeth 4-4.
PUGNOSE SHINER
Notropis anogenus Forbes Page 558

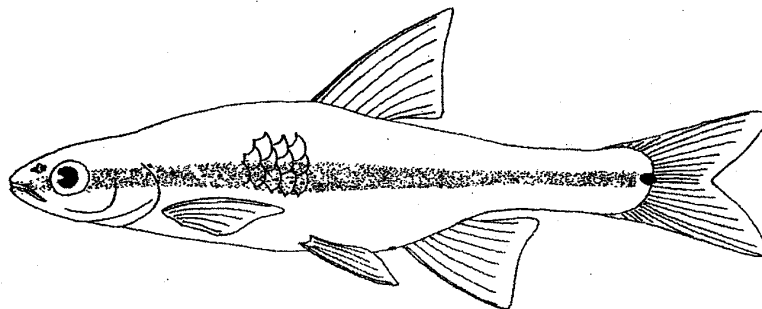


- 42b. Mouth oblique, about 45° with horizontal. Upper jaw extending at
least to below posterior nostril. Peritoneum silvery (may have a few
dark chromatophores) 43

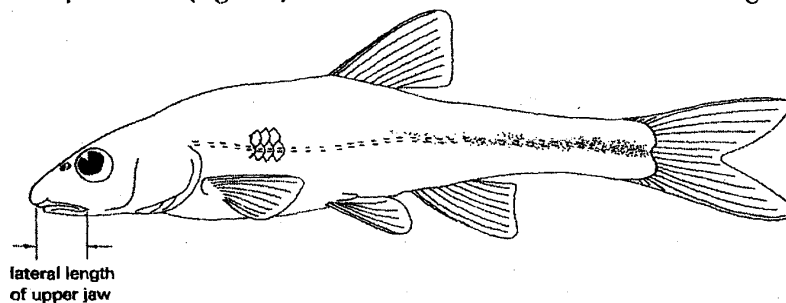
- 43a. Breast scaled. Pigment absent on inner borders of jaws, on floor and roof of mouth, and on oral valve. Lateral stripe often producing a zigzag (scales of next row above lateral line with dark bars alternating with the black marks on lateral line scales). Teeth 1,4-4,1 or 4-4.
BLACKCHIN SHINER
Notropis heterodon (Cope) Page 537



- 43b. Breast naked. Dark pigment conspicuous on inner borders of jaws, on floor and roof of mouth, and on oral valve. Solid dark lateral stripe 1 to 2 scales wide. Teeth 2,4-4,2.
IRONCOLOR SHINER
Notropis chalybaeus (Cope) Page 530

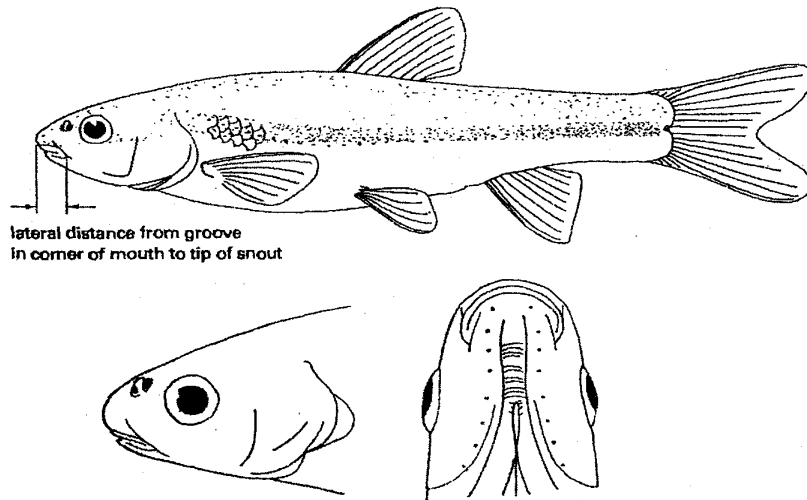


- 44a. Lateral length of upper jaw greater than eye diam. Teeth 1,4-4,1.
BIGMOUTH SHINER
Notropis dorsalis (Agassiz)..... Page 545



- 44b. Lateral length of upper jaw equal to or less than eye diam. 45

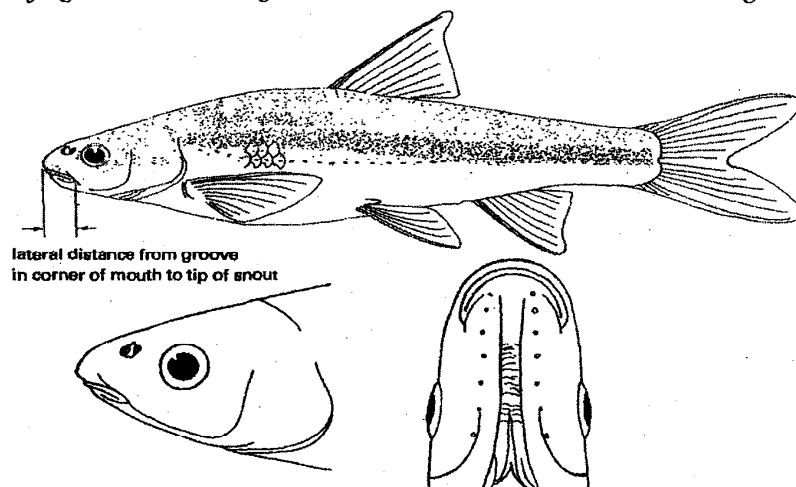
- 45a. Belly blackish (i.e., dusky to black peritoneum visible through white belly tissue). Lateral line scales usually 36–39 46
- 45b. Belly white; peritoneum silvery (may contain some dark chromatophores). Lateral line scales usually 32–35 48
- 46a. Eye diam into head length 3.4–3.9. Teeth 4–4.
OZARK MINNOW (see illustration under 41b.)
Notropis nubilus (Forbes) Page 578
- 46b. Eye diam into head length 4.1–4.7 47
- 47a. In adult, eye diam equal to or greater than lateral distance from groove in corner of mouth (lip groove) to tip of snout. Relaxed dorsal fin rounded. Eye diam into head length 4.1–4.5. Lateral length of mouth into width of gape 2.3–2.7. Teeth 4–4 with oblique grinding surfaces.
BRASSY MINNOW
Hybognathus hankinsoni Hubbs Page 582



- 47b. In adult, eye diam less than lateral distance from groove in corner of mouth (lip groove) to tip of snout. Relaxed dorsal fin pointed. Eye diam into head length 4.5–4.7. Lateral length of mouth into width of gape 2.0–2.3. Teeth 4–4 with oblique grinding surfaces.

MISSISSIPPI SILVERY MINNOW

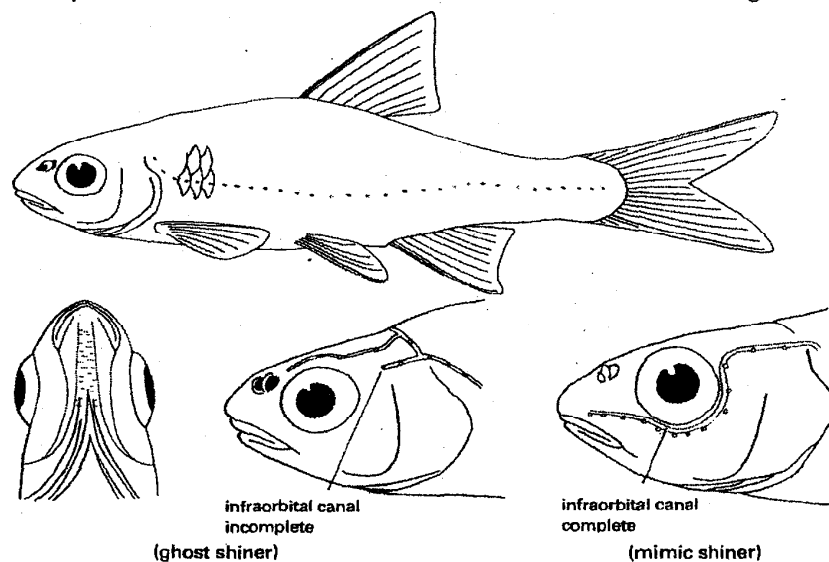
Hybognathus nuchalis Agassiz..... Page 587



- 48a. Infraorbital canal short or undeveloped. Pigment absent on sides of body; chromatophores absent on lateral line scales. Teeth 4–4.

GHOST SHINER

Notropis buchanani Meek..... Page 570

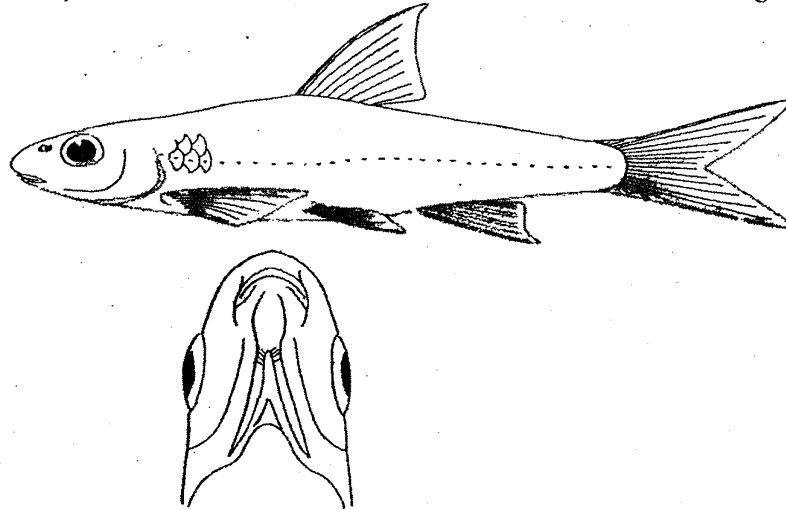


- 48b. Infraorbital canal entire, extending from lateral line canal along lower edge of eye toward nostril. Pigment present on side of body; chromatophores present on lateral line scales, and faint lateral stripe (often seen only under magnification in the pallid shiner)..... 49

- 49a. Mouth ventral, 25° or less with horizontal. Tip of snout in adult anterior to upper lip 0.4 mm or more. Teeth 1,4-4,1.

PALLID SHINER

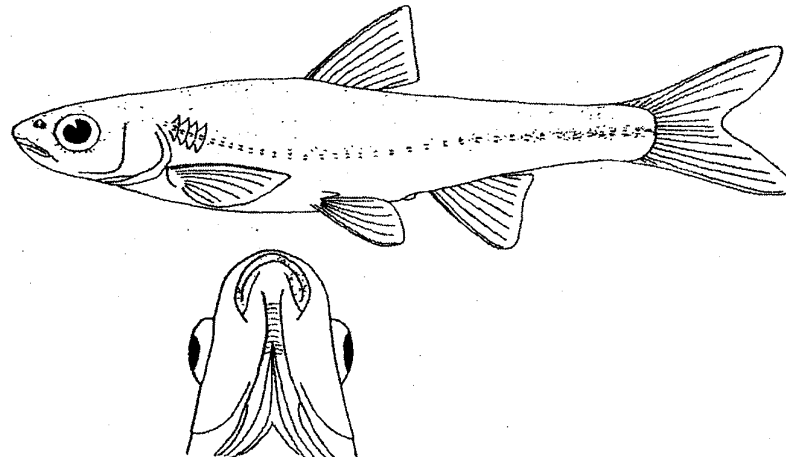
Notropis amnis Hubbs and Greene Page 502



- 49b. Mouth oblique, 30° or more with horizontal. Tip of snout in adult scarcely anterior to upper lip. Teeth 4-4.

MIMIC SHINER

Notropis volucellus (Cope) Page 566



Key to the Suckers

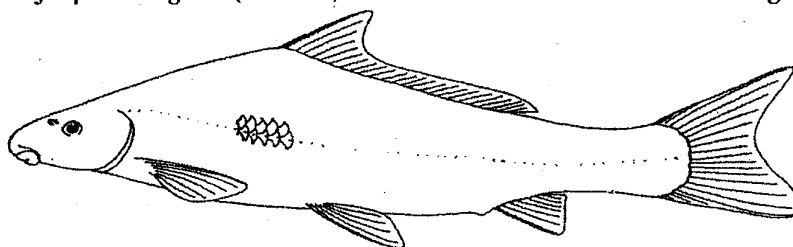
1a. Dorsal fin with more than 20 rays; length of its base into SL less than 4.0 2

1b. Dorsal fin with 18 or fewer rays; length of its base into SL greater than 4.0 8

2a. Lateral line scales more than 50. Eye closer to posterior edge of opercular membrane than to tip of snout. Body depth into SL 4.0-4.4.

BLUE SUCKER

Cyprinus elongatus (Lesueur) Page 611



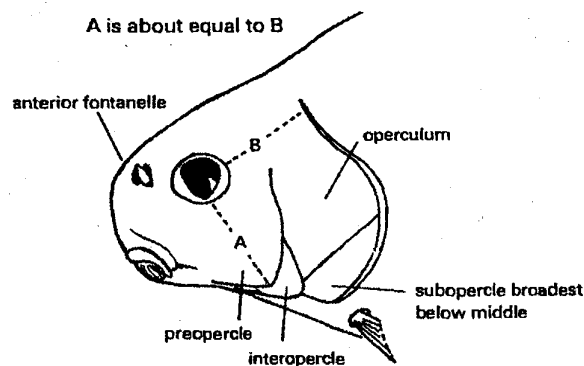
2b. Lateral line scales fewer than 50. Eye closer to tip of snout than to posterior edge of opercular membrane. Body depth into SL less than 4.0

Carpoides spp. or *Ictiobus* spp. 3

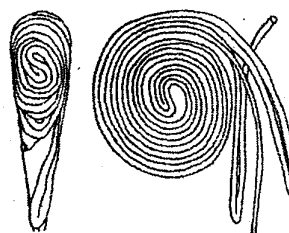
3a. Subopercle broadest below middle. Distance A is about equal to B. Anterior fontanelle (locate by probing dorsal surface of head between nostrils) present. Lower fins cream-colored, colorless, or clear, almost lacking in pigment. Anterior lobe of dorsal fin essentially filamentous. Intestinal configuration of circular loops.

Carpoides spp. (the carpsuckers) 4

A is about equal to B



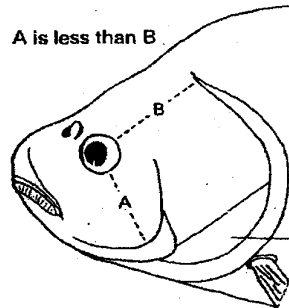
(river carpsucker)



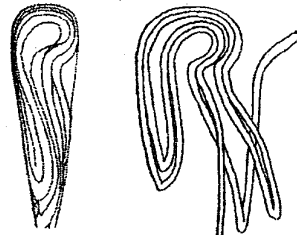
intestinal configuration
(Berner 1948:141)

- 3b. Subopercle broadest at middle. Distance A is less than B. Anterior fontanelle much reduced or lacking. Lower fins darkly pigmented. Anterior lobe of dorsal fin rounded or pointed, but not filamentous. Intestinal configuration of elongated loops. *Ictiobus* spp. (the buffaloes) 6

A is less than B

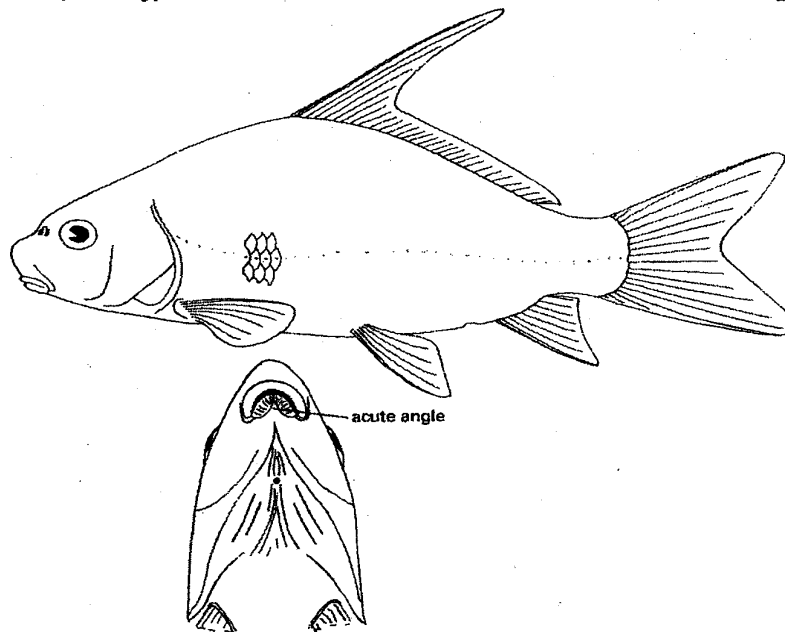


(bigmouth buffalo)



intestinal configuration
(Bernier 1948:141)

- 4a. No knob on tip of lower lip. Posterior edge of lower lip forming an acute angle. Tip of lower lip clearly in advance of anterior nostril. Snout in lateral view usually notched. Scales in lateral line usually 36–40. Body depth into SL 2.6–3.2. Head length into SL 3.2–3.8. **QUILLBACK**
Carpionodes cyprinus (Lesueur) Page 630

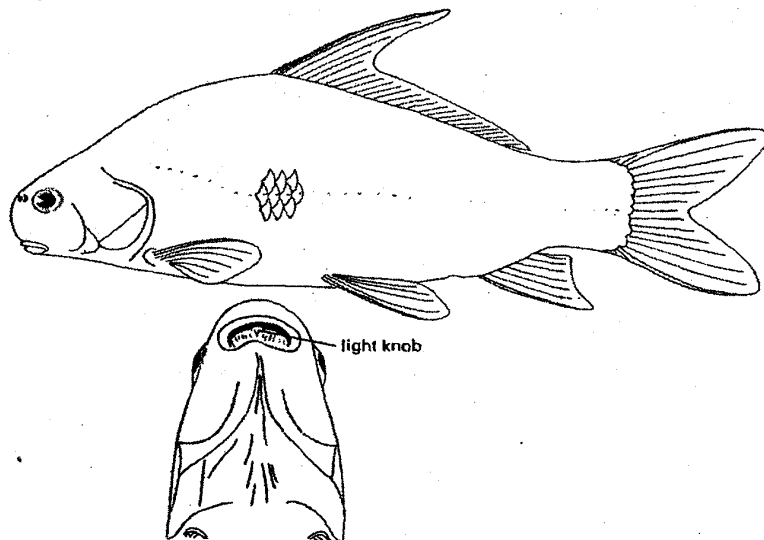


- 4b. Light knob on tip of lower lip. Posterior edge of lower lip usually forming an obtuse angle. Tip of lower lip scarcely or not at all in advance of anterior nostril. Snout in lateral view usually rounded and not notched. Scales in lateral line usually 33–37. Body depth into SL 2.2–3.1. Head length into SL 3.5–4.3. 5

- 5a. Body depth into SL 2.5–3.1. Length of anterior rays of depressed dorsal fin usually less than $\frac{1}{2}$ length of dorsal fin base.

RIVER CARPSUCKER

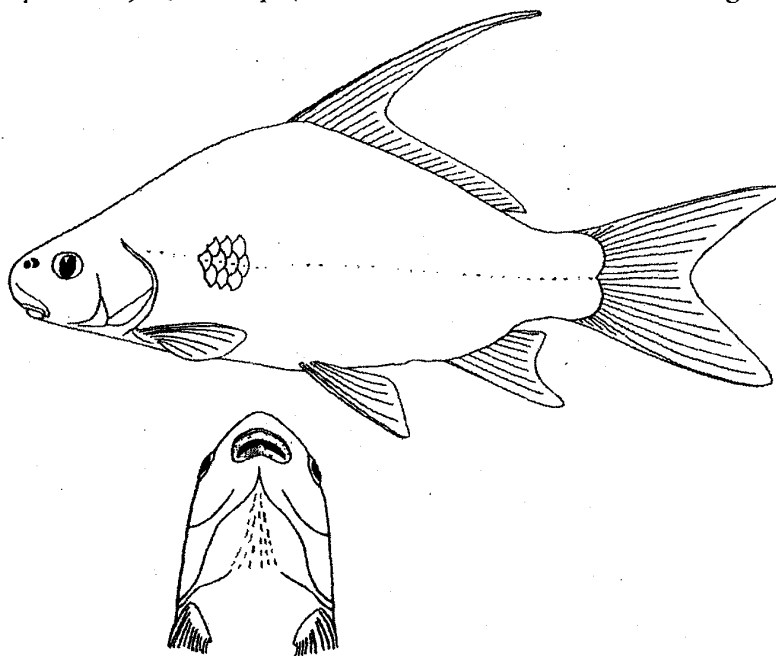
Carpiodes carpio (Rafinesque) Page 634



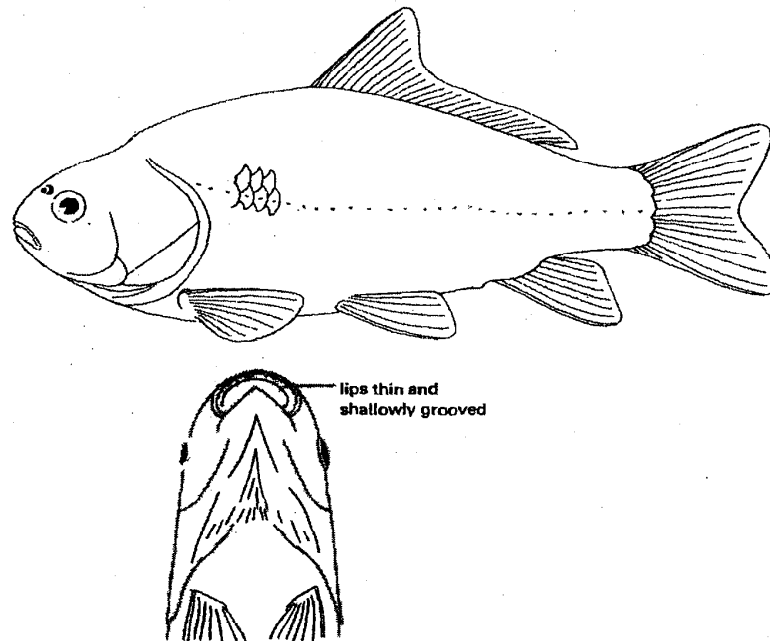
- 5b. Body depth into SL 2.2–2.6. Length of anterior rays of depressed dorsal fin usually greater than length of dorsal fin base.

HIGHFIN CARPSUCKER

Carpiodes velifer (Rafinesque) Page 638



- 6a. Mouth large, terminal, and extremely oblique. Tip of upper lip about level with lower margin of eye. Lips thin and shallowly grooved. Length of upper jaw nearly equal to snout length.
BIGMOUTH BUFFALO
Ictiobus cyprinellus (Valenciennes) Page 615

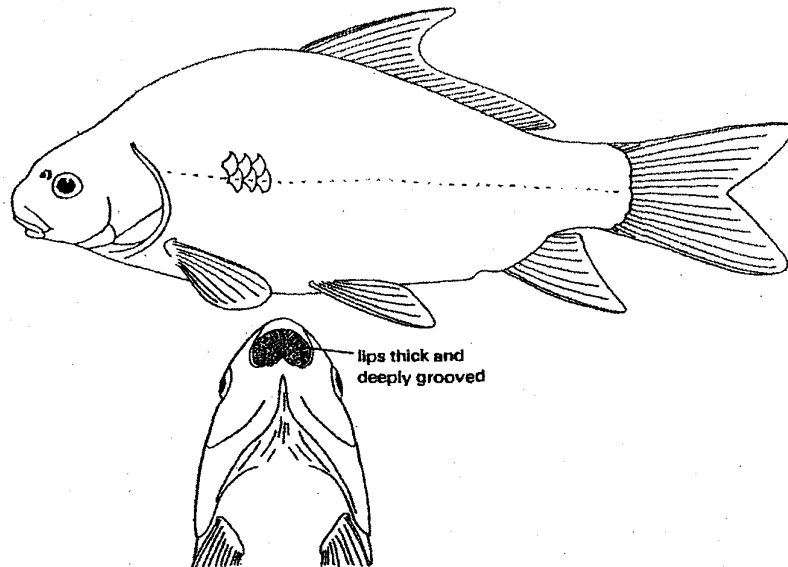


- 6b. Mouth smaller, subterminal, and almost horizontal. Tip of upper lip at a level far below lower margin of eye. Lips thick and deeply grooved. Length of upper jaw much less than snout length 7

- 7a. Body depth into SL 2.4–2.8. Back highly arched and compressed into mid-dorsal ridge (appearing humpbacked in combination with small head). Head small, its length into SL 3.4–4.1. Length of anterior rays of dorsal fin into dorsal fin base about 1.6. Length of upper jaw into snout length 1.5–2.0. Head thickness at opercular bulge into SL 5.2–6.1.

SMALLMOUTH BUFFALO

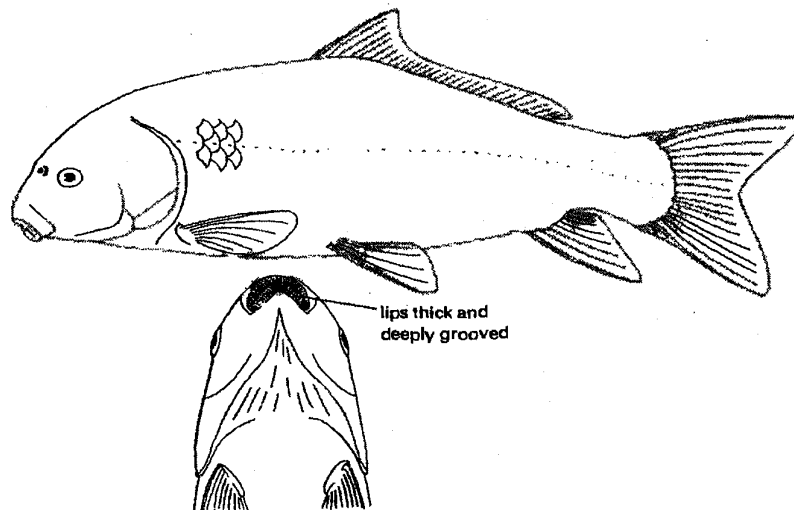
Ictiobus bubalus (Rafinesque)..... Page 625



- 7b. Body depth into SL 2.9–3.5. Back not highly arched or ridged but rounded over top from side to side. Head large, its length into SL 2.9–3.8. Length of anterior rays of dorsal fin into dorsal fin base 2.2–2.5. Length of upper jaw into snout length 2.0–2.5. Head thickness at opercular bulge into SL 4.7–5.4.

BLACK BUFFALO

Ictiobus niger (Rafinesque) Page 621

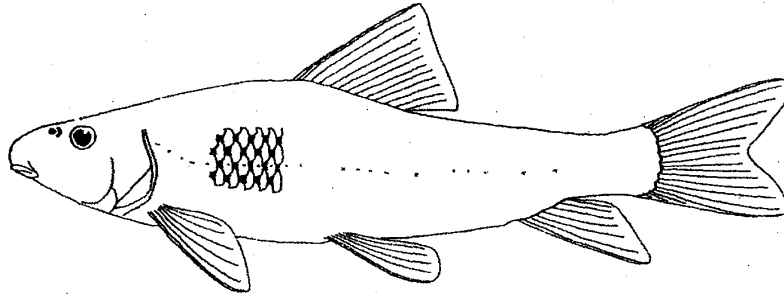


- 8a. Lateral line incomplete (developed anteriorly in adult spotted sucker) or absent 9
- 8b. Lateral line complete and well developed 11

- 9a. Lateral series scales 42–46. Distinct blackish spot present on each scale base, resulting in series of longitudinal stripes which are most distinct (except in the smallest young where the faint spots and stripes may be restricted to region above anal fin base). Body depth into SL usually greater than 4.0. Lateral line somewhat developed anteriorly in adults.

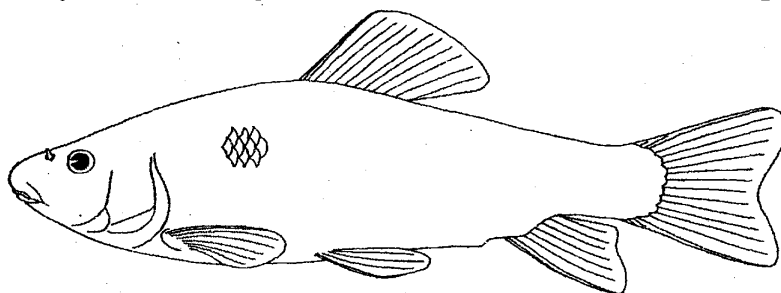
SPOTTED SUCKER

Minytrema melanops (Rafinesque) Page 642

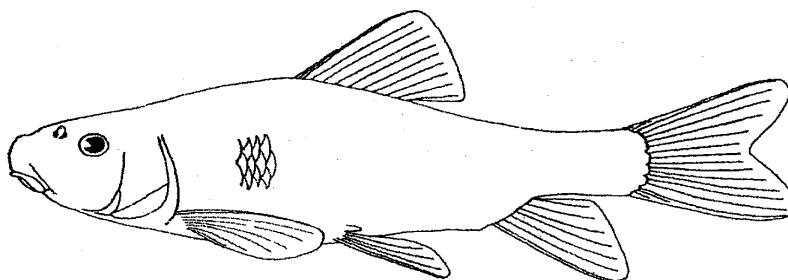


- 9b. Lateral series scales 35–41 (33–45). Blackish spot absent on each scale base. Body depth into SL usually less than 3.5. Lateral line lacking at all ages.
Erimyzon spp. (the chubsuckers) 10

- 10a. Dorsal rays 11 or 12 (10–13). Lateral series scales 35–37 (33–40). Body depth into SL usually 3.3 or less. Unbroken, blackish lateral stripe very distinct in young, least distinct in large adults.
LAKE CHUBSUCKER
Erimyzon sucetta (Lacepède) Page 646



- 10b. Dorsal rays 9 or 10 (8–11). Lateral series scales 39–41 (37–45). Body depth into SL usually 3.3 or more. Dusky lateral stripe broken into series of more or less confluent blotches (these blotches sometimes very faint or absent in large adults).
CREEK CHUBSUCKER
Erimyzon oblongus (Mitchill) Page 650

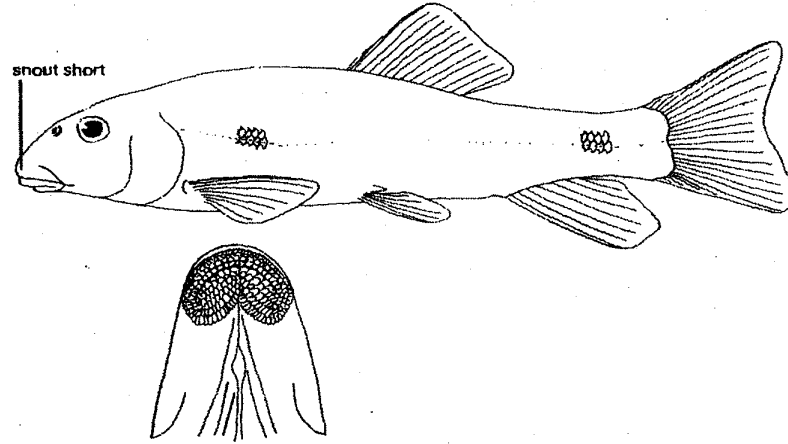


- 11a. Lateral line scales 55 or more.
Catostomus spp. 12
- 11b. Lateral line scales fewer than 54 13

- 12a. Lateral line scales 55–85. Snout short, scarcely protruding beyond upper lip.

WHITE SUCKER

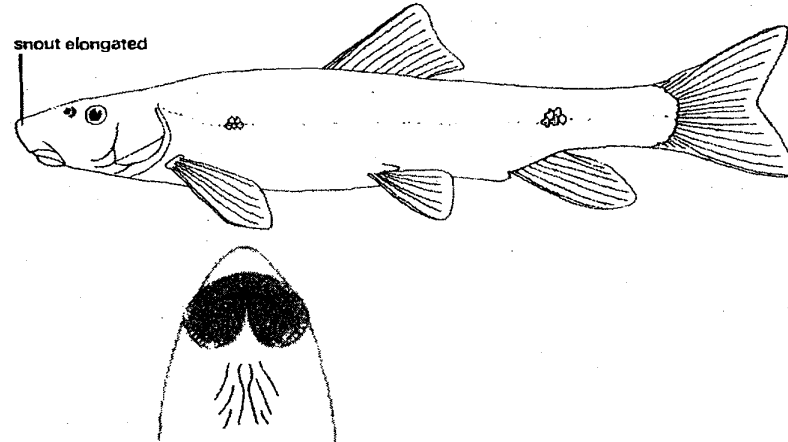
Catostomus commersoni (Lacepède) Page 682



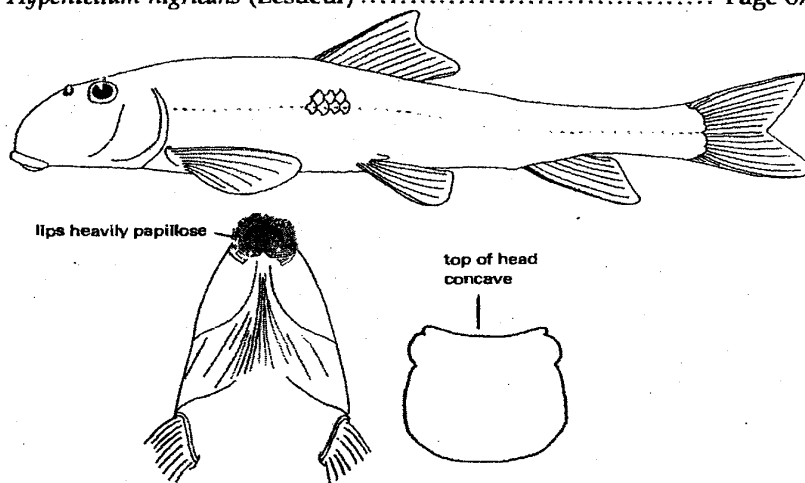
- 12b. Lateral line scales more than 90. Snout elongated, protruding well beyond upper lip.

LONGNOSE SUCKER

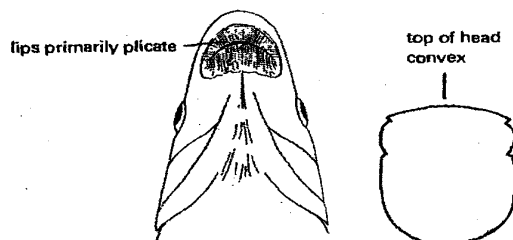
Catostomus catostomus (Forster) Page 688



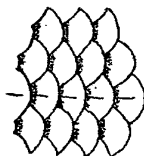
- 13a. Top of head between eyes concave. Body with 5 (4-6) dark, usually prominent oblique bars. Lips heavily papillose.
NORTHERN HOG SUCKER
Hypentelium nigricans (Lesueur) Page 678



- 13b. Top of head between eyes usually convex. Body not marked with dark oblique bars. Lips primarily plicate, but may be papillose posteriorly and in corners.
Moxostoma spp (the redhorses) 14



- 14a. Body scales, principally above lateral line, with distinct, dark spots at their bases. Tail always pink, red, or carmine in life; color soon fades in preserved specimens 15

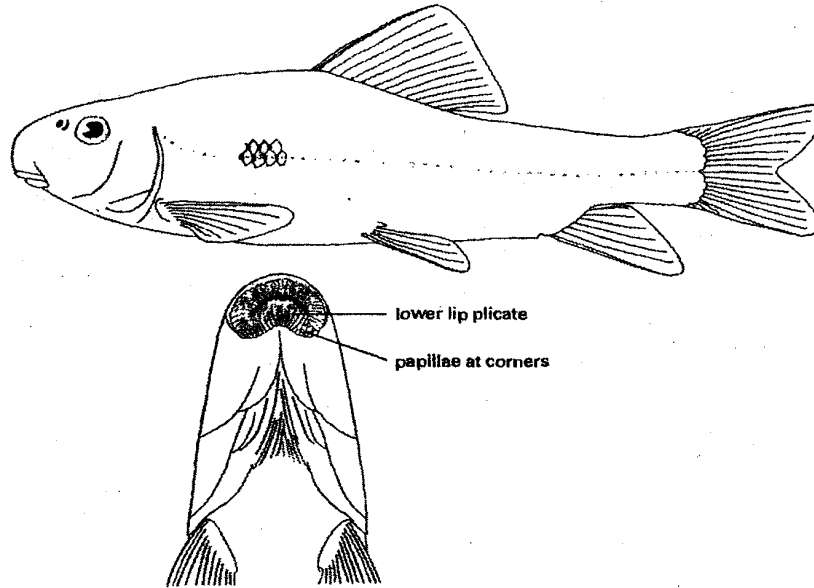


- 14b. Body scales without dark spots at their bases. Tail always slate-colored in life 17

- 15a. Scales around caudal peduncle 16 (7 above and 7 below the 2 lateral lines). Lower lip plicate with few papillae at corners. Dorsal fin slightly concave in young to convex in adults. Pharyngeal teeth heavy, comb-like.

GREATER REDHORSE

Moxostoma valenciennesi Jordan Page 670

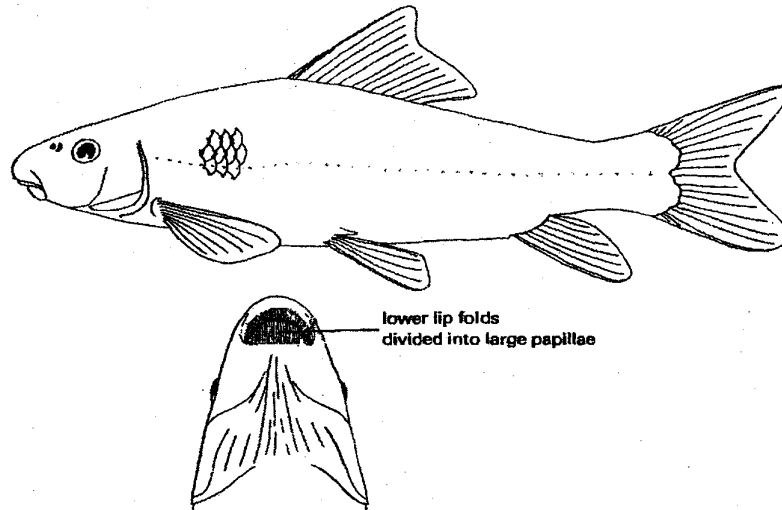


- 15b. Scales around caudal peduncle 12 (5 above and 5 below the 2 lateral lines). Lower lip either entirely plicate or partially papillose, especially along posterior half. Dorsal fin falcate to straight. Pharyngeal teeth thin, comblike, or thick, molarlike..... 16

- 16a. Head small and short, its length into SL usually 4.3–5.4 in yearlings and adults, 3.5–4.0 in young less than 76 mm (3 in) TL. Mouth small. Folds of lower lip transversely divided into large papillae; lower lip appearing swollen; posterior edge forming a straight line, rarely an obtuse angle. Pharyngeal teeth about 53 per arch, thin and comblike. Dorsal fin falcate.

SHORthead REDHORSE

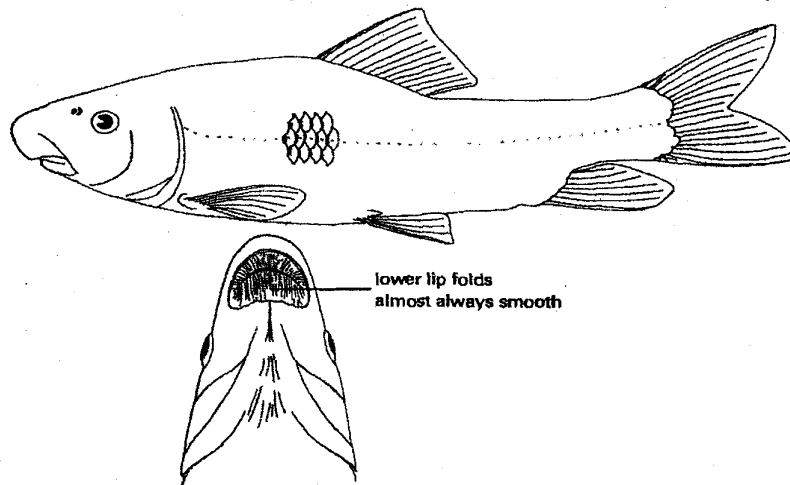
Moxostoma macrolepidotum (Lesueur)..... Page 665



- 16b. Head bulky and long, its length into SL usually less than 4.3 in yearlings and adults, 3.0–3.8 in young less than 76 mm (3 in) TL. Mouth large. Folds of lower lip almost always smooth; papillae absent; lower halves nearly straight along posterior margin, which may be weakly scalloped. Pharyngeal teeth 33–45 per arch, large and molarlike. Dorsal fin straight or slightly concave in large young and adults.

RIVER REDHORSE

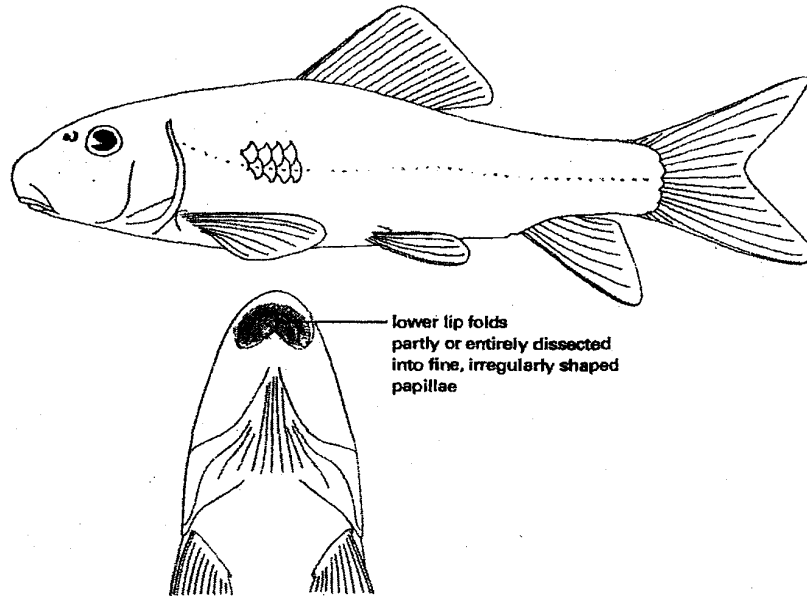
Moxostoma carinatum (Cope)..... Page 674



- 17a. Dorsal fin rays 15 (14–17). Length of dorsal fin base equal or almost equal to distance from back of head to dorsal fin origin. Lower lip folds partly or entirely dissected into fine, irregularly shaped papillae; lower lip halves forming an angle of about 90°. Dorsal fin slightly concave to convex.

SILVER REDHORSE

Moxostoma anisurum (Rafinesque)..... Page 661

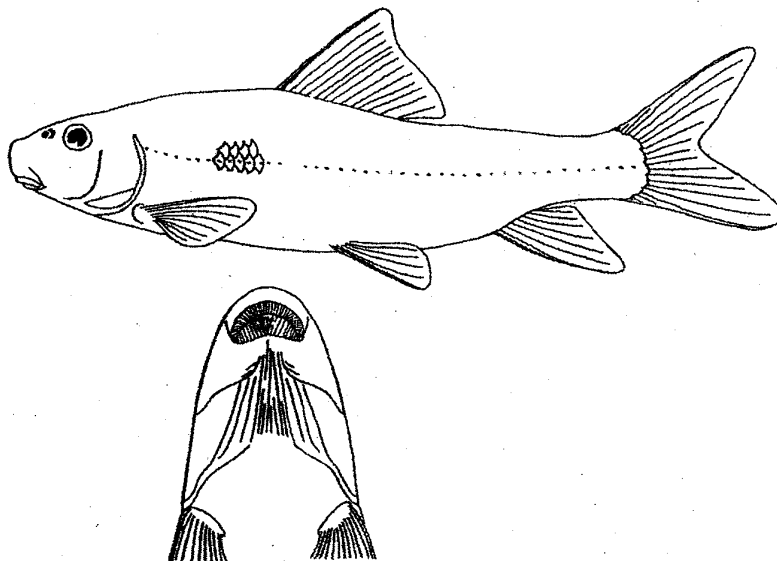


- 17b. Dorsal fin rays 12 or 13 (10–15). Length of dorsal fin base $\frac{3}{4}$ – $\frac{3}{4}$ the distance from back of head to dorsal fin origin. Lower lip folds not dissected into papillae; lower lip halves in an almost straight line or broad obtuse angle, usually over 100°. Dorsal fin slightly falcate 18

- 18a. Lateral line scales 40–42 (37–45). Rays of pelvic fins usually 9, rarely 8 or 10. Least depth of caudal peduncle into its length usually less than 1.6. Snout blunt to rounded but not overhanging mouth. Head length into SL 3.9–4.3.

GOLDEN REDHORSE

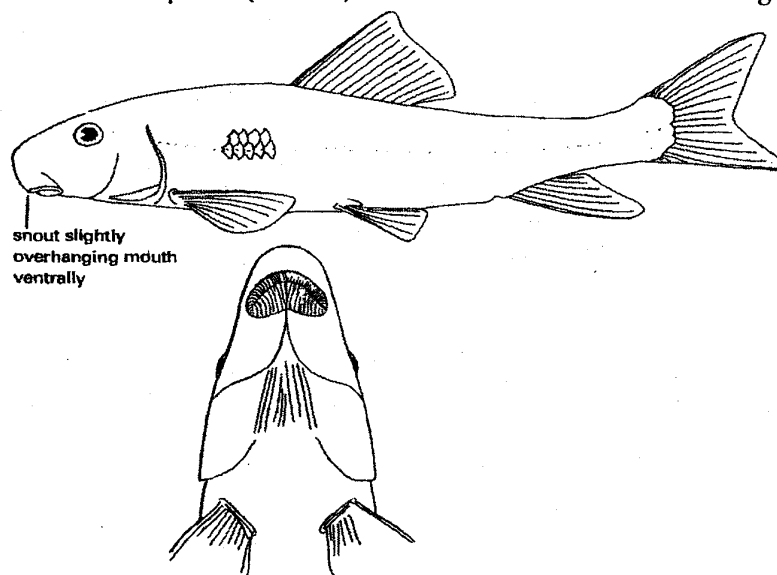
Moxostoma erythrurum (Rafinesque)..... Page 657



- 18b. Lateral line scales 44–47 (43–51). Rays of 1 or both pelvic fins usually 10 (8–11). Least depth of caudal peduncle into its length greater than 1.7. Snout rounded and swollen, slightly overhanging mouth ventrally. Head length into SL 4.1–4.8.

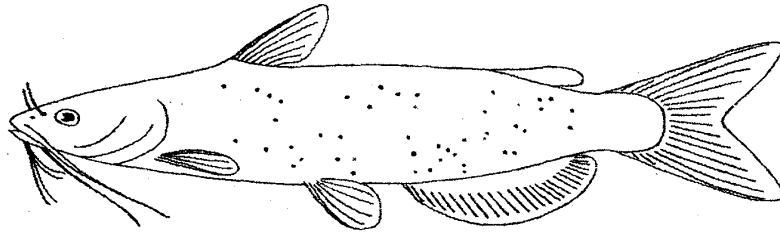
BLACK REDHORSE

Moxostoma duquesnei (Lesueur)..... Page 653

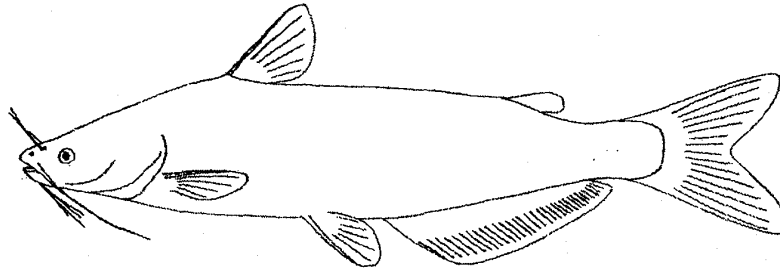


Key to the Bullhead Catfishes

- 1a. Adipose fin with its posterior margin flaplike and free, not fused to back or to caudal fin posteriorly 2
- 1b. Adipose fin with its posterior margin fused to back and to caudal fin, and separated from caudal fin by not more than an incomplete notch 7
- 2a. Caudal fin deeply forked 3
- 2b. Caudal fin not deeply forked, its rear margin rounded, straight, or with a slight notch 4
- 3a. Outer margin of anal fin rounded; anal fin rays 24–27 including rudimentaries. Body with dark spots except in large adults. Swim bladder of paired lateral chambers, no posterior chamber.
CHANNEL CATFISH
Ictalurus punctatus (Rafinesque) Page 712



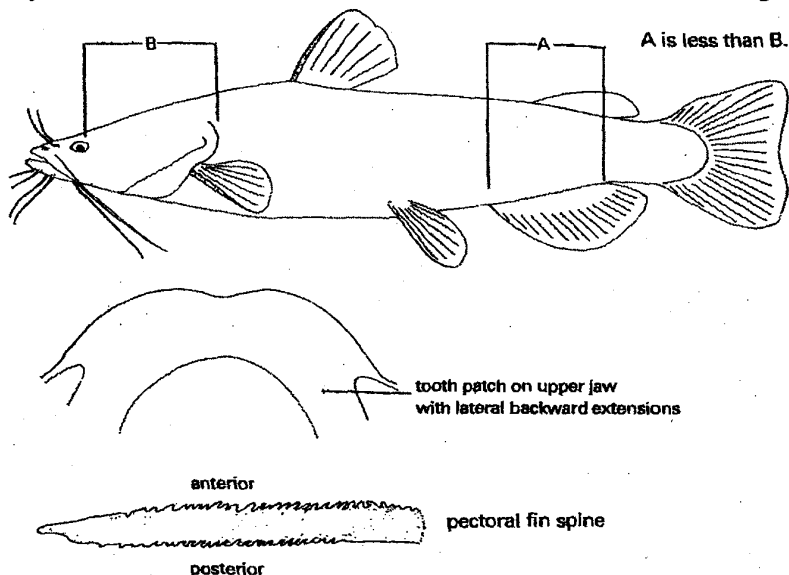
- 3b. Outer margin of anal fin straight, anal fin rays 30–36 including rudimentaries. Body without dark spots. Swim bladder with paired lateral chambers and a posterior chamber.
BLUE CATFISH
Ictalurus furcatus (Lesueur) (Not in Wisconsin. See page 694.)



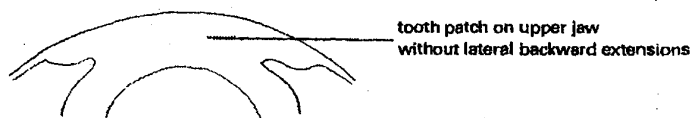
- 4a. Lower jaw protruding beyond upper jaw. Tooth patch on upper jaw with elongate lateral backward extensions. Length of anal fin base (A) less than distance from back of eye to rear margin of operculum (B). Pectoral fin spine strongly toothed along both anterior (teeth pointing toward base) and posterior (teeth pointing toward tip) edges.

FLATHEAD CATFISH

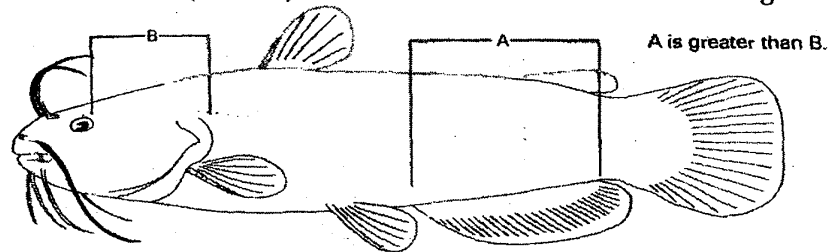
Pylodictis olivaris (Rafinesque) Page 728



- 4b. Upper jaw extending beyond lower jaw. Tooth patch on upper jaw without lateral backward extensions. Length of anal fin base (A) greater than distance from back of eye to rear margin of operculum (B) (see illustration under 5a). Pectoral fin spine slightly rough to strongly toothed along posterior edge; along anterior edge weakly notched near tip 5

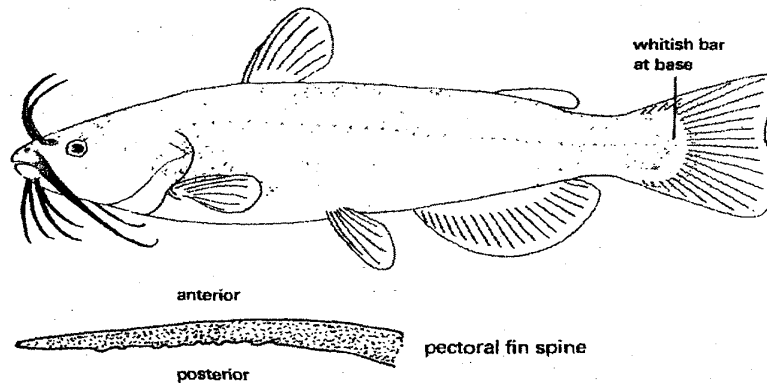


- 5a. Anal fin rays 24–27 including rudimentaries. Chin barbels whitish.
Caudal fin rounded.
YELLOW BULLHEAD
Ictalurus natalis (Lesueur)..... Page 708



- 5b. Anal fin rays 15–24 including rudimentaries. Chin barbels gray to black.
Caudal fin squarish and slightly notched 6

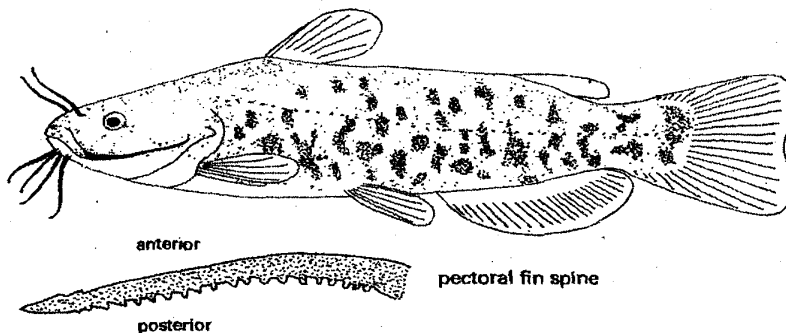
- 6a. Pectoral fin spine toothless along posterior edge or with irregular or poorly developed teeth. Side not mottled. Interradial membranes of fins jet-black. Adults with whitish bar at caudal fin base. Anal fin rays 15–21 including rudimentaries.
BLACK BULLHEAD
Ictalurus melas (Rafinesque)..... Page 697



- 6b. Pectoral fin spine with strong, sawlike teeth along posterior edge. Side mottled. Interradial membranes of fins dark but not jet-black. Adults without whitish bar at caudal fin base. Anal fin rays 21-24 including rudimentaries.

BROWN BULLHEAD

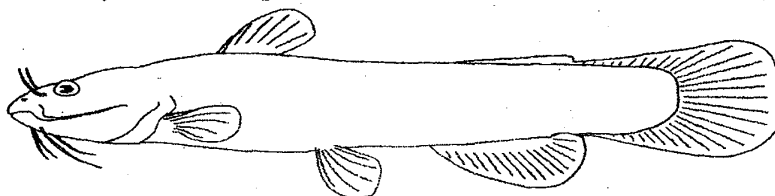
Ictalurus nebulosus (Lesueur)..... Page 702



- 7a. Tooth patch of upper jaw with lateral backward extensions (see illustration under 4a). Tip of upper jaw projecting well beyond lower jaw. Caudal fin elongate, rectangular-appearing with more-or-less straight rear edge. Large, light, rectangular-shaped patch from back of head to near origin of dorsal fin; small, roundish, light patch immediately posterior to base of dorsal fin.

STONECAT

Noturus flavus Rafinesque Page 725

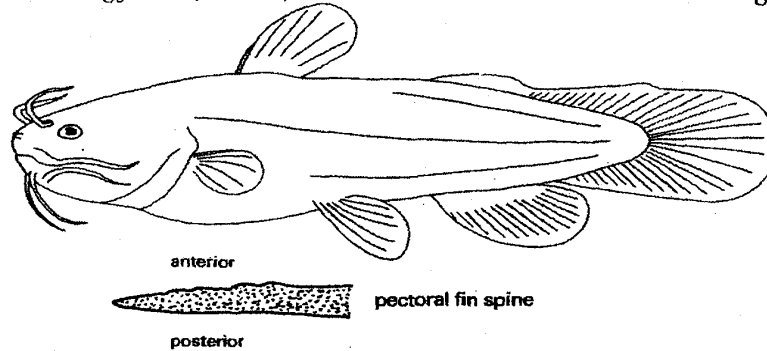


- 7b. Tooth patch of upper jaw without lateral backward extensions. Tips of jaws about equal. Caudal fin oval-appearing with rounded rear edge. Light patches behind head and dorsal fin absent or appearing as transverse bands 8

- 8a. Pectoral fin spine smooth on posterior edge. Distance from end of caudal fin to notch between adipose and caudal fins contained once or less in distance from notch to posterior base of dorsal fin. Usually 3 dark longitudinal streaks on each side and dark lines outlining the muscle segments. No transverse light bands behind head and dorsal fin. Anal, caudal, and dorsal fins not dark edged.

TADPOLE MADTOM

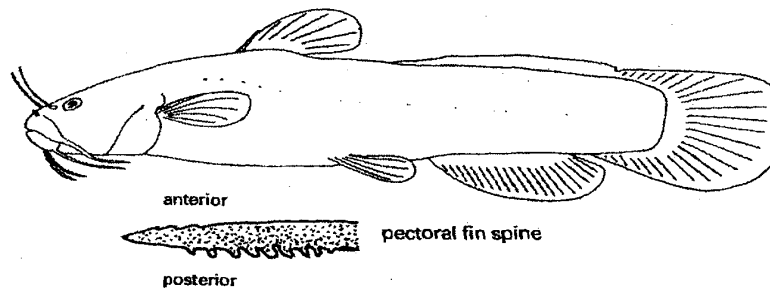
Noturus gyrinus (Mitchill) Page 719



- 8b. Pectoral spine with well-developed teeth on posterior edge. Distance from end of caudal fin to notch between adipose and caudal fins contained decidedly more than once in distance from notch to posterior base of dorsal fin. Dark longitudinal streaks on sides absent; muscle segments not outlined with dark lines. Transverse light bands behind head and dorsal fin. Anal, caudal, and dorsal fins usually dark edged.

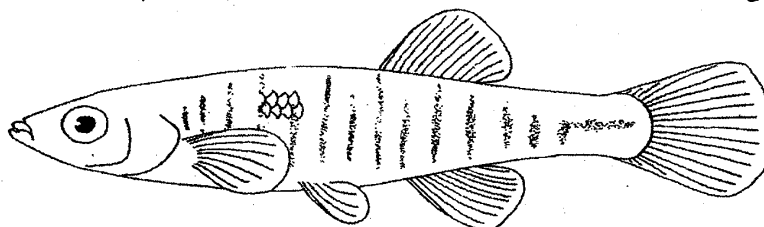
SLENDER MADTOM

Noturus exilis Nelson Page 722



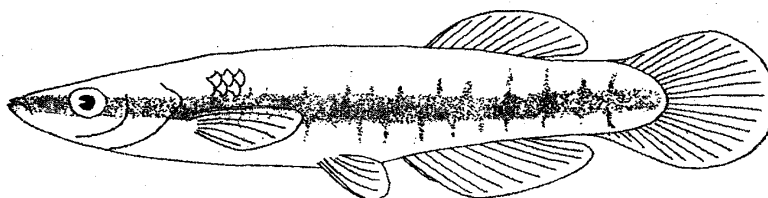
Key to the Killifishes

- 1a. Dorsal fin origin distinctly in advance of anal fin origin. Lateral series scales 39–43. No broad dark lateral stripe or dark blotch under eye.
BANDED KILLIFISH
Fundulus diaphanus (Lesueur)..... Page 755

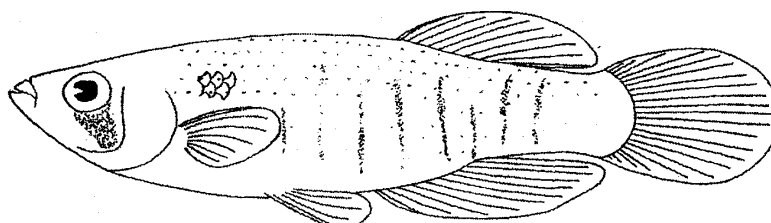


- 1b. Dorsal fin origin distinctly behind anal fin origin. Lateral series scales fewer than 38. Either broad dark lateral stripe or dark blotch under eye present 2

- 2a. Broad dark lateral stripe present; no thin, dotted horizontal stripes. No dark blotch ("teardrop") under eye. Body depth into SL generally greater than 4.
BLACKSTRIPE TOPMINNOW
Fundulus notatus (Rafinesque)..... Page 759

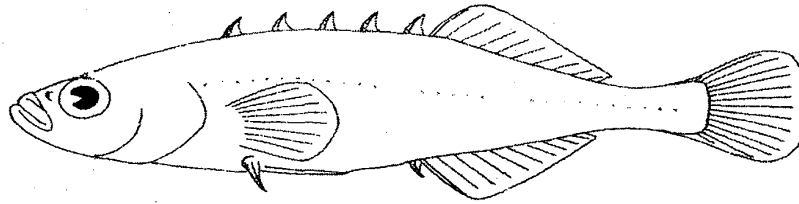


- 2b. Broad dark lateral stripe absent; instead, 7 or 8 thin, dotted horizontal stripes. Dark blotch ("teardrop") under eye. Body depth into SL usually 4 or less.
STARHEAD TOPMINNOW
Fundulus notti (Agassiz)..... Page 763

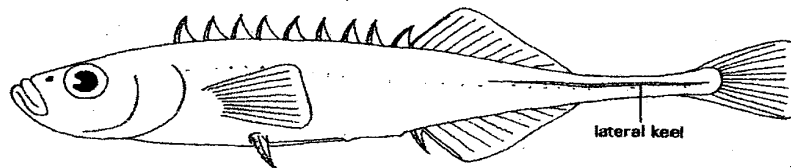


Key to the Sticklebacks

- 1a. Dorsal spines 4–6. Caudal peduncle deeper than wide, without trace of a lateral keel. Caudal fin rounded.
BROOK STICKLEBACK
Culaea inconstans (Kirtland)..... Page 777



- 1b. Dorsal spines 8–11. Caudal peduncle wider than deep, with sharp lateral keels. Caudal fin truncate to slightly notched.
NINESPINE STICKLEBACK
Pungitius pungitius (Linnaeus)..... Page 782

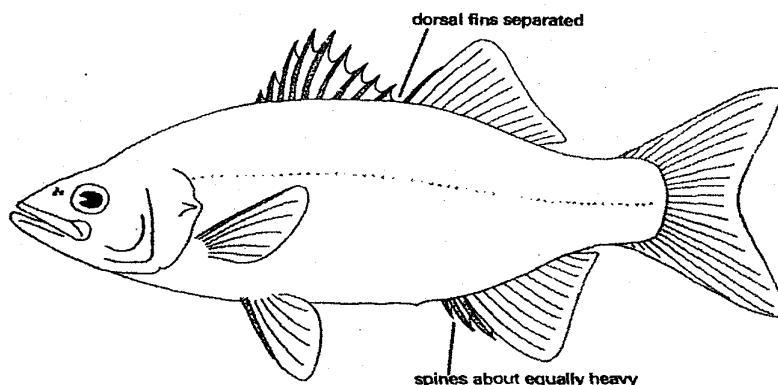


Key to the Temperate Basses

- 1a. Spinous dorsal fin and soft dorsal fin entirely separate. Anal spines graduated—first spine $\frac{1}{3}$ or more length of second spine, third spine considerably longer than second; second and third spines about equally heavy. Soft anal fin rays 12 or 13. Color largely silvery; lateral stripes narrower and not usually broken or offset above origin of anal fin.

WHITE BASS

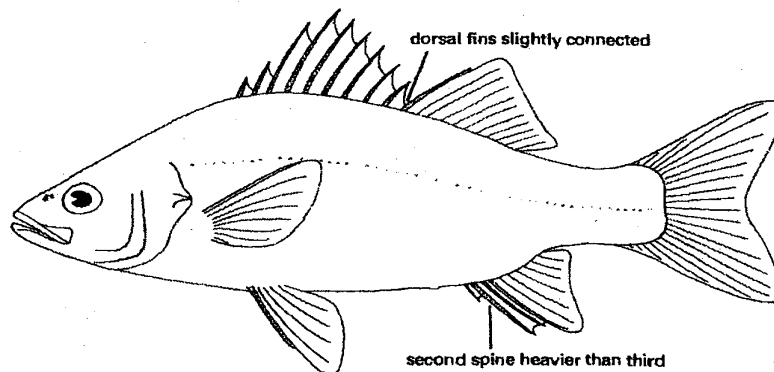
Morone chrysops (Rafinesque)..... Page 789



- 1b. Spinous dorsal fin and soft dorsal fin slightly connected by membrane. Anal spines not graduated—first spine less than $\frac{1}{3}$ length of second spine, second spine almost equal to third; second spine much heavier than third. Soft anal fin rays 8–10. Color largely yellowish or olive; lower lateral stripes broader and usually sharply broken and offset above origin of anal fin.

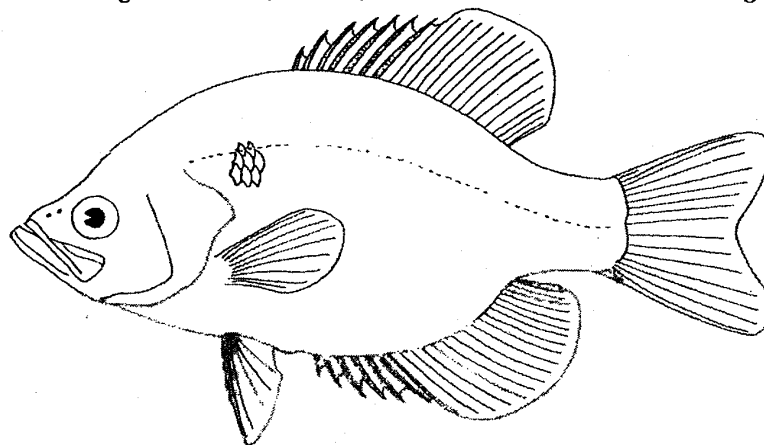
YELLOW BASS

Morone mississippiensis Jordan and Eigenmann Page 794

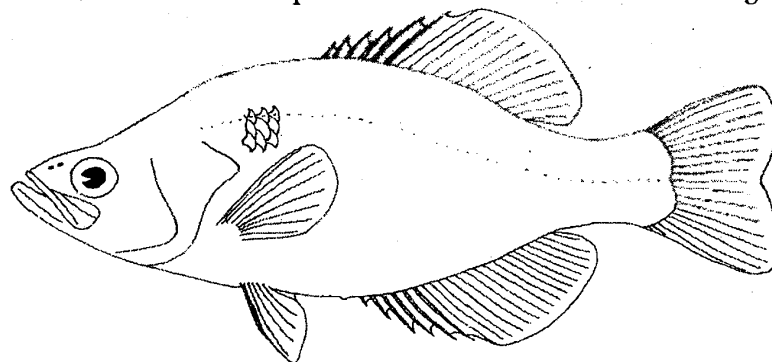


Key to the Sunfishes*

- 1a. Dorsal fin spines 6–8. Base of anal fin equal to or slightly longer than base of dorsal fin.
Pomoxis spp. (the crappies)..... 2
- 1b. Dorsal fin spines 10–12 (9–12). Base of anal fin much shorter than base of dorsal fin, anal fin base into dorsal fin base 1.5–3.0..... 3
- 2a. Dorsal fin spines 7 or 8 (6–9). Length of dorsal fin base about equal to distance from front of dorsal fin to eye. Irregular dark blotches and white spots on side; dorsal, caudal, and anal fins strongly vermiculate.
BLACK CRAPPIE
Pomoxis nigromaculatus (Lesueur) Page 863



- 2b. Dorsal fin spines 6 (4–7). Length of dorsal fin base much less than distance from front of dorsal fin to eye. Dark to faint vertical bars on side; dorsal and caudal fins strongly vermiculate, anal fin less so.
WHITE CRAPPIE
Pomoxis annularis Rafinesque..... Page 857

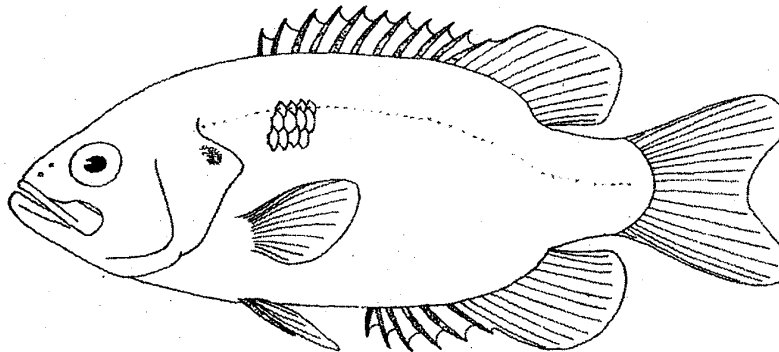


*Characteristics of common *Lepomis* hybrids are listed on page 157.

3a. Anal fin spines 5-7.

ROCK BASS

Ambloplites rupestris (Rafinesque) Page 852



3b. Anal fin spines 3 4

4a. Scales small, more than 55 in lateral line

Micropterus spp. (the basses) 5

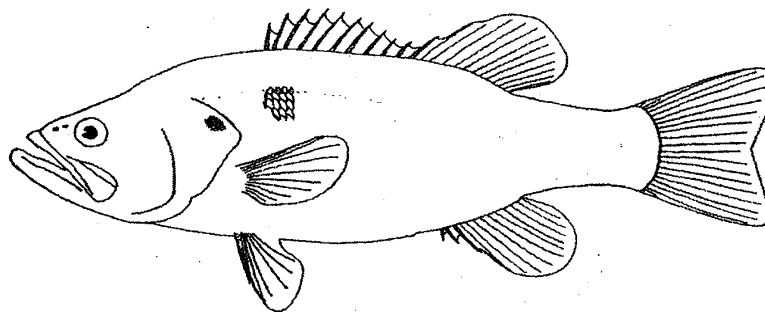
4b. Scales large, fewer than 55 in lateral line

Lepomis spp. (the sunfishes) 6

5a. Mouth large, upper jaw extending beyond posterior margin of eye in large fish. Lateral line scales 60-68. Dorsal fins almost divided, shortest posterior spine less than 1/2 the longest. Young with prominent lateral stripe and without colorful pigment on caudal fin.

LARGEMOUTH BASS

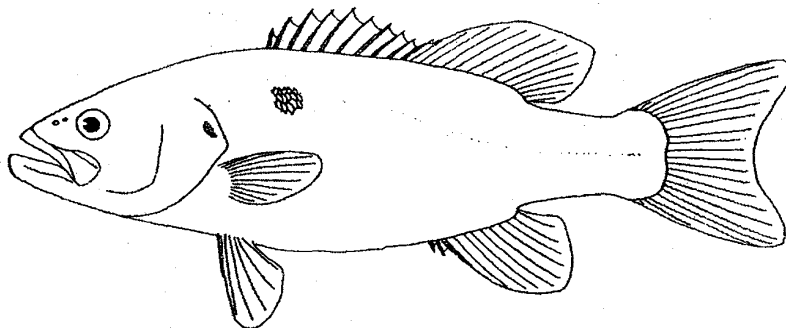
Micropterus salmoides (Lacepède) Page 809



- 5b. Mouth moderate, upper jaw extending from middle to posterior margin of eye, never beyond. Lateral line scales 69–80. Dorsal fins moderately connected, shortest posterior spine greater than $\frac{1}{2}$ the longest. Young without lateral stripe but having caudal fin with conspicuous yellow-orange base and dark crescent-shaped band through middle.

SMALLMOUTH BASS

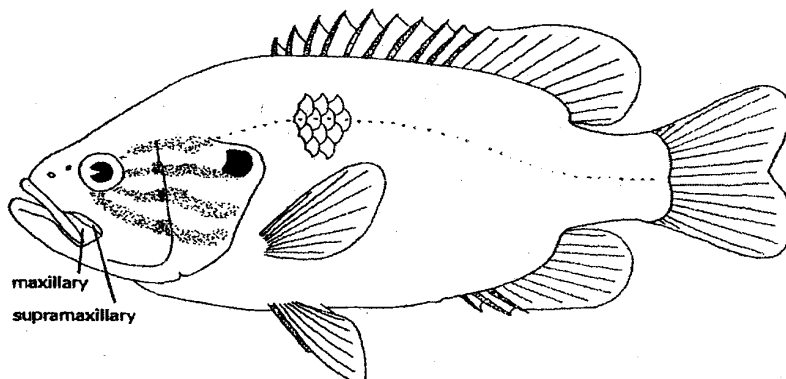
Micropterus dolomieu Lacepède..... Page 801



- 6a. Teeth present in midtongue. Supramaxillary well developed, its length greater than the greatest width of maxillary. Head with 3–5 distinct dark lines radiating posteriorly from eye; general body color pattern similar to that of rock bass.

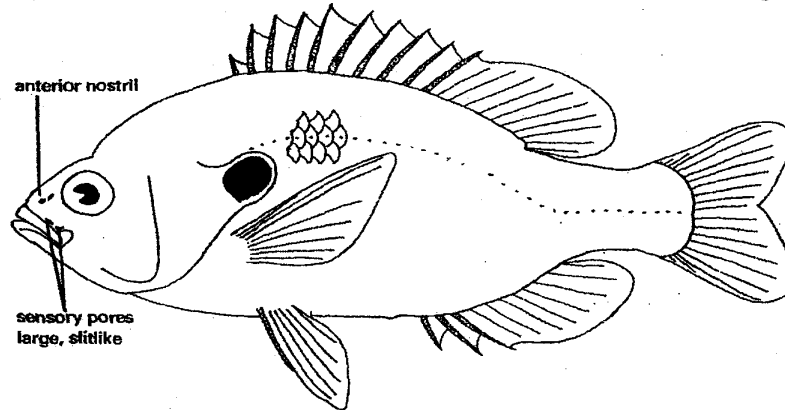
WARMOUTH

Lepomis gulosus (Cuvier)..... Page 817



- 6b. No teeth on tongue (rarely a few in green sunfish). Supramaxillary reduced or absent, its length when present less than greatest width of maxillary. Head with no distinct dark lines radiating posteriorly from eye..... 7

- 7a. Pectoral fin when laid forward across cheek reaches anterior edge of eye or beyond; pectoral fin long and pointed, its length into SL about 3 8
- 7b. Pectoral fin when laid forward across cheek reaches only posterior edge of eye; pectoral fin short and rounded, its length into SL about 4 10
- 8a. "Earflap" has narrow, even, light-colored margin along entire edge. Sensory pores of head (just above lip groove) large and slitlike, width of largest opening greater than diam of anterior nostril. Anal fin soft rays 8 or 9. Largest seldom more than 100 mm (4 in) TL.
ORANGESPOTTED SUNFISH
Lepomis humilis (Girard) Page 840

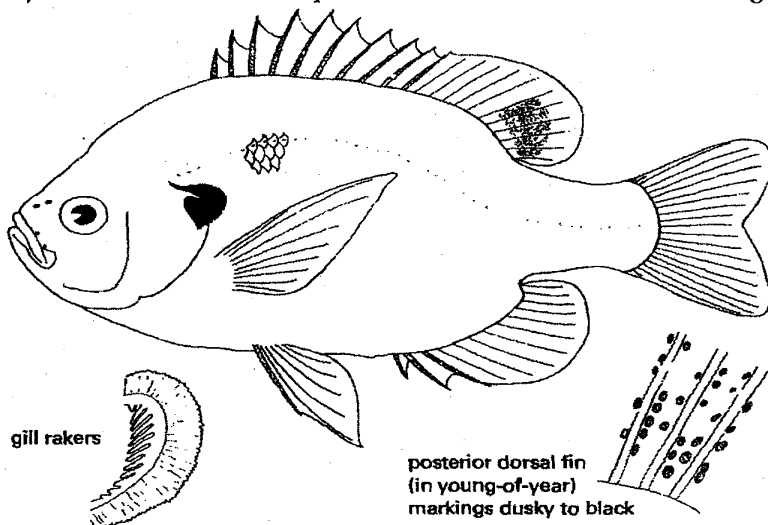


- 8b. "Earflap" is black or with margin becoming abruptly broader (light-colored spot, crimson in life) at posterior edge. Sensory pores of head small and round, width of largest openings less than diam of anterior nostril (see illustration under 9b). Anal fin soft rays 10-12. Often more than 125 mm (5 in) TL. 9

- 9a. "Earflap" black to edge without light-colored margin. Distinct black blotch present toward rear of dorsal fin. Gill rakers on first gill arch moderately long, straight, and pointed. (Young can be distinguished from pumpkinseed by long thin gill rakers and large, dark, well-defined oval to circular spots in last few interradiar membranes of soft dorsal fin.)

BLUEGILL

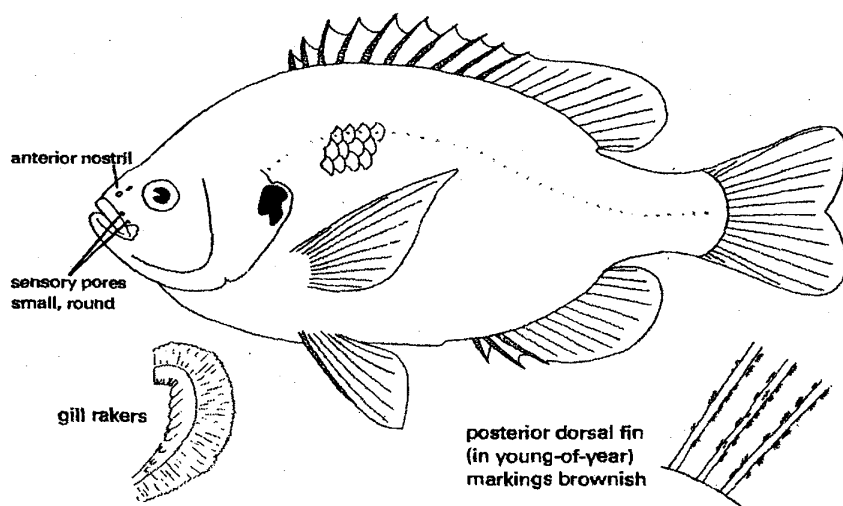
Lepomis macrochirus Rafinesque Page 844



- 9b. "Earflap" with abruptly broader light-colored spot (crimson in life) at posterior edge. No distinct black blotch toward rear of dorsal fin. Gill rakers on first gill arch short, knobby, scarcely longer than wide. (Young can be distinguished from bluegill by short, bent gill rakers and diffuse irregular brown markings alongside last few dorsal fin rays.)

PUMPKINSEED

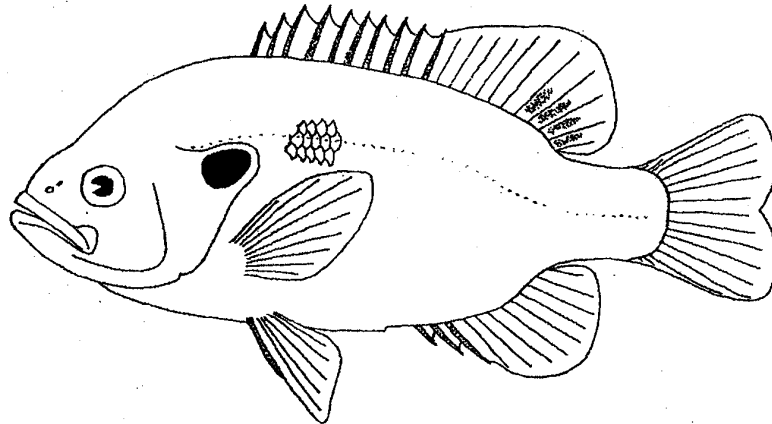
Lepomis gibbosus (Linnaeus) Page 828



- 10a. Scales in lateral line 44–51. Gill rakers long, straight, pointed (see illustration under 9a). Posterior soft dorsal fin usually with dark blotch near base.

GREEN SUNFISH

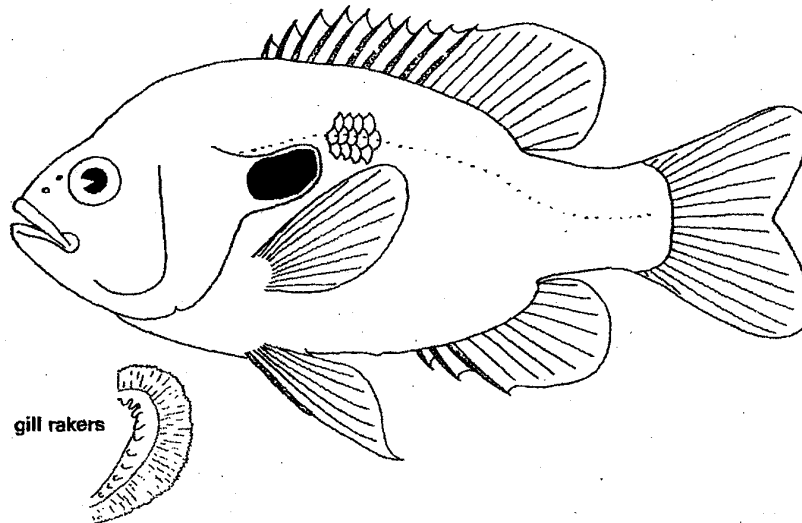
Lepomis cyanellus Rafinesque Page 822



- 10b. Scales in lateral line 34–38. Gill rakers reduced to knobs. Posterior soft dorsal fin without dark blotch near base.

LONGEAR SUNFISH

Lepomis megalotis (Rafinesque)..... Page 834



CHARACTERISTICS OF COMMON LEPOMIS HYBRIDS*

GREEN SUNFISH × PUMPKINSEED

Lepomis cyanellus × *Lepomis gibbosus*

Ear flap edged with wide, light-colored membrane and a red spot in life.

Pectoral fin laid forward, usually reaching between pupil and posterior edge of eye.

Gill rakers intermediate in length with some curvature—neither long and thin nor short, stubby, and bent.

Upper jaw reaching to below anterior edge of eye or beyond.

Posterior soft dorsal fin with diffuse dark spots between rays; anterior edge of pelvic fins and ventral edge of anal and caudal fins yellow or cream-colored.

Cheek and opercle with faint wavy lines radiating from eye to distal edge of opercle.

GREEN SUNFISH × BLUEGILL

Lepomis cyanellus × *Lepomis macrochirus*

Ear flap edged with a wide, uniformly gray-to-black membrane.

Pectoral fin laid forward, usually reaching between pupil and posterior edge of eye.

Gill rakers long and thin.

Upper jaw reaching to below anterior edge of eye or beyond.

Posterior soft dorsal fin with solid black pigmentation, not broken into diffuse spots; anterior edge of pelvic fins and ventral edge of anal and caudal fins yellow or cream-colored.

Cheek and opercle plain, without faint wavy lines radiating from eye to distal edge of opercle.

PUMPKINSEED × BLUEGILL

Lepomis gibbosus × *Lepomis macrochirus*

Ear flap black and edged with a narrow, light-colored membrane and a small red spot in life.

Pectoral fin laid forward, usually reaching anterior edge of eye.

Gill rakers intermediate in length with some curvature—neither long and thin nor short, stubby, and bent.

Upper jaw short, scarcely reaching to below anterior edge of eye.

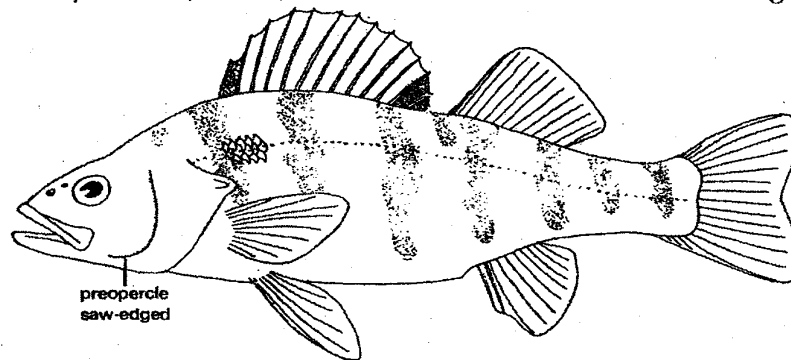
Posterior soft dorsal fin with elongated dark markings, thinner and more irregular than in *L. macrochirus*, but not small circular spots as in adult *L. gibbosus*; anterior edge of pelvic fins light-colored, ventral edge of anal and caudal fins generally pigmented.

Cheek and opercle with faint wavy lines radiating from eye to distal edge of opercle.

*Prepared by Dale Becker

Key to the Perches

- 1a. Preopercle saw-edged. Upper jaw extending to middle of eye or beyond. Branchiostegal rays 7 or 8.
Perca sp. and *Stizostedion* spp. (yellow perch, walleye, sauger) 2
- 1b. Preopercle smooth-edged. Upper jaw usually not extending to middle of eye. Branchiostegal rays 5 or 6.
Ammocrypta spp., *Etheostoma* spp., and *Percina* spp. (the darters) 4
- 2a. No canine teeth in upper and lower jaws. Soft rays of anal fin 7 or 8.
Body with distinct vertical bars. Body depth into SL 3.3–3.8.
YELLOW PERCH
Perca flavescens (Mitchill) Page 886

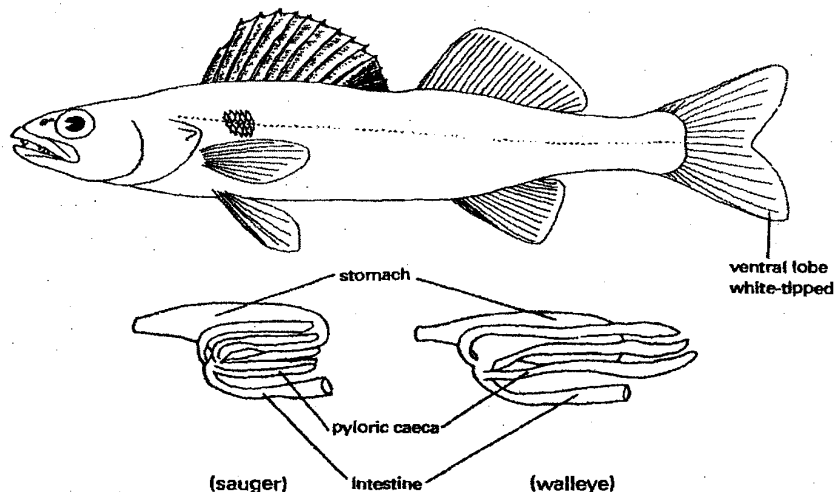


- 2b. Canine teeth in upper and lower jaws. Soft rays of anal fin 11–14.
Body without distinct vertical bars. Body depth into SL 4.9–5.9. 3

- 3a. Spinous dorsal fin with large black blotch at posterior base. Pyloric caeca 3, each extending to posterior edge of stomach or beyond. Ventral lobe of caudal fin white-tipped. Soft dorsal fin rays 18–21. Cheeks sparsely scaled to naked.

WALLEYE

Stizostedion v. vitreum (Mitchill) Page 871

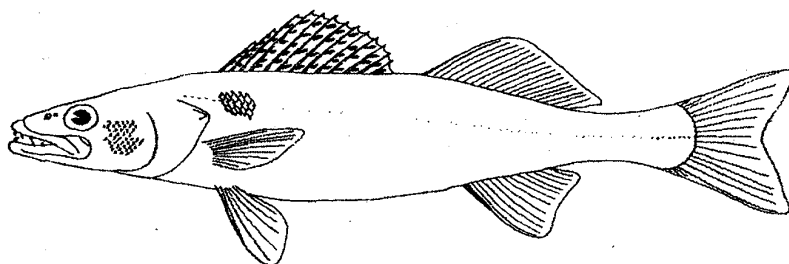


(Lutterbie 1975:22)

- 3b. Spinous dorsal fin with distinct dark spots; no large black blotch at posterior base. Pyloric caeca usually 4–6, each not extending to posterior edge of stomach. Ventral lobe of caudal fin usually without white tip. Soft dorsal fin rays 17–19. Cheeks well scaled.

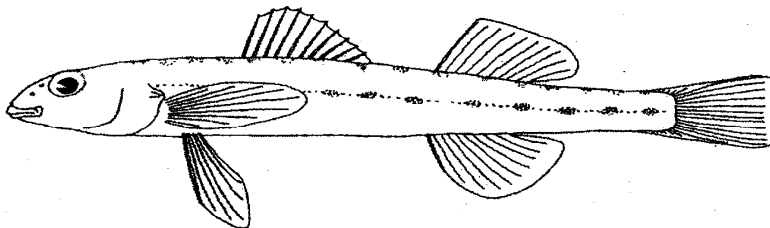
SAUGER

Stizostedion canadense (Smith) Page 880

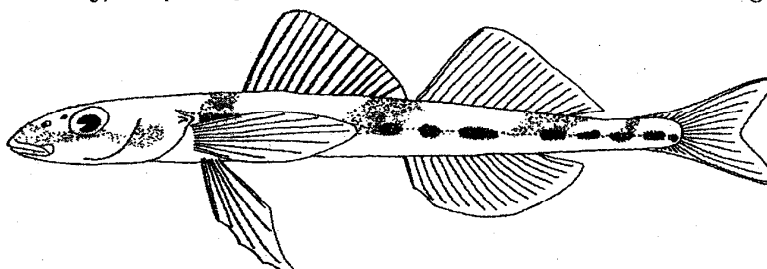


- 4a. Body depth into SL usually 7 or greater. Belly usually without scales. Anal fin with 1 spine 5
- 4b. Body depth into SL usually less than 7. Belly usually with at least a few scales. Anal fin usually with 2 spines (1 in johnny darter, bluntnose darter, and occasionally in the least darter) 6

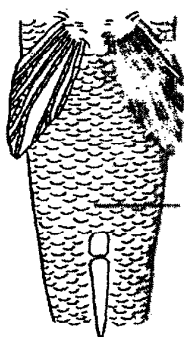
- 5a. Back with 12 or more small dark saddles along mid-dorsal line. Anal fin rays 7-10. Soft dorsal fin rays 9-12.
WESTERN SAND DARTER
Ammocrypta clara Jordan and Meek Page 918



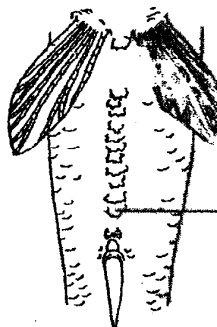
- 5b. Back with 3 or 4 broad saddle marks extending forward to lateral line. Anal fin rays 15 or 16. Soft dorsal fin rays 14-16.
CRYSTAL DARTER
Ammocrypta asprella (Jordan)..... Page 915



- 6a. No enlarged and modified scales between pelvic fins; midline of belly usually well scaled with scales of same type as those on sides. Anal fin usually smaller than soft dorsal fin. Lateral line complete or incomplete.
Etheostoma spp. 7



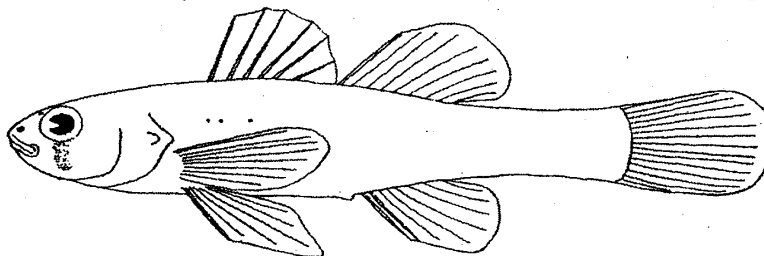
belly scaled as on sides



belly with enlarged specialized scales, or devoid of scales

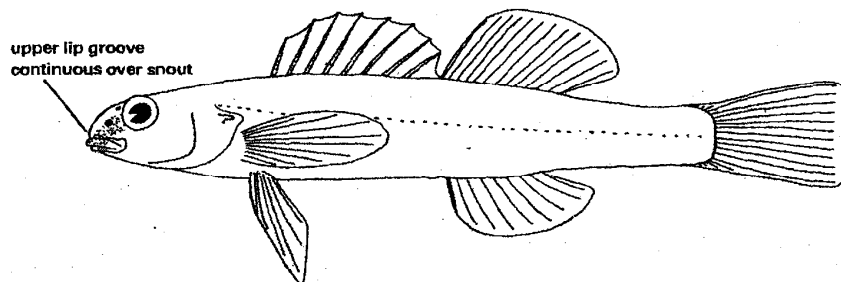
(Lutterbie 1975:23)

- 6b. One or more enlarged and modified scales between pelvic fins; mid-line of belly usually without scales or with a series of enlarged and modified scales, these bounded on each side by naked areas. Anal fin often nearly as large as or larger than soft dorsal fin. Lateral line always complete.
Percina spp. 14
- 7a. Spinous dorsal fin with 6 (5-7) spines. Lateral series scales 32-38, lateral line incomplete (0-7 pored scales). Pelvic fin extremely long, reaching to vent or beyond.
LEAST DARTER
Etheostoma microperca Jordan and Gilbert Page 950

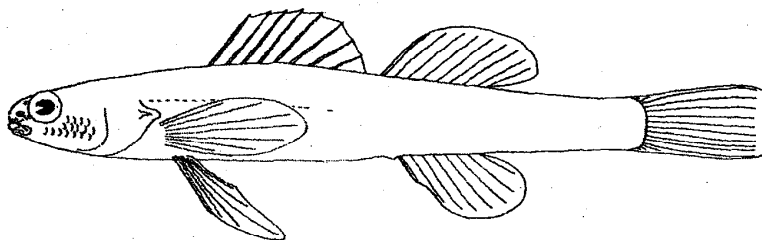


- 7b. Spinous dorsal fin with 7 or more spines. Lateral series scales 37 or more, lateral line complete or incomplete (more than 16 pored scales). Pelvic fin short, not reaching to vent 8
- 8a. Upper lip groove continuous over tip of snout. Anal fin spine 1 9
- 8b. Upper lip groove not continuous over tip of snout. Anal fin spines 2 ... 10

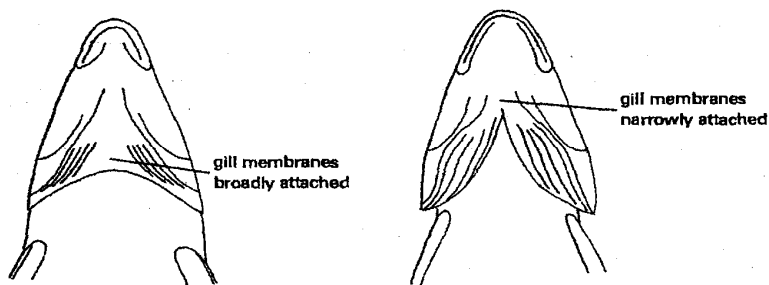
- 9a. Dark stripe extending from eye to snout interrupted medially on snout. Cheek usually naked. Soft dorsal fin rays usually 13. Dorsal fins only slightly separated, less than width of pupil. Lateral line complete.
JOHNNY DARTER
Etheostoma nigrum Rafinesque Page 921



- 9b. Dark stripe extending from eye to snout continuous over tip of snout. Cheek scaled. Soft dorsal fin rays usually 9-11. Dorsal fins widely separated, about width of pupil or connected by thin membrane. Lateral line incomplete, with fewer than 25 pored scales.
BLUNTNOSE DARTER
Etheostoma chlorosomum (Hay) Page 926



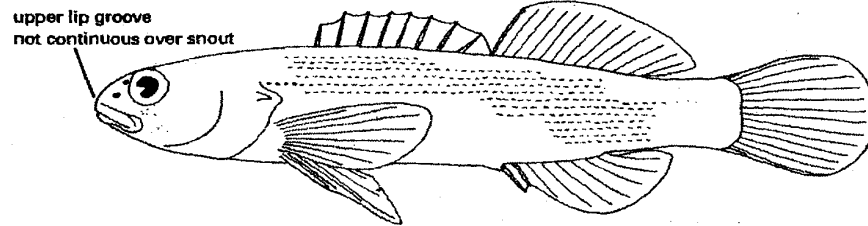
- 10a. Gill membranes broadly attached to one another 11



- 10b. Gill membranes narrowly or moderately attached to one another 12

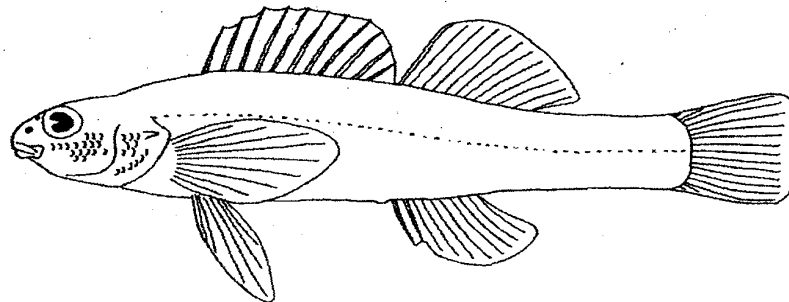
- 11a. Cheek, opercle, and nape without scales. Spinous dorsal fin with 7 or 8 spines. Sides conspicuously marked with longitudinal rows of dots or dashes (central portion of each scale marked with dot or dash).
FANTAIL DARTER

Etheostoma flabellare Rafinesque Page 945



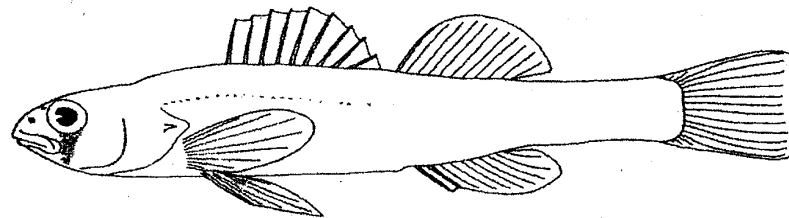
- 11b. Cheek, opercle, and nape scaled. Spinous dorsal fin with 10–12 spines. Sides not marked with longitudinal rows of dots or dashes.
BANDED DARTER

Etheostoma zonale (Cope) Page 929



- 12a. Lateral series scales 55–65. Body depth into SL 4.8–5.5.
IOWA DARTER

Etheostoma exile (Girard) Page 940

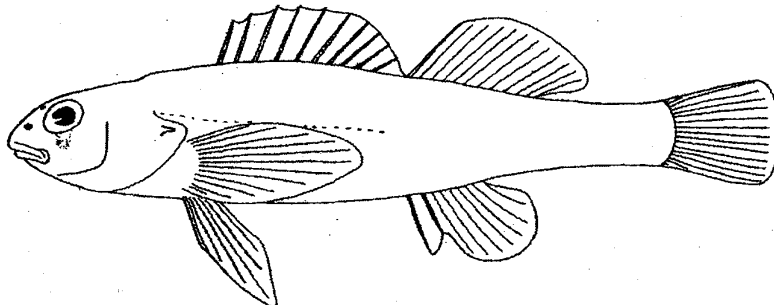


- 12b. Lateral series scales 50 or fewer. Body depth into SL 4.0–5.0 13

- 13a. Cheek naked or with row of scales along posterior border of eye. Anal fin soft rays usually 7. Without 3 dark spots at base of caudal fin. Males with a series of unbroken vertical bands on sides forming saddles over back.

RAINBOW DARTER

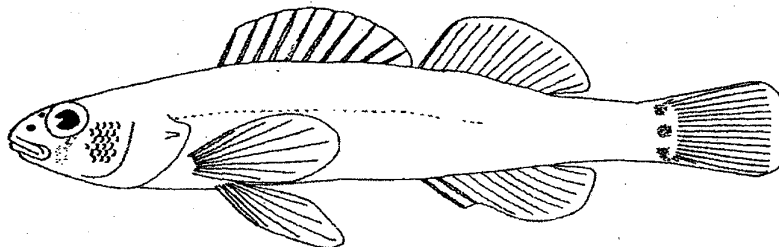
Etheostoma caeruleum Storer..... Page 932



- 13b. Cheek scaled. Anal fin soft rays 8 or 9. Three small dark spots arranged vertically at base of caudal fin (occasionally interconnected). Males with a series of vertical bands on sides often confluent with one another and interrupted by lightly pigmented lateral scales.

MUD DARTER

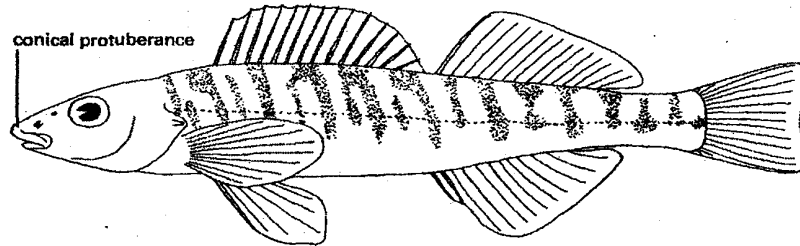
Etheostoma asprigene (Forbes) Page 937



- 14a. Snout with conical protuberance. Lateral bands 15–25, narrow and zebralike, crossing over back and extending vertically down sides. Lateral line scales 71 or more.

LOGPERCH

Percina caprodes (Rafinesque) Page 907

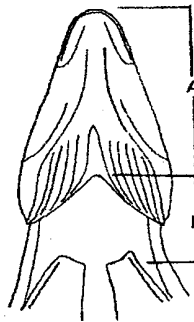
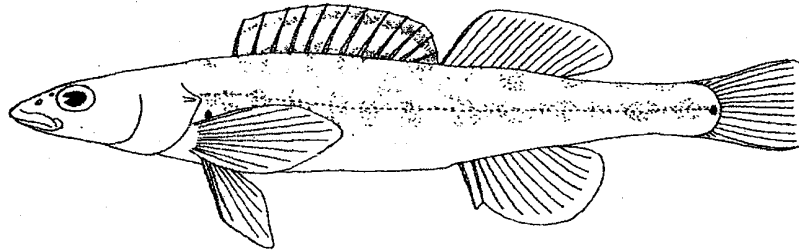


- 14b. Snout without conical protuberance. Lateral bands or blotches usually fewer than 15, irregular in width and often confluent. Lateral line scales usually fewer than 71 15

- 15a. Distance from tip of upper lip to junction of gill membranes (A) equal to or greater than distance from junction of gill membranes to back of pelvic fin base (B). Lateral blotches 10–16, dark and more-or-less confluent. Suborbital bar absent or faint.

SLENDERHEAD DARTER

Percina phoxocephala (Nelson) Page 894



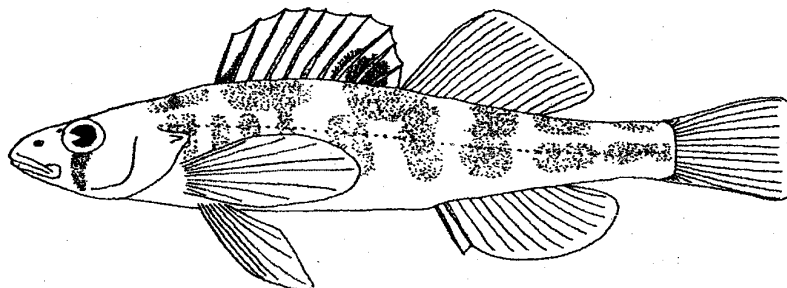
A is equal to or greater than B

- 15b. Distance from tip of upper lip to junction of gill membranes (A) less than distance from junction of gill membranes to back of pelvic fin base (B). Lateral markings 5–11, blotches or becoming short vertical bars anteriorly. Suborbital bar distinct, black 16

- 16a. Spinous dorsal fin with black blotch on membrane behind first spine and larger black blotch on membranes between last 3 or 4 spines. Lateral blotches 8-11, becoming short vertical bars anteriorly. Lateral line scales 52-54 (48-60). Gill rakers on lower limb of first arch short, stout, bent, about 9.

RIVER DARTER

Percina shumardi (Girard) Page 912

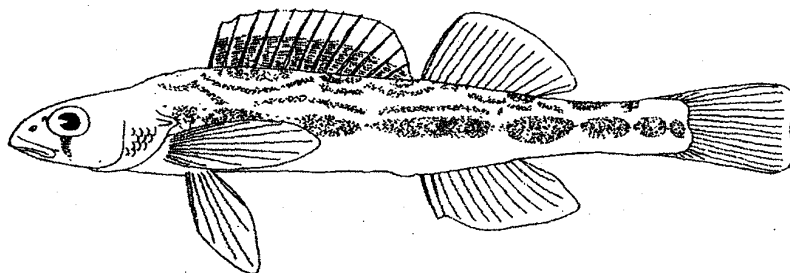


- 16b. Spinous dorsal fin almost totally pigmented or with heavy dark base, but not pigmented as in 16a. Lateral blotches 5-8. Lateral line scales 60-65 (56-71). Gill rakers on lower limb of first arch long, narrow, straight, 10 or 11 17

- 17a. Spinous dorsal fin with black pigment on lower half, becoming less intense posteriorly, extreme outer edge clear; spines 13 (12–15). Caudal peduncle scales 20–23. Back with 6–11 dark, saddle-type markings and dorsolateral vermiculations or checkerboard design. Lateral blotches usually connected, forming wide, irregular lateral stripe.

BLACKSIDE DARTER

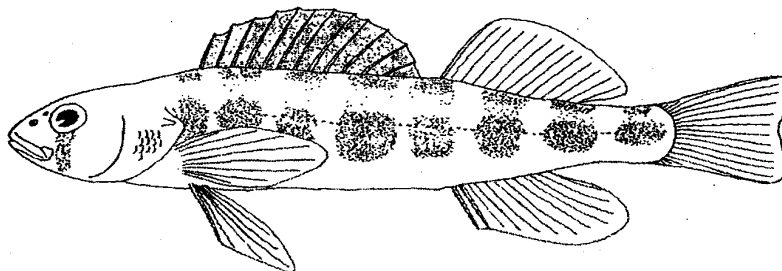
Percina maculata (Girard)..... Page 898



- 17b. Spinous dorsal fin more-or-less evenly pigmented, except extreme outer margin where whitish or clear; spines usually 12. Caudal peduncle scales 24–29. Back with 5–8 dark, squarish saddle bands; vermiculations or checkerboard markings absent. Lateral blotches separated, squarish, green-black, directly below saddle bands.

GILT DARTER

Percina evides (Jordan and Copeland)..... Page 903

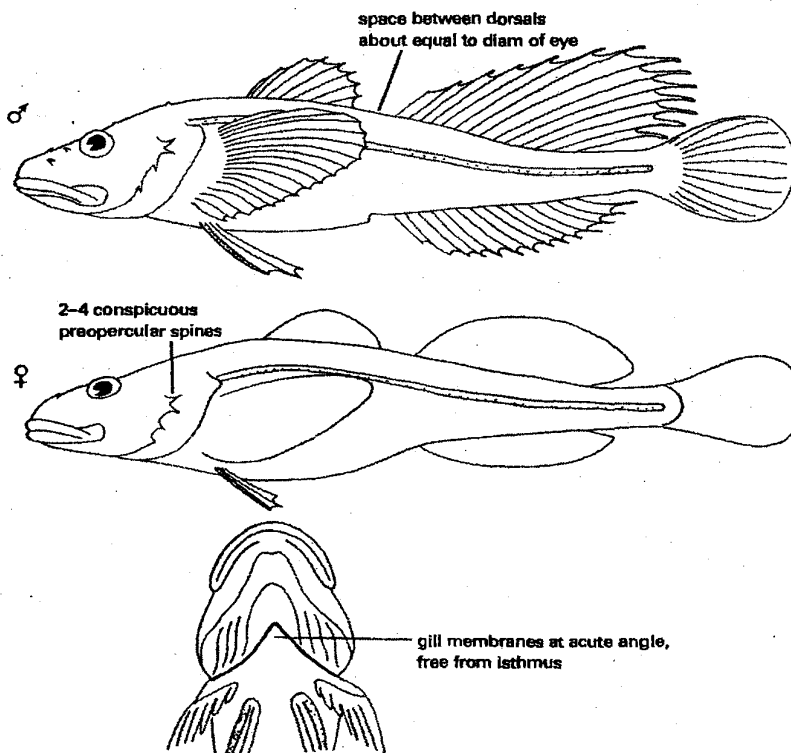


Key to the Sculpins

- 1a. Gill membranes meeting at acute angle, free from isthmus. Two to 4 conspicuous and partially naked preopercular spines on each side. Dorsal fins separated by space about equal to diam of eye.

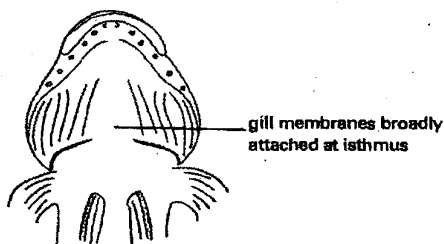
DEEPWATER SCULPIN

Myoxocephalus thompsoni (Girard) Page 965



- 1b. Gill membranes broadly attached to isthmus. One conspicuous and partially naked preopercular spine on each side, other spines skin covered. Dorsal fins touching or narrowly joined.

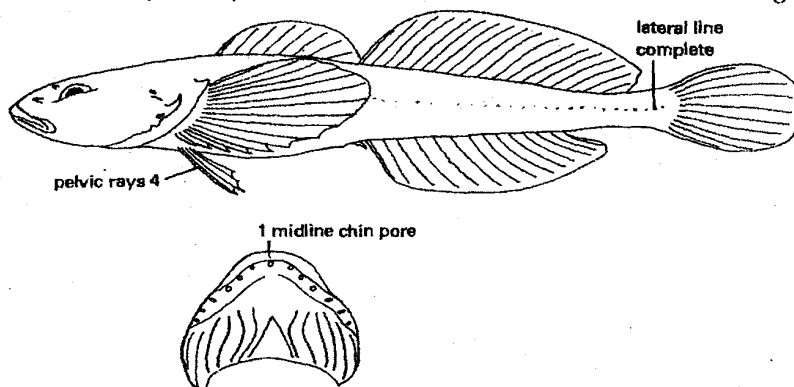
Cottus spp. 2



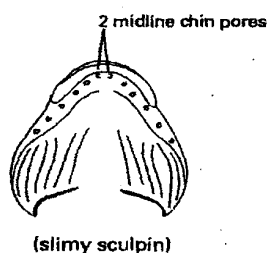
- 2a. Lateral line complete. One midline chin pore. Preopercular spine usually longer than $\frac{1}{3}$ eye diam and curved strongly inward. Upper head and body covered with prickles. Pelvic fins with 1 spine and 4 soft rays appearing as 4 units (spine and first ray encased in single fleshy membrane). Chin membrane with brainlike convolutions and folds.

SPOONHEAD SCULPIN

Cottus ricei (Nelson) Page 979



- 2b. Lateral line normally ending below base of second dorsal fin. Two midline chin pores. Preopercular spine about $\frac{1}{2}$ eye diam and scarcely or not at all curved inward. Prickles, if present, behind pectoral fin and below lateral line. Pelvic fins with 1 spine and 3 or 4 soft rays appearing as 3 or 4 units (spine and first ray encased in single fleshy membrane). Chin membrane usually smooth or weakly folded. 3

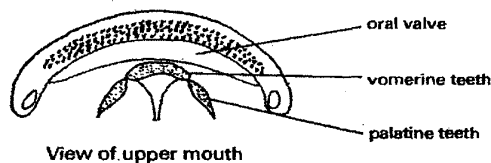
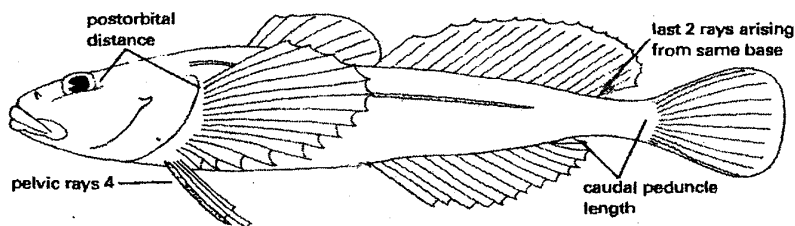


(slimy sculpin)

- 3a. Pelvic fin rays 4, last a little shorter than third. Caudal peduncle length less than postorbital distance. Last 2 rays of dorsal and anal fins arising from the same base. Palatine teeth usually present.

MOTTLED SCULPIN

Cottus bairdi Girard..... Page 969



View of upper mouth

- 3b. Pelvic fin rays usually 3, if 4, last much shorter than third. Caudal peduncle length greater than postorbital distance. Last 2 rays of dorsal and anal fins separated, arising from separate bases. Palatine teeth usually absent.

SLIMY SCULPIN

Cottus cognatus Richardson..... Page 974

