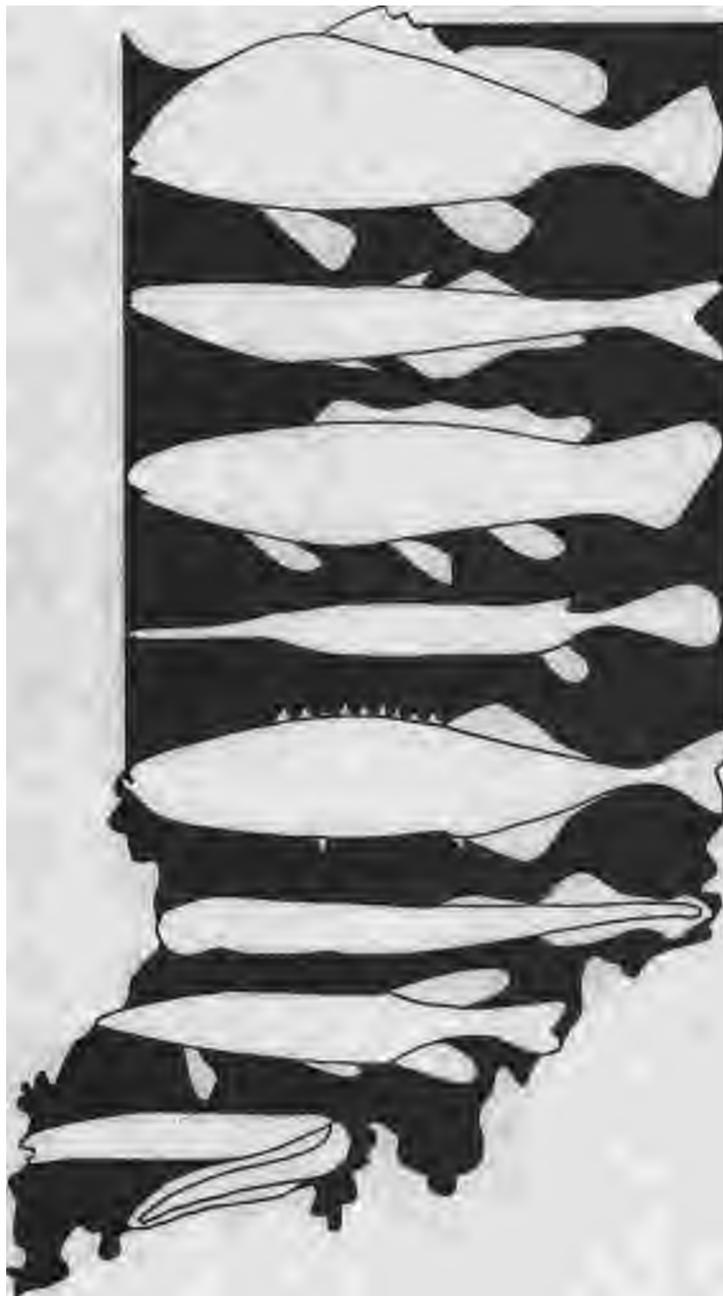


# ANNOTATED KEY TO THE FISHES OF INDIANA



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Introduction

This annotated key provides a means of identifying fishes presently occurring or known to have occurred in Indiana and gives a rough indication of their range and distribution within the state. Recent changes in nomenclature, additional diagnostic characters, and distributional changes are combined with information from the detailed analyses of Indiana fishes by Gerking (1945, 1955).

Geography

The state of Indiana covers 36,291 square miles. It extends 265 miles in a north-south direction between the extremes of 41°46' and 37°46' N latitude and 160 miles in an east-west direction between the extremes of 84°47' and 88°06' W longitude. Its northern border includes the southern tip of Lake Michigan and extends along part of the southern border of Michigan state. Ohio lies along most of the eastern border, the Ohio River, with Kentucky to the south, comprises the southern border, while Illinois lies along the western border. Approximately the northern sixth of Indiana lies in the Lake Michigan-Lake Erie watershed; the remainder is in the Mississippi drainage, composed primarily of the Wabash and Ohio rivers and their tributaries (Fig. 1). The elevation of the state is highest in the east central portion with the highest point at 1257 feet in the northeastern corner of Wayne County, 40°00' N; 84°51' W. The lowest area is 335 feet elevation in the southwestern tip of the state near the junction of the Ohio and Wabash rivers (Posey County). Flat or slightly rolling land typifies the central and northern sections of

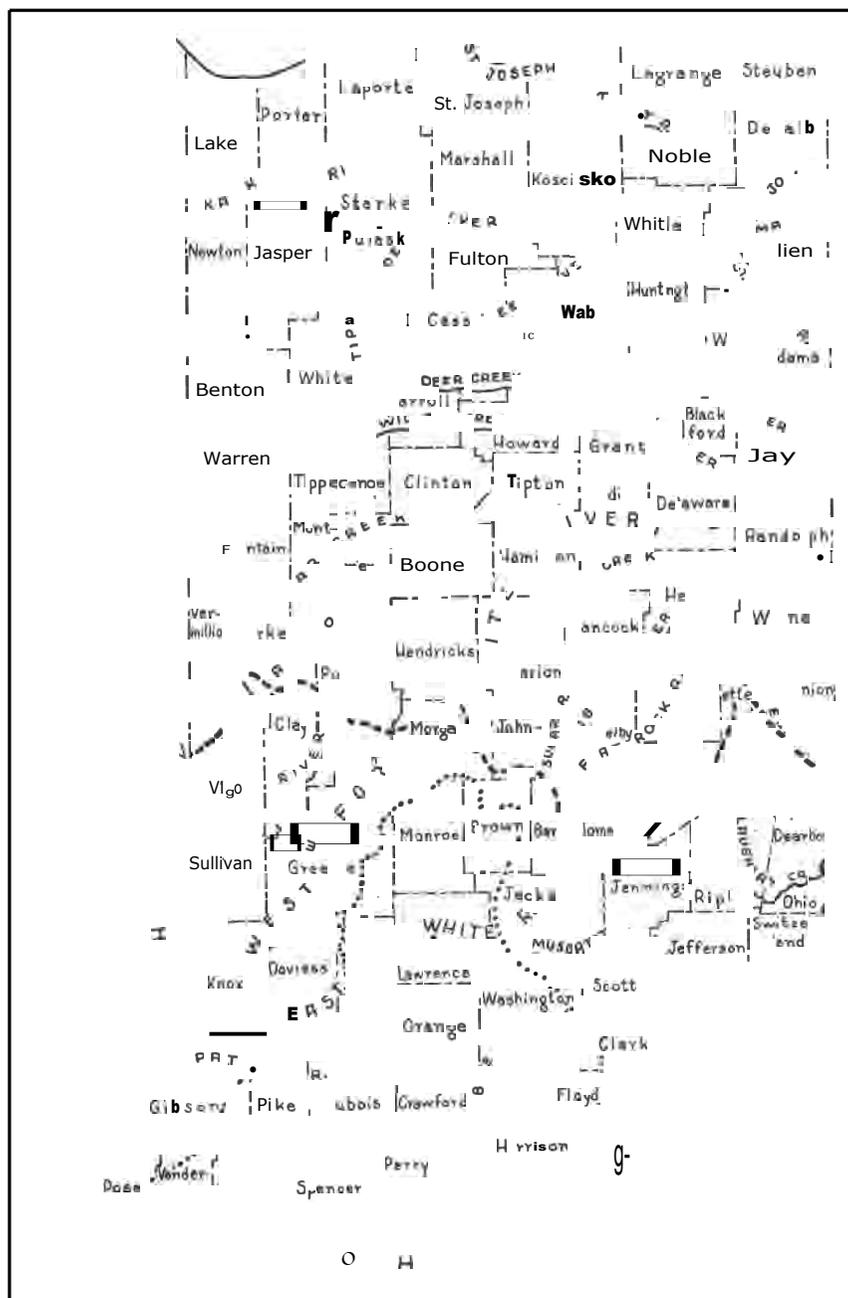


Fig. 1. Counties and principal streams of Indiana. Lakes and reservoirs are omitted. The limits of Wisconsin glaciation are denoted by dashes and the limits of Kansan and Illinoian glaciation are denoted by dots.

the state, while hilly country is common in the south. The mean monthly winter temperature is 31° F and the mean monthly summer temperature is 76° F. Annual precipitation varies from 36 inches near Lake Michigan to 45 inches along the Ohio River.

Northern Indiana is richly endowed with lakes created by glaciers. About 234 square miles of Lake Michigan lie within the Indiana border. Lake Wawasee in Kosciusko County, with an area of 2618 acres, is the largest natural body of water completely within Indiana. The deepest lake is Tippecanoe, also in Kosciusko County, with a maximum depth of 123 feet. Crooked Lake in Whitley County and Clear Lake in Steuben County also have depths exceeding 100 feet. The northern lakes are highly variable in their physical-chemical conditions. Aquatic vegetation is usually abundant. The northern lakes remain frozen for a maximum of about 3½ months.

No natural lakes, except oxbows, exist in central and southern Indiana, but streams are numerous. The Wabash River drains water from about two-thirds of Indiana and has an average flow of about 26,500 cubic feet per second in its lower reaches. Many reservoirs and thousands of farm ponds have been created throughout the state. The largest body of water wholly within Indiana is Monroe Reservoir, which covers some 10,700 acres, in Monroe and Brown counties. Caves and sinkholes are common in southern Indiana.

#### Glaciation

The last glaciation, called the Wisconsin, covered two-thirds of Indiana at its greatest extent about 21,000 years ago. This glacier left Indiana about 16,000 years ago. The maximum extent of Pleistocene glaciation (Kansan and Illinoian) moved much further south, leaving a wedge-shaped unglaciated area from southern Morgan County southwestward to Posey County and southeastward to

Clarke County (Fig. 1). Stream changes and other effects of glaciation have affected the present distribution of fish. Since the retreat of the Wisconsin glaciation, various routes of invasion have been followed by the species into areas previously unavailable to them. Perhaps all fishes native to Indiana have been derived from a Mississippian refugium. There is no evidence that any species moved into the state from the Yukon Valley or Atlantic coastal refugia. Northward movements probably occurred from the **Wabash** drainage into Lake Erie by way of the Maumee River, from the Kankakee drainage into the St. Joseph drainage, and from the Illinois drainage into Lake Michigan through the Chicago outlet. A former connection between the Tippecanoe and Kankakee and Iroquois rivers was also probably used by some species.

#### The Fishes

The Indiana freshwater fish fauna is diverse, with 179 species and 28 families (Table I). Some of the species were last collected over 70 years ago and may be extinct. According to the classification of Berg (1940), 13 taxonomic orders occur in Indiana compared with 57 orders with living representatives throughout the world. The cooler glaciated north, with many lakes and drainage into the Great Lakes, has a fauna which is different from that in the warmer unglaciated south, which has no natural lakes and a drainage into the Mississippi River. About 10 Indiana species are absent from the entire Great Lakes watershed. However, no native species occurring in the Great Lakes drainage of Indiana is absent from all parts of the Mississippi drainage. No species is restricted in distribution to the state. The species composition is similar to surrounding areas (Table I). The fauna includes cave fish, derivatives of marine species, and so-called living fossils. Some of the families have probably originated in Asia, and others in North America.

TABLE Total number of species in adjacent areas to Indiana. "T" denotes total number; "II" denotes the number of species in each area which are also in Indiana.

Family	Illinois <sup>1</sup>		Great Lakes <sup>4</sup>		Ohio <sup>3</sup>		Kentucky <sup>1</sup>		Indiana <sup>2</sup>
	T	II	T	II	T	II	T	II	T
	56,400		7,770		44,803		40,395		36,291
	sq. mi.		sq. mi.		sq. mi.		sq. mi.		sq. mi.
<b>Petromyzontidae</b>	6	6	5	5	7	6	7	6	7
<b>Acipenseridae</b>	3	2	1	1	2	2	3	2	2
Polyodontidae	1	1	1	1	1	1	1	1	1
Lepisosteidae	4	4	3	3	4	4	4	4	14
<b>Amiidae</b>	1	1	1	1	1	1	1	1	1
Clupeidae	5	4	3	2	3	3	4	14	5
Salmonidae	4	4	23	6	6	6	3	3	6
Osmeridae	1	1	1	1	1	1	0	0	1
Hiodontidae	2	2	1	1	2	2	2	2	2
Umbridae	1	1	1	1	1	1	0	0	1
Esocidae	3	3	4	3	4	3	14	3	3
<b>Cobitidae</b>	0	0	1	0	0	0	0	0	0
Cyprinidae	53	44	51	41	44	42	48	40	49
Catostomidae	18	18	20	19	21	21	19	18	21
Ictaluridae	13	11	12	8	12	11	14	11	12
Anguillidae	1	1	1	1	1	1	1	1	1
Gadidae	1	1	1	1	1	1	1	1	1
Amblyopsidae	1	0	0	0	0	0	3	2	2
<b>Cyprinodontidae</b>	4	3	3	3	2	2	4	3	4
Poeciliidae	1	1	1	1	1	1	1	1	1
Percopsidae	1	1	1	1	1	1	1	1	1
Aphredoderidae	1	1	1	1	1	1	1	1	1
<b>Atherinidae</b>	1	1	1	1	1	1	2	1	1
<b>Serranidae</b>	2	2	3	2	2	1	3	2	2
Centrarchidae	17	15	12	12	13	13	17	14	15
Percidae	28	26	19	19	25	23	38	27	30
Sciaenidae	1	1	1	1	1	1	1	1	1
<b>Cottidae</b>	5	2	4	1	2	1	2	2	2
Gasterosteidae	2	2	3	2	1	1	0	0	2
<b>TOTAL</b>	<b>181</b>	<b>159</b>	<b>179</b>	<b>139</b>	<b>161</b>	152	185	152	179

<sup>1</sup>From Smith (1965). Includes four presumed extirpated species from Smith's problematical list to make counts comparable with Indiana.

<sup>2</sup>From Hubbs and Lagler (1964). Includes three more species than the 1958 edition.

<sup>3</sup>From Trautman (1957). Includes one more cyprinid species due to splitting of species name.

<sup>4</sup>Tentative list from William M. Clay, personal communication, September, 1966.

<sup>5</sup>Includes recent introductions of salmon.

Some of the species are native to both North America and **Asia**, whereas others are restricted to the east-central United States. Eight species have been introduced either directly into Indiana or into adjacent areas from which they dispersed into the state. Transportation of fish seined within Indiana and importation of fish from outside the state for bait is common. The importance of the fishermen in disturbing natural distribution, however, is difficult to **assess**. Pollution has restricted the range of **many** species (**Gerking, 1945**).

Several famous ichthyologists, including David S. Jordan, Charles H. Gilbert, Carl **H.** Eigenmann, Barton W. Evermann, and Seth E. Meek have lived in Indiana and studied its fishes. Introductions into the fascinating history of Indiana ichthyology and an insight into our early ichthyologists may be found in Gerking (**1945, 1957a**), Torrey (**1949**), and Hubbs (**1964**).

#### Use of the Annotated Keys

The following keys are designed to separate characters so that an identification can be made by means of a series of alternative **choices**. To identify a fish, the user should examine the first alternative, determine which member of the couplet best describes the fish (a or b) and proceed to the next alternative indicated by the number at the end of the correct member couplet and continue to successive alternatives until a name is reached. The number in **parentheses** after the couplet number enables the user to retrace the path of alternatives quickly. The amount of variation in many species precludes a simple and un-failing key. Exceptions must often be ignored to keep the key within reasonable length. The use of series of specimens is occasionally necessary.

The species in the keys are not necessarily arranged in phylogenetic (evolutionary) order. The arrangement of families in the species key generally follows that given by Greenwood, et al. (1966). The arrangement of families in Tables I and II follows that of Berg (**1940**).

~~An~~ attempt has been made to include enough diagnostic characters ~~so~~ that mistakes at one alternative will not lead to incorrect identifications and ~~so~~ that the key will be of use with specimens having obviously deformed key characters. This also **reduces** the chance of failing to recognize a species new to the **state**. The danger of misidentifying a species new to Indiana and thus not in the key can be further avoided by checking all identifications in Hubbs and Lagler (1964), Moore (1957), and Trautman (1957), and by comparison with specimens previously identified by competent **workers**. The key is not intended for hybrids, teratological individuals, or very young individuals.

Counts, measurements, and attributes given in the species key have generally been taken from Gerking (1955), regional works outside Indiana, and recent **systematic studies**, and thus the key **includes** variation over the species range.

The methods **of** Hubbs and Lagler (1964) in counting and measuring body parts have been used unless otherwise mentioned. Three commonly employed characters are principal dorsal and anal fin rays and lateral-line scales. Unless otherwise stated a dorsal and anal fin ray number includes the number of branched rays plus one unbranched ray, with the last ray in dorsal and anal fin counts consisting of two ray elements in which one is branched and the other is usually unbranched. The first principal dorsal or **anal** fin ray is usually unbranched and followed by a branched ray. The lateral-line scale count begins with the last scale in contact with the shoulder girdle and proceeds along the lateral-line, or in a straight line along the side if the lateral-line is absent, and terminates at the structural caudal base (hypural **plate**), which is at the middle of a crease formed by moving the caudal fin from side to side. This crease also **marks** the point to which standard length is measured (Fig. 2).

Recent synonymies are indicated in brackets below the currently accepted taxonomic **name**. Information for the brief account of the total range of each

species (generally indicated by extremes only) was obtained from numerous recent regional check-lists and from **systematic** works. Information for the general description of the Indiana species distribution is taken from Gerking (1945, **1955**). Recent work, largely by the Indiana Department of Natural Resources, Division of Fish and Game, showing distributional extensions, has been included.

Table II presents four systems of classification in order to show various concepts of grouping.

#### Acknowledgments

Many people made valuable contributions to the present work. Dr. Reeve M. Bailey of the University of Michigan gave much of his time in stimulating discussions. His advice and comments are appreciated. Dr. Craig **E.** Nelson critically read the manuscript and gave many suggestions. Mr. Harold E. McReynolds of the **U.S.** Forest Service, Milwaukee, generously gave much information on the distribution of fishes and criticised the manuscript. Dr. David G. Frey gave advice throughout the work. Thanks go to Dr. William M. Clay of the University of Louisville for unpublished information on Kentucky fishes. Mr. Woodrow Fleming and the Division of Fish and game of the Indiana Department of Natural Resources gave encouragement and support to the study. Drs. R. E. **Mumford** of Purdue University and J. R. Gammon of DePauw University provided several locality records. Mrs. E. A. McDonald typed the **manuscript**. Miss Lois Carbone prepared the figures.

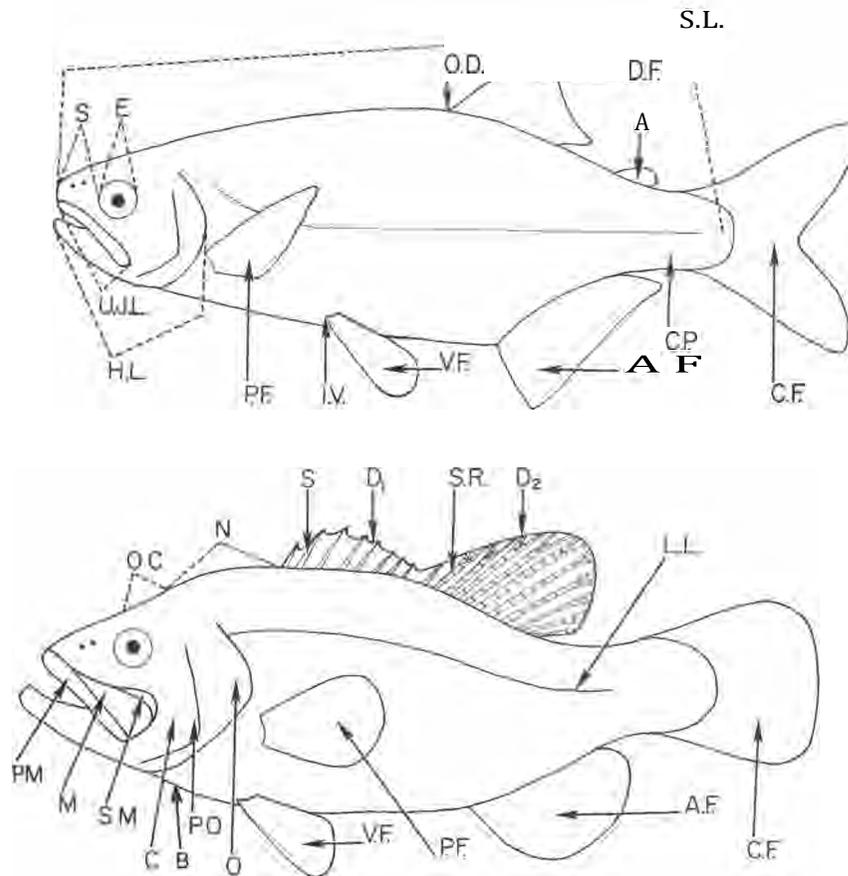


Fig. 2. Upper: Hypothetical soft rayed fish showing structures used in identification and methods of measurement. A, adipose fin; A.F., anal fin; C.F., caudal fin (forked); C.P., caudal peduncle; D.F., dorsal fin; E, eye diameter; H.L., head length (to tip of membrane); I.V., pelvic fin insertion; O.D., dorsal fin origin; P.F., pectoral fin (pointed, as in *Lepomis microlophus*); S, snout length; S.L., standard length; U.J.L., upper jaw length; V.F., pelvic fin (in abdominal position).

Lower: Hypothetical spiny rayed fish showing structures used in identification. B, breast; C, cheek; C.F., caudal fin (rounded); D<sub>1</sub>, first dorsal fin (spiny); D<sub>2</sub>, second dorsal fin (soft rayed, joined to first dorsal by small membrane as in *Micropterus salmoides*); L.L., lateral line; M, maxilla (extending past eye as in *Micropterus salmoides*); N, nape; O, tip of opercle; O.C., occiput; P.F., pectoral fin rounded as in *Lepomis cyanellus*); P.M., premaxillae; P.O., preopercle; S, spine (stiff, unjointed, unbranched, without longitudinal median split); S.M., supramaxilla; S.R., soft ray (not stiff, not sharp, jointed, branched, with a longitudinal median split); V.F., pelvic fin (in thoracic position).

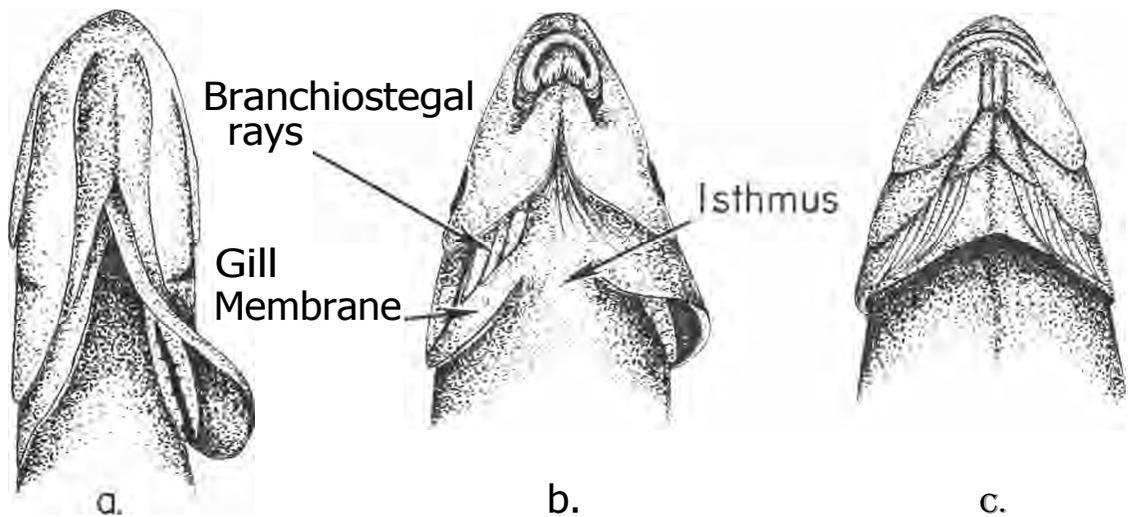


Fig. 3. Ventral views of the heads of three fishes.

- a) Gill-membranes (or branchiostegal membranes) free from isthmus, not attached to each other and gill slits extended far forward, *Esox americanus vermiculatus*.
- b) Gill-membranes united to isthmus and gill slits not extended far forward, *Moxostoma anisurum*.
- c) Gill-membranes broadly connected to each other, *Etheostoma blennioides*.

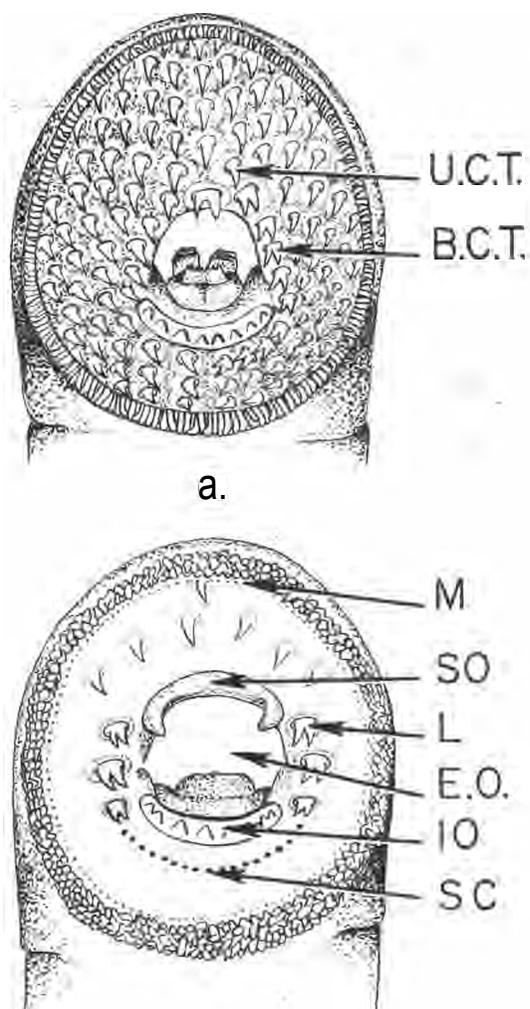


Fig. 4. Hypothetical ventral views of the mouth cavities (buccal funnels) of two lampreys to show various teeth patterns.

- a) Circumoral teeth in a radiating series. B.C.T., bicuspid circumoral teeth; U.C.T., unicuspid circumoral teeth.
- b) Teeth in groups. E.O., esophageal opening; IO, infraoral tooth bar; L, lateral teeth; M, marginal teeth; SC, semicircular teeth; SO, supraoral tooth bar.

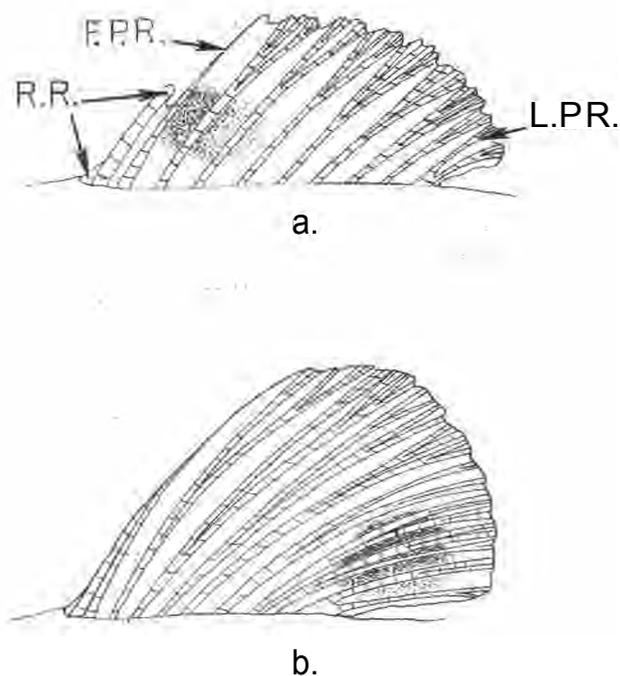


Fig. 5. Dorsal fins of two cyprinids.

- a) *Pimephales notatus* (breeding male), the stout half-ray (last rudimentary ray) is distinctly separated from the first principal ray (less pronounced in immature and females).
- b) *Notropis whipplei*, the slender half-ray is tightly bound to the first principal ray. R.R., rudimentary rays; E.P.R., first principal ray; L.P.R., last principal ray.

TABLE II. Classifications of Indiana Fish Families to Order

Family	Pegan (1929) and other sources	Jordan (1923)	Berg (1940)	Greenwood et al. (1966) for teleosts
<b>Petromyzontidae</b>	Hyperoartia	<b>Hyperoartia</b>	Petromyzoniformes	
Acipenseridae	<b>Chondrostei</b>	Glaniosstomi	Acipenseriformes	
Polyodontidae		Selachostomi	"	
Lepisosteidae	Ginglymodi	Holostei	Lepisosteiformes	
<b>Amiidae</b>	Protospondyli	Halecomorphi	<b>Amiiformes</b>	
Clupeidae	Isospondyli	Isospondyli	Clupeiformes	<b>Clupeiformes</b>
<b>Salmonidae</b>			"	Salmoniformes
Osmeridae	"	"	"	"
Hiodontidae				<b>Osteoglossiformes:</b>
Umbridae	<b>Haplomi</b>	Haplomi	"	<b>Salmoniformes</b>
Esocidae			"	"
Cyprinidae	Ostariophysii	Eventognathi	Cypriniformes	Cypriniformes
Catostomidae	"	"	"	"
Ictaluridae		Nematognathii		Siluriformes
Anguillidae	Apodes	Apodes	Anguilliformes	Anguilliformes
Gadidae	<b>Anacanthini</b>	<b>Anacanthini</b>	Gadiformes	Gadiformes
Amblyopsidae	Microcyprini	<b>Cyprinodontes</b>	Cyprinodontiformes	Percopsiformes
Cyprinodontidae			"	Atheriniformes
Poeciliidae				"
Percopsidae	Salmopercae	<b>Salmopercae</b>	Percopsiformes	Percopsiformes
Aphredoderidae		<b>Xenarchi</b>	"	"
<b>Atherinidae</b>	Percomorphi	Percomorphi	Mugiliformes	Atheriniformes
Serranidae	"		<b>Perciformes</b>	Perciformes
Centrarchidae		"	"	"
<b>Percidae</b>	"		"	"
<b>Sciaenidae</b>	"		"	"
<b>Cottidae</b>	Scleroparei	Cataphracti	"	Scorpaeniformes
Gasterosteidae		Thoracostei	<b>Gasterosteiformes</b>	<b>Gasterosteiformes</b>

## KEY TO THE FAMILIES OF INDIANA FISHES

- 1a **Mouth** without jaws; paired fins absent; 7 paired external gill openings; single median nostril; no scales  
 Lamprey family - PETROMYZONTIDAE p. 18
- 1b Mouth with jaws, paired fin(s) present; 1 pair of external gill openings; two nostrils; scales **present** or absent ..... 2
- 2a(1) Caudal fin strongly heterocercal (upper lobe with distinct fleshy base and longer than lower); flattened snout projecting beyond mouth **by** a distance exceeding opening of mouth; mouth posterior to front of eye ... 3
- 2b Caudal fin abbreviate heterocercal or homocercal (upper and lower caudal fin lobes about equal in length); snout not projecting beyond mouth by a distance exceeding opening of mouth; mouth anterior to eye ..... 4
- 3a(2) Body virtually naked; snout length (**distance** from eye to tip of snout) more than 2 times greatest body depth; **snout** paddle-like; 2 small barbels on **lower** surface of snout  
 Paddlefish family - POLYDONTIDAE, p. 20
- 3b Body with bony plates in **5** separate rows; snout length less than body depth; snout not paddle-like; **4** **elongate** barbels on lower surface of snout  
 Sturgeon family - ACIPENSERIDAE, p. 21
- 4a(2) Caudal fin abbreviate heterocercal (upper part of caudal peduncle extending slightly dorsally, not symmetrical) and rounded ..... 5  
 Caudal fin homocercal and rounded or forked ..... 6
- 5a(4) Snout length more than 2 times dorsal fin length; dorsal fin origin much behind pelvic fin insertion; dorsal fin length contained more than 4 times in standard length; gular plate (bone between the mandibles) not present; scales ganoid (thick and inflexible)  
 Gar family - LEPISOSTEIDAE, p. 21
- 5b Snout length less than  $\frac{1}{4}$  dorsal fin length; dorsal fin origin much ahead of pelvic fin insertion; dorsal fin length contained less than 0.5 times in standard length; a wide flat gular plate present; scales cycloid (thin and flexible)  
 Bowfin family - AMLIIDAE, p. 22

		14
6a(4)	Pelvic fins absent, or if present, eyes rudimentary and <b>body</b> without pigment	7.....
6b	Pelvic fins and eyes conspicuous; body with pigment .....	8.....
7a(6)	Anus jugular, in front of pectoral fins; dorsal, caudal, and anal fins not <b>continuous</b> ; eye rudimentary and body without pigment  Blindfish family - <b>AMBLYOPSIDAE</b> , p. 56	
7b	Anus normal, behind pectoral fins; dorsal, caudal, and anal fins continuous; eyes conspicuous and body with pigment  Eel family - <b>ANGUILLIDAE</b> , p. 23	
8a(6)	Adipose fin (small but distinct fleshy appendage behind dorsal fin and without rays) present .....	9
8b	Adipose fin not present . . . . .	12
9a(8)	Spine present in dorsal and pectoral fins; 4 pairs of barbels on head; skin naked  Catfish family - <b>ICTALURIDAE</b> , p.52	
9b	No spine in pectoral fin; no barbels on head; distinct scales covering body .....	10
10a(9)	Adipose fin originating distinctly posterior to the basal end of the anal fin; ctenoid scales; weak spines in dorsal, anal, and pelvic fins  Trout Perch family - <b>PERCOPSIDAE</b> , p. 57	
10b	Adipose fin originating anterior to the basal end of the anal fin; cycloid scales; no spines in dorsal, anal, or pelvic fins . .	11
11a(10)	Fleshy appendage at base of pelvic fin; either lateral-line scales more than 100 or fewer than 100 with jaw teeth absent or very weak  Salmon family - <b>SALMONIDAE</b> , p. 24	
11b	No fleshy appendage at base of pelvic fin; lateral-line scales less than 75 and jaw teeth well developed  Smelt family - <b>OSMERIDAE</b> , p. 27	

12a(8)	Body scaleless or with <b>prickles</b> . . . . .	13
12b	Body with overlapping clearly visible scales . . . . .	14
13a(12)	Dorsal spines strong and isolated, not interconnected with a membrane; pelvic fin reduced to a single spine <b>and soft ray</b> ; no spines on <b>the preopercle</b> edge  <b>Stickleback</b> family - <b>GASTEROSTEIDAE</b> , p4 60	
13b	Dorsal spines weak and not isolated., connected to one another. <b>by a</b> membrane; pelvic fin with 3 or 4 soft rays; spines on the <b>preopercle edge</b> , often <b>covered</b> by skin  Sculpin family - <b>TIME</b> , p. 61	
14a(12)	Anus in front of pelvic fin in fish over 35 mm standard length; rounded caudal fin and undivided <b>dorsal</b> fin  Pirate Perch <b>family</b> - <b>APHREDODERIDAE</b> , p. 57	
14b	Anus behind pelvic fin; rounded, squarish, or forked caudal fin and partially or completely divided dorsal fin . . . . .	15
15a(14)	Dorsal fin without spines or with one distinct spine; pelvic fin without a spine and rayed dorsal fin single, or if not single, anal fin origin behind dorsal fin origin . . . . .	16
15b	Dorsal fin with more than 1 spine; pelvic fin with a spine, or if absent or weak, either anal fin origin even with or ahead of dorsal fin origin . . . . .	24
16a(15)	Caudal fin weakly or strongly forked (Fig. 2) or if rounded then barbel under tip of chin . . . . .	17
16b	Caudal fin rounded (posterior margin definitely convex) and <b>barbels</b> never present . . . . .	22
17a(16)	Gill membranes united to isthmus (gill slits not extended far forward - Fig. 3); <b>branchiostegal</b> rays 4 or less; Weberian apparatus present . . . . .	18
17b	Gill membranes free from isthmus (gill slits extended far forward - Fig. 3); branchiostegal rays 5 or more; <b>Weberian</b> apparatus (fusion and modification of anterior 3 or 4 vertebrae) not present . . . . .	19

- 18a(17) Lips usually thick and covered with papillae; caudal fin usually with 16 branched rays; distance from anal fin origin to tip of snout over 21 times distance from anal fin origin to base of caudal fin and no spine in dorsal or anal fins; pharyngeal teeth in single row with more than 15 teeth; maxillaries forming part of the upper jaw margin

Sucker family - CATOSTOMIDAE, p. 45

- 18b Lips not usually thick and never covered with papillae; caudal fin usually with 17 branched rays; distance from anal fin origin to tip of snout less than 21 times distance from anal fin origin to base of caudal fin, or if not, spine in dorsal and anal fin; pharyngeal teeth in 1 to 3 rows with less than 7 teeth in any row; upper jaw margin formed by only premaxillaries

Minnow family - CYPRINIDAE, p. 30

- 19a(17) Body compressed, standard length less than \* greatest body depth 20  
19b Body elongate, standard length more than  $\frac{1}{4}$  body depth ..... 21

- 20a(19) Belly with strong spiny scutes, lateral line absent; gillrakers numerous and long

Herring family - CLUPEIDAE, p. 23

- 20b Belly without strong spiny scutes (may have sharp edge); lateral line present; gillrakers few and short

Mooneye family - HIODONTIDAE, p. 27

- 21a(19) Pelvic fin insertion behind pectoral fin insertion; no barbel under chin; dorsal fin length shorter than or about equal to snout length

Pike family - ESOCIDAE, p. 28

- 21b Pelvic fin insertion in front of pectoral fin insertion; single barbel under chin; total dorsal fin length several times greater than snout length

Cod family - GADIDAE p. 57

- 22a(16) Premaxillaries not protractile (no groove separating upper lip and snout), pelvic fin insertion nearer to caudal base than to tip of snout

Mudminnow family - UMBRID, 1E, p. 28

- 22b Premaxillaries protractile (groove separating upper lip and snout); pelvic fin insertion midway between caudal base and tip of snout, or nearer snout ..... 23

- 23a(22) Third anal ray (including rudimentary rays) branched (usually requires magnification to determine); longitudinal stripes or vertical bars present, or if not, dorsal fin rays more than 12  
Killifish family - **CYPRINODONTIDAE**, p. 58
- 23b Third anal ray unbranched; stripe(s) or bars not present on body and dorsal fin rays less than 10  
Livebearer family - **POECILIIDAE**, p. 59
- 24a(15) Dorsal fin single or at least a membrane clearly continuous along length of dorsal fin, and if not, then 3 anal spines and maxilla extending past center of eye ..... 25
- 24b Dorsal fins separated or just abutting, and if not, then anal spines 1 or 2 ..... 26
- 25a(24) Lateral line extending across caudal fin; 2 anal spines; caudal fin rounded  
Drum family - **SCIAENIDAE**, p. 80
- 25b Lateral line not extending across caudal fin; 3 or more anal spines; caudal fin forked  
Sunfish family - **CENTRARCHIDAE**, p. 62
- 26a(24) Less than 1/3 of pectoral fin length extending past pelvic fin insertion and anal fin origin even with or ahead of dorsal fin origin  
Silverside family - **ATHERINIDAE**, p. 60
- 26b More than of pectoral fin length extending past pelvic fin insertion and anal fin origin much behind dorsal fin origin . . . 27
- 27a(26) Anal spines 3; prominent, horizontal dark lines on the upper body, except in young  
Sea bass family - **SERRANIDAE**, p. 61
- 27b Anal spines 1 or 2; no prominent, horizontal dark lines on the upper body  
Perch family - **PERCIDAE**, p. 69

THE FAMILIES OF INDIANA FISHES  
WITH KEYS AND ACCOUNT OF THE SPECIES

Order: *Petromyzontiformes*

Lamprey family - *PETROMYZONTIDAE*

Seven or eight genera in cool zones of northern and southern hemispheres; three or four genera in North America all in sub-family *Petromyzontinae*, *Anadromous* or *freshwater*. Metamorphosis of filter feeding *ammocoete* larvae to parasitic or non-feeding adult.

The following key is for the identification of adults only. Hubbs and Lagler (1964) and Trautman (1957) give a key to ammocoetes of some species. These keys, however, do not include all of Indiana's species and are not entirely quantitative. The distribution of Indiana lampreys is poorly known, partly because of the lack of knowledge concerning identification of the larvae.

- 00 Dorsal fin continuous, never divided into 2 distinct fins; myomeres (muscle segments) between last gill opening and anus 47 to 60 (skin must usually be scraped of mucus to see the myomeres) ..... 2
- 1b Two distinct dorsal fins, close together or well separated; myomeres between last gill opening and anus 63 to 74 ..... 5
- 2a(1) Teeth degenerate on posterior field; disc length (longitudinal diameter) contained more than 19 times in total length (measured to tip of tail); (maximum length about 6 inches; nonparasitic)
- Northern brook lamprey - *Ichthyomyzon fossor* Reighard and Cummins
- Southern Ontario to southern Quebec and Wisconsin to New York. Indiana: *Tippecanoe* drainage.
- 2b Teeth well developed on posterior field; disc length contained less than 17 times in total length ..... 3

- 3a(2) Circumoral teeth (Fig. 4) usually all unicuspid; 5 to 8 teeth in lateral rows radiating from the esophageal opening; myomeres between last gill slit and anus 48 to 54; (maximum length about 14 inches; parasitic)

Silver lamprey - Ichthyomyzon unicuspis Hubbs and Trautman

Manitoba to Quebec and Missouri to **Kentucky**, Indiana: White and Wabash drainages. Doubtful records: Lake Michigan and Ohio drainages.

- 3b Circumoral teeth lateral to the esophageal opening in part bicuspid; 7 to 10 teeth in lateral rows radiating from the esophageal opening; myomeres between last gill slit and anus 49 to 61 ..... 4

- 4a(3) **Myomeres between** last gill slit and anus 54 to 61; transverse lingual lamina (lies on the floor of the esophageal opening) moderately to strongly **bilobed**; (maximum length about 10 inches; parasitic)

Ohio lamprey - Ichthyomyzon bdellium (Jordan)

Confined to Ohio River drainage. Indiana: **White, Wabash** (mainly Tippecanoe), and Ohio drainages,

- 4b **Myomeres** between last gill slit and anus 49 to 55; transverse lingual lamina linear or weakly **bilobed**; (maximum length about 12 inches; parasitic)

Chestnut lamprey - Ichthyomyzon castaneus Girard

Manitoba and North Dakota to Michigan and Texas to Georgia. Indiana: Lake Michigan drainage, East Fork of the White River, and Muscatatuck **River**.

- 5a(1) Buccal funnel with numerous series of teeth radiating in all directions from mouth (Fig. 4); (parasitic)

Sea lamprey - Petromyzon marinus Linnaeus

Atlantic coasts of Europe and North America. Native in Lake Ontario and invaded the other Great Lakes through canals. Indiana: Lake Michigan drainage. One specimen has been reported from Maxinkuckee Lake outlet (Tippecanoe drainage).

- 5b Buccal funnel with teeth in groups, not in radiating series (Fig. 4) .. 6

6a(5) Myomeres between last gill slit and anus more than 61; semi-circular row of teeth visible on posterior field of buccal disc; supraoral tooth bar single; lateral teeth usually bicuspid (Fig. 4); (nonparasitic)

American brook lamprey - Lampetra lamottei (Lesueur)  
(= Entosphenus lamottenii)

Minnesota to Quebec and Missouri ~~to Maryland~~.  
Indiana: a few scattered localities in northern (La Porte and Kosciusko) and central (Wayne, Brown, Owen, and Vigo) counties and in Lake Michigan, Tippecanoe, White, and Wabash drainages.

6b ~~Myomeres~~ between last gill slit and anus less than 61; no semicircular row of teeth on posterior field of buccal disc; supraoral tooth bar separated; lateral teeth usually unicuspid (Fig. 4); (nonparasitic)

Least brook lamprey - Lampetra aepyptera (Abbott)  
(= Eudontomyzon aepypterus (Abbott))

Upper Ohio Valley to Maryland and Gulf Coast from Georgia to Mississippi. Indiana: White drainage (Monroe, ~~Greene~~, and Orange counties).

Order: Acipenseriformes

Paddlefish family - **POLYDONTIDAE**

Two genera, one in China and one in United States. Freshwater

Paddlefish - Polyodon spathula (Walbaum)

Originally eastern Montana to New York and Texas to North Carolina. Present range: much restricted. Indiana: White, ~~Wabash~~, (including Tippecanoe), and Ohio drainages.

Sturgeon family - ACIPENSERIDAE

Four genera in northern hemisphere; two genera occurring in North **America**. Anadromous or freshwater.

- 1a Caudal peduncle incompletely armored; dorsal lobe of caudal fin without long filament; spiracle (small opening) between eye and upper corner of **opercle**; dorsal fin rays 35 to **40**; lower lip with 2 non-papillose **lobes**

Lake sturgeon - Acipenser fulvescens Rafinesque

Alberta to Quebec and Alabama. Indiana: only a few localities in Lake Michigan, Wabash and Ohio **drainages**.

- 1b Caudal peduncle completely armored; dorsal lobe of caudal fin with long filament; spiracle not present; dorsal fin rays 30 to 36; lower lip with **4** papillose lobes

Shovelnose sturgeon - Scaphirhynchus platyrhynchus (Rafinesque)

Mississippi drainage from Montana to Pennsylvania and Louisiana to Mississippi. Indiana: only a few localities in White, Wabash, and Ohio drainages.

Order: Lepisosteiformes

Gar family - LEPISOSTEIDAE

One genus in eastern North America, Central America, and **Cuba**. Freshwater but with salt-tolerant species.

- 1a Width of upper jaw at nostrils less than diameter of eye; distance from posterior edge of eye to posterior edge of opercle membrane contained more than **3.5** times in head length; least width of snout contained more than 8 times in its length

Longnose gar - Lepisosteus osseus (Linnaeus)

North Dakota to Quebec and northeastern Mexico to **Florida**. Indiana: all major drainages.

- 1b Width of upper jaw at nostrils greater than diameter of eye; distance from posterior edge of eye to posterior edge of opercle membrane contained less than 3.5 times in head length; least width of snout contained less than 8 times in its length . . . 2

- 2a(1) Diameter of eye contained more than 1.5 times in width of upper jaw at nostrils; **large** teeth in upper jaw in two rows on each side (except in young less than 10 inches); distance from tip of snout to angle of jaw equal to or shorter than rest of head

Alligator gar - Lepisosteus spatula **Lacépède**

Missouri to Ohio and northeastern Mexico to northwestern Florida. Indiana: only from the Ohio River Falls (**Rafinesque**, 1820) and from the lower Wabash River (Jordan, 1890).

- 2b Diameter of eye contained less than 1.5 times in width of upper jaw at nostrils; large teeth in upper jaw in one row on each side (young **L. platostomus** may have two rows); distance from tip of snout to angle of jaw equal or longer than rest of head . . . . 3

- 3a(2) Lateral-line scales (including informed ones on caudal fin) **54** to 58; top of head usually heavily spotted; dark pigment on body mostly in spots

Spotted gar - Lepisosteus oculatus (Winchell)  
(= L. productus (Cope))

Illinois to Ontario and northeastern Mexico to Florida. Indiana: Lake Michigan, Wabash, and Ohio drainages.

- 3b Lateral-line scales (including **illformed** ones on caudal fin) 59 to **64**; top of head with few or no spots; dark pigment on body mostly in streaks between scale rows

Shortnose gar - Lepisosteus platostomus Rafinesque

Eastern Montana to Pennsylvania and Texas to Mississippi. Indiana: White and **Wabash** drainages.

Order: Amiiformes

Bowfin family - AMIIDAE

One species in eastern North America, fossils in Europe. Freshwater.

**Bowfin** - Amia calva Linnaeus

Minnesota to Quebec and Texas to Florida. Northern Indiana: Lake Michigan, Kankakee, Tippecanoe, and Eel drainages; southern Indiana: White, Wabash, and Ohio drainages.

Order: Anguilliformes

Eel family - ANGUILLIDAE

Atlantic and Indo-Pacific area; catadromous (spawning in salt water and living most of adult life in fresh water)

American eel - Anguilla rostrata (Lesueur)  
(= Anguilla bostoniensis (Lesueur))

Southern Greenland to Brazil and throughout much of the Mississippi valley. Introduced in the Great Lakes above Niagara Falls. Individuals die after spawning but may live up to 50 years in landlocked lakes. Descent to the sea is necessary for reproduction. Indiana: very rare, known from a few localities in Lake Michigan, Wabash, White, and Ohio drainages.

Order: Clupeiformes

Suborder: Clupeoidei

Herring family - CLUPEIDAE

Six subfamilies from arctic, through tropical, to antarctic regions. Marine, anadromous, and freshwater species. The two Indiana genera are placed in different subfamilies, Dorosoma in Dorosomatinae and Alosa in Alosinae.

- |       |   |   |
|-------|---|---|
| 1a    | Posterior dorsal fin ray greatly elongated; mouth sub-terminal or inferior (protruding upper jaw) . . . . .   | 2 |
| 1b    | Posterior dorsal fin ray not elongated; mouth terminal (protruding lower jaw) . . . . .   | 3 |
| 2a(1) | Anal fin rays 29 to 35; scales in lateral series more than 50; head length contained about 4.3 times in standard length, dorsal fin origin slightly behind pelvic fin insertion |   |

Gizzard shad - Dorosoma cepedianum (Lesueur)

Minnesota to Quebec and northeastern Mexico to Florida. Indiana: Maumee, Kankakee, White, Wabash (including Tippecanoe), and Ohio drainages.

- |    |   |  |
|----|---|--|
| 2b | Anal fin rays 17 to 25; scales in lateral series less than 50; head length contained about 3.5 times in standard length; dorsal fin origin slightly ahead of pelvic fin insertion |  |
|----|---|--|

Threadfin shad - Dorosoma petenense (Günther)  
(= Signalosa petenensis (Günther))

Southern Indiana to Texas and Florida and British Honduras. First captured in Indiana in 1957 in the Little Blue River, a tributary to the Ohio River in Crawford County (McReynolds, 1966).

- 3a(1) Gillrakers on lower limb of first arch less than 30; teeth on tongue in 2 to 4 rows; premaxillae meeting at an obtuse angle to form a shallow notch; lower jaw strongly projecting beyond upper jaw

Skipjack herring - Alosa chrysochloris (Rafinesque)  
(= Pomolobus chrysochloris Rafinesque)

Minnesota to Pennsylvania and Louisiana to Florida.  
Indiana: a few records in White, Wabash, and Ohio rivers.

- 3b Gillrakers on lower limb of first arch more than 30; teeth on tongue in single median row or in a small patch; premaxillae meeting at a midanterior point in an acute angle to form a deep notch receiving lower jaw; lower jaw slightly projecting beyond upper jaw

- 4a(3) One or more black spots on side of body behind upper end of gill opening; tongue with a small patch of teeth

Alewife - Alosa pseudoharengus (Wilson)

Labrador to Florida and in Lake Ontario.  
Recently spread through the upper Great Lakes. Indiana: Lake Michigan.

No black spot behind gill opening; tongue with single row of teeth

Ohio shad - Alosa alabamae Jordan and Evermann  
(= Alosa ohioensis Evermann)

Originally: Ohio and Mississippi rivers but now much more restricted. Indiana: not recorded since Evermann's (1902) specimens from the Ohio River at Jeffersonville.

Suborder: Salmonoidei

World wide; marine, anadromous, and freshwater

Salmon family - SALMONIDAE

Nine genera in northern hemisphere; seven occurring in North America. Three subfamilies are currently recognized (Norden, 1961) with two occurring in Indiana; Coregoninae with Coregonus and Salmoninae with Oncorhynchus, Salmo, and Salvelinus. Anadromous or freshwater.

1a Lateral-line scales less than 100; teeth on jaws and tongue weak or absent; maxilla not extending to below middle of eye; young without parr marks (vertical dark bars) ..... 2

1b Lateral-line scales more than 110; teeth on jaws and tongue strong; maxillae extending to at least below middle of eye; young with parr marks ..... 3

2a(1) Mouth subterminal, anterior edge of upper jaw directed downward and backward (retrorse); first arch gillrakers less than 33

Lake whitefish - Coregonus clupeaformis (Mitchill)

Alaska to Labrador and British Columbia to New Brunswick with southern limits in Lakes Michigan and Erie. Indiana: only from Lake Michigan.

2b Mouth terminal, anterior edge of upper jaw directed forward and slightly downward (antrorse); first arch gillrakers more than 40

Cisco - Coregonus artedii Lesueur  
(= Leucichthys artedii (Lesueur))

Alberta and Northwest Territories to Quebec and Great Lakes Region. Indiana: Great Lakes and northern Wabash drainages. The occurrence of this species in Shriner Lake, Whitley County, Indiana, at latitude 41 14 N, represents the southernmost locality of the Coregoninae (Frey, 1955). Some workers believe C. artedii, C. sardinella, and C. albula should be treated as conspecific. If so, C. albula (Linnaeus) has priority (McAllister, 1960).

3a(1) Scales along lateral line less than 170; color pattern of dark spots on lighter background; teeth on head and shaft of a flat vomer ..... 5

3b Scales along lateral line more than 175; color pattern of light spots on darker background; teeth on head, not on shaft, of a boat-shaped vomer ..... 5

4a(3) Anal fin with 13 or more rays

Salmon - Oncorhynchus spp.

Oncorhynchus kisutch (coho salmon) and O. tshawytscha (chinook salmon) occur in Lake Michigan, Indiana, from recent introductions. Their continued presence may depend upon plantings. There is some doubt about means of separating these two species in Indiana.

4b Anal fin with 12 or fewer rays ..... 5

5a(4) Dark spots on caudal fin, if present, confined to upper lobe; many of the large black spots on body surrounded by pale halos; live young with orange ~~adipose~~ fin and pith row of red spots (white when preserved) along lateral line

Brown trout - Salmo trutta Linnaeus

Native range: western Europe and the British Isles. Planted throughout the world in temperate regions. Stocked in Indiana in several streams.

5b Dark spots on both lobes of caudal fin; no halos around black body spots; young without orange on adipose fin and without row of red spots along lateral line

Rainbow trout - Salmo gairdnerii Richardson

Native range: southern Alaska to the California-Mexico border and east to western Alberta. Planted throughout the world in temperate regions. Indiana: stocked in several northern lakes and streams and in Washington, Shelby, and Bartholomew counties.

6a(3) Dark wavy markings on back and dorsal fin; caudal fins squarish, not deeply forked; pyloric caeca less than 50; young with sharp dark chin margin and black stripe along front of dorsal fin

Brook trout - Salvelinus fontinalis (Mitchill)

Native range: Hudson Bay drainage and Newfoundland to the Carolinas and Lake Superior drainage and the Mississippi headwaters. Planted throughout the world in temperate regions. The original distribution may have included the Indiana portion of Lake Michigan. Stocked in some Indiana streams.

6b Spots irregular but not forming wavy markings on back or dorsal fin; caudal fin deeply forked; pyloric caeca more than 90; young without a sharp dark chin margin and no black stripe along front of dorsal fin

Lake trout - Salvelinus namaycush (Walbaum)  
(= Cristivomer namaycush (Walbaum))

Northern Alaska to Labrador and British Columbia to Nova Scotia with southern limits in Montana, Wisconsin, and Minnesota. Introduced south of natural range in western North America. Indiana: early records in Lake Michigan.

## Smelt family - OSMERIDAE

Six genera in northern hemisphere; all extending into North America. Two **subfamilies** with the single Indiana species in Osmerinae. Marine, anadromous, and freshwater.

Rainbow smelt - Osmerus eperlanus mordax (Mitchill)  
(= Osmerus mordax (Mitchill))

Circumpolar. The subspecies ranges in the Pacific from Korea to Alaska and British Columbia, in the Arctic along the Northwest Territories and in the White Sea. In the western Atlantic it is **known** from Labrador, south perhaps as far as Virginia and eastward to Lake Ontario. Occurs in anadromous and freshwater forms. It has been introduced into the upper four Great Lakes. Indiana: Lake Michigan and its immediate tributaries.

Suborder: **Notopteroidel**

North America, Africa, East Indies, and Indo-Malayan Archipelago. Freshwater.

Mooneye family - HIODONTIDAE (= HYODONTIDAE)

One genus, North America

- 1a Dorsal fin rays 11 or 12; dorsal fin origin before anal fin origin and its base about  $\frac{1}{2}$  anal base; ventral keel not extending in front of pelvic fin base; anal fin rays 23 to 29; iris silvery; eye diameter contained 2.5 times in head length

Mooneye Hiodon tergisus Lesueur

Saskatchewan to Quebec and southeastern Oklahoma to Maryland. Indiana: Wabash drainage (Carroll, Lawrence, Vigo, and Owen counties). **Krumholz** et al. (1962) report it in the Ohio River.

- 1b Dorsal fin rays 8 to 10; dorsal fin origin behind anal fin origin and its base about  $\frac{1}{3}$  anal base; ventral keel extending in front of pelvic fin base; anal fin rays 29 to 32; iris golden; eye diameter contained 3.5 times in head length

Goldeye - Hiodon alosoides (Rafinesque)  
(= Amphiodon alosoides (Rafinesque))

Northeastern British Columbia, through the Northwest Territories to Quebec and Mississippi valley to Alabama. Absent from the Great Lakes. Indiana: historical records (1887 to 1924) from White, Wabash (and recently in Warren County), and Ohio rivers (and recently from the latter).

Suborder: Esocoidei

Northern hemisphere, freshwater.

Mudminnow family - UMBRIDAE

Two subfamilies (Umbrinae and Dalliinae). Umbrinae consists of two genera, one in Washington and one occurring in eastern North America and central Europe.

Central mudminnow - Umbra limi (Kirtland)

Manitoba to Quebec to Tennessee. Indiana: Lake Michigan, Maumee, Kankakee, White, Wabash, and Whitewater drainages. Peckham and Dineen (1957) describe the ecology of this species from a northern Indiana stream.

Pike family - ESOCIDAE

One genus in Eurasia and North America. Four species in North America.

Opercles completely scaled; lateral-line scales less than 114; branchiostegal rays 10 to 14; prominent dusky, vertical bar extending downward from eye; fork length never over 15 inches

Grass pickerel - Esox americanus vermiculatus Lesueur  
(= Esox vermiculatus Lesueur)  
Crossman (1966) gives details on the taxonomy and distribution of Esox americanus.

Southernmost Ontario to Quebec and Texas to Florida. The subspecies ranges from Ontario to Quebec and Texas to Alabama, but is absent from the Atlantic coastal area where the other subspecies occurs. Indiana: all major drainages.

Opercles scaleless on lower half; lateral-line scales more than 114; branchiostegal rays 14 to 19; dusky vertical bar below eye absent or very faint; fork length up to 4 feet .....

- 2a(1) Cheeks (region in front of preopercle) fully scaled; branchiostegal rays 13 to 16; pores on mandible (lower jaw) 5; lateral-line scales less than 145; body and vertical fins with many whitish or yellowish spots in individuals more than 10 inches fork length

Northern pike - Esox lucius Linnaeus

Circumpolar in northern portion of the northern hemisphere. Ranges in North America from Alaska to Labrador and northern British Columbia to Missouri and New York. Indiana: Lake Michigan and northern Wabash drainages. Recorded first from Indiana in New Harmony, Posey County, southwestern Indiana (Cuvier and Valenciennes, 1833; Jordan, 1890). Introduced in some other southern areas.

- 2b Cheeks scaleless on lower half; branchiostegal rays 16 to 20; pores on mandible 6 to 9; lateral-line scales more than 145; body and vertical fins without whitish spots but with few (in southern form) to many (in northern form) dark or dusky spots in individuals more than 10 inches fork length

Muskellunge - Esox masquinongy Mitchill

Ontario to Quebec to northern Alabama. Gerking (1945) recognized two subspecies in Indiana: E. m. masquinongy from Lake Michigan and possibly from the Kankakee River and E. m. ohioensis from the Ohio River and in the Little Blue River, an Ohio River tributary.

Order: Cypriniformes

Suborder: Cyprinoidei

Teeth on the pharyngeal arch (modified fifth gill arch) must often be counted in identifications. The arch lies adjacent to the shoulder girdle and may be easily removed (but with great care) through the opercular opening. The teeth in each row are counted and given in a formula from left to right. A dash separates counts on the two sides. Thus, a count of 2, 4-1 indicates that there are two teeth on the outer row, four teeth on the inner row on the left arch and four teeth on the inner row, one tooth on the outer row of the right arch. The teeth may be in one, two, or three rows on each side (see Cross, 1967 for figures). The pharyngeal arch must be examined under magnification to ascertain the presence of a broken tooth or an old socket where a tooth once was. Counts of several specimens should preferably be made.

## Minnow family - CYPRINIDAE

Europe, Africa, Asia, and North America. Freshwater. Cyprinus and Carassius are in the subfamily Cyprininae. The native North American minnows, with the possible exception of Notemigonus, are in the family Leuciscinae.

1a Dorsal and anal fins each with a strong serrated spine at origin; dorsal fin base longer than  $\frac{1}{3}$  standard length and with more than 14 soft rays . . . . . 2

1b No spines in dorsal or anal fin; dorsal fin base shorter than  $\frac{1}{4}$  standard length and with less than 10 rays . . . . . 3

2a(1) Upper jaw with two barbels on each side; first arch gillrakers less than 28; pharyngeal teeth 1,1,3-3,1,1 or 2,3--3,2; lateral-line scales more than 31 except in the Mirror and Leather carp which are only partly scaled and scaleless, respectively

Carp - Cyprinus carpio Linnaeus

Native to Asia, widely introduced in Europe, North America, and elsewhere. Carp have been established in all drainages of Indiana.

2b Upper jaw without barbels; first arch gillrakers more than 36; pharyngeal teeth 4-4; lateral-line scales less than 31

Goldfish - Carassius auratus (Linnaeus)

Native to Asia and widely introduced elsewhere. A few reports exist for the establishment of this species in Indiana.

3a(1) Barbel present at or near tip of maxilla (end of jaw - the barbel may be hidden in a groove, missing from one side, or be minute; small specimens require examination under magnification). 4

3b Barbels absent (a barbel-like swelling occurs at the end of the maxillary in breeding males of Pime hales) . . . . . 13

4a(3) Premaxillaries nonprotractile (upper lip connected with snout by a broad frenum - a vertical bridge of tissue which the premaxillary groove does not cross) . . . . . 5

Premaxillaries protractile (upper lip separated from snout by a groove) . . . . . 6

5a(4) Preorbital head length usually contained 0.7 (large adults) to 1.2 (small young) times in postorbital length; eye contained 4.8 (small young) to 6.3 (large adults) times in head length; snout projecting far beyond the horizontal mouth; eyes superolateral

Longnose dace - Rhinichthys cataractae (Valenciennes)

British Columbia to Labrador, extending north in the Mackenzie River and south along the Rocky Mountains to northern Mexico, and south from the Great Lakes to North Carolina. Indiana: St. Joseph River, Elkhart County, Lake Michigan drainage.

5b Preorbital head length usually contained 1.1 (large adults) to 1.7 (small young) times in postorbital length; eye contained 3.8 (small young) to 5.3 (large adults) times in head length; snout projecting slightly beyond a somewhat oblique mouth; eyes lateral

Western blacknose dace - Rhinichthys atratulus meleagris Agassiz

Manitoba to New Brunswick and Nebraska to Virginia. The subspecies ranges from Manitoba to Ontario and Nebraska to Pennsylvania. Indiana: all major drainages, but not recorded from Maumee drainage or from the southwestern corner of the state.

Mouth somewhat oblique (dipping slightly downward posteriorly) and terminal or slightly inferior; eye diameter less than upper jaw length .....

6b Mouth horizontal and distinctly inferior; eye diameter equal to or more than upper jaw length ..... 9

7a(6) Barbel on lower edge of maxillary, well in advance of posterior end (usually concealed and often minute); teeth in outer row of pharyngeal arch usually 2; black spot often with rusty color at anterior base of dorsal fin (indistinct in young); origin of dorsal fin distinctly behind pelvic fin insertion

Creek chub - Semotilus atromaculatus (Mitchill)

Manitoba to Nova Scotia and New Mexico to northern Florida. Indiana: all major drainages'.

7b Barbel at or near end of maxillary; teeth in outer row of pharyngeal arch usually 1; no black spot on dorsal fin; origin of dorsal fin about even with pelvic fin insertion . . . 8

- 8a(7) Pharyngeal teeth usually ~~1,4~~ ~~4,1~~; snout length usually contained 1.2 to 1.7 times in postorbital head length; distinct caudal spot in young, faint or absent in large adults

Hornyhead chub - Nocomis biguttatus (Kirtland)  
 (= Hybopsis biguttata (Kirtland))  
 Lachner and Jenkins (1967) discuss the systematics of Nocomis.

Manitoba to New York and Colorado to Arkansas.  
 Indiana: all drainages within the limits of Wisconsin glaciation; very few records in the southern third of the state.

- 8b Pharyngeal teeth ~~4-4~~; snout length usually contained 0.8 to 1.2 times in postorbital head length; caudal spot usually faint or absent, distinct only in small young

River chub - Nocomis micropogon (Cope)  
 (= Hybopsis micropogon (Cope))

Ontario to New York and Alabama to Virginia.  
 Indiana: that portion of the Ohio drainage lying within or near the limits of Wisconsin glaciation. Not known in Indiana from Lake Michigan, Kankakee, or Maumee drainages.

- 9a(6) Bony interorbital space contained 0.7 (small young) to ~~1.4~~ (large adults) times in snout length; pharyngeal teeth ~~1,4-4,1~~ . 10

- 9b Bony interorbital space contained ~~1.4~~ (small young) to ~~2.4~~ (large adults) times in snout length; pharyngeal teeth ~~4-4~~ . . . 11

- 10a(9) No distinct dark lateral band; distance from dorsal fin origin to caudal base much greater than distance from dorsal origin to snout

Silver chub - Hybopsis storeriana (Kirtland)

Manitoba to Ontario and Wyoming and Texas to Arkansas and Ohio. Indiana: White, Wabash, and Ohio drainages.

- 10b A distinct dusky lateral band usually encircling the snout; distance from dorsal fin origin to caudal base about equal to distance from dorsal origin to snout

Northern bigeye chub - Hybopsis amblops amblops (Rafinesque)

Oklahoma to western New York and Alabama. The subspecies occupies all but the southernmost range of the species. Indiana: all major drainages except the Kankakee River. Eigenmann and Beeson (1894) is the only record from Lake Michigan drainage.

- 11a(9) Posterior end of maxillary reaching ~~to~~ or past the anterior edge of eye; snout bulbous and greatly overhangs mouth; spots on suborbital region conspicuous
- Speckled chub - Hybopsis aestivalis (Girard)  
(= Extrarius aestivalis (Girard))
- Minnesota to Pennsylvania and New Mexico and northern Mexico to southeastern Mississippi.  
Indiana: ~~White~~ and Wabash drainages.
- 11b Posterior end of maxillary not reaching to anterior edge of eye; snout not bulbous and, at most, moderately overhanging mouth; no distinct spots in suborbital region ..... 12
- 12a(11) A broken lateral band of 7 to 11 oblong, blackish spots; lateral-line scales ~~43~~ to ~~47~~; preorbital head length shorter than, or equal to, postorbital length
- Ohio spotted chub - Hybopsis dissimilis dissimilis (Kirtland)  
(= Erimystax dissimilis (Kirtland))
- Southern Ontario to western New York and Oklahoma to Tennessee. The subspecies ranges from Indiana to ~~western~~ New York and south to Tennessee.  
Indiana: Bartholomew and Crawford counties in White and Ohio drainages.
- 12b No distinct oblong, blackish spots along lateral line; lateral-line scales 38 to ~~43~~; preorbital head length longer than, or equal to (in small young), postorbital length
- Eastern gravel chub - Hybopsis x-punctata trautmani  
~~Hubbs~~ and Crowe
- Minnesota to New York and Oklahoma to Kentucky. The subspecies occurs in the western half of the above range. Indiana: White, Wabash, and Whitewater drainages.
- 13a Dorsal fin with a rather stout, blunt-tipped, anterior half-ray that is distinctly separated from the first principal ray, although connected with it by a membrane (Fig. 5); scales on somewhat flat pre-dorsal region much crowded, and much smaller than scales on sides; lateral-line scales ~~41~~ to ~~49~~; pharyngeal teeth usually ~~4-4~~; a dark spot usually present in at least the adults at front on dorsal fin near but not at base ..... 14
- 13b Dorsal fin with the anterior half-ray slender and tightly bound to the first principal ray (Fig. 5); scales on predorsal region not greatly crowded nor much smaller than those on rest of body; lateral-line scales 30 to 70; pharyngeal teeth variable, may be no dark spot at front of dorsal fin above base (may be present at the base) ..... 16

- 14a(13) Peritoneum silvery; small crescent of melanophores present on side of snout between anterior third of upper lip and eye
- Northern bullhead minnow - Pimephales vigilax perspicuus (Girard)  
(= Ceratichthys perspicuus (Girard))

Minnesota to Pennsylvania and northeastern Mexico to Alabama. The subspecies occupies all but the southwestern range. Indiana: Iroquois, White, Wabash and Ohio drainages.

- 14b Peritoneum blackish or black; no crescent of melanophores on side of snout ..... 15

- 15a(14) Lateral line not extending past anal fin; caudal spot faint; mouth terminal and oblique

Northern fathead minnow - Pimephales promelas promelas Rafinesque

Marcus and Vandermer (1966) note the marked geographic variation in completeness of the lateral line of this species. Alberta to Quebec to northeastern Mexico. The Indiana subspecies ranges from Alberta to Quebec and Colorado to Tennessee. Indiana: known primarily from the eastern half of the state in Maumee, White, Wabash and Ohio drainages.

- 15b Lateral line extending past anal fin; caudal spot distinct; mouth inferior and horizontal

Bluntnose minnow - Pimephales notatus (Rafinesque)  
(= Hyborhynchus notatus (Rafinesque))

Southern Manitoba to Quebec and Oklahoma to Virginia. Indiana: all major drainages.

- 16a(13) Dorsal fin with 9 rays (rarely 8); combination of small oblique mouth (maxillary not extending to vertical line through nostrils), silvery peritoneum, lateral-line scales less than 40, present

Pugnose minnow - Opsopoeodus emiliae Hay

Minnesota to southern Ontario and Texas to Florida. Indiana: Wabash, White, and Ohio drainages; known in Great Lakes drainage only from Lake County (Meek and Hildebrand, 1910).

- 16b Dorsal fin with 7 or 8 rays; combination of small oblique mouth, silvery peritoneum, and lateral-line scales less than 40, not present ..... 17

- 17a(16) Cavernous spaces prominent on ventral surface of head and lower cheeks (enlarged head lateral-line system in form of radiating lines ventrally from the eye); combination of silvery peritoneum, lateral-line scales 31 to 36, inferior  $\square\square\square\square$ , and dorsal fin origin about even with pelvic fin insertion, present
- Silverjaw minnow - Ericymba buccata Cope
- Michigan to Pennsylvania and Louisiana and Georgia. Indiana: all major drainages.
- 17b No prominent cavernous spaces in form of lines radiating ventrally from eye; combination of silvery peritoneum, lateral-line scales 31 to 36, inferior mouth, and dorsal fin origin about even with pelvic fin insertion, not present . . . 18
- 18a(17) Lateral-line scales more than 58 . . . . . 19
- 18b Lateral-line scales less than 59 . . . . . 20
- 19a(18) Lateral-line scales 59 to 70; anal fin usually with 9 rays; peritoneum silvery; pharyngeal teeth 2,5-5,2; single darky, discontinuous, longitudinal band on each side; lower jaw projecting beyond upper
- Redside dace - Gila elongata (Kirtland)  
(= Clinostomus elongatus (Kirtland))
- Range is  $\square\square\square\square\square\square\square\square\square\square$ ; occurs in the Iowa-Wisconsin area, and from southeastern Michigan, into Ontario, to New York to K $\square\square\square\square\square\square$ . I $\square\square\square\square$ : reported in Wabash County by Hay (1894) and in Wayne C $\square\square\square\square\square\square$  Plummer (1851).
- 19b Lateral-line scales 70 to 95; anal fin usually with 8 rays; peritoneum black; pharyngeal teeth 5--5; two darky, longitudinal bands on each side, sometimes with a  $\square\square\square\square\square\square\square\square$  line connecting the two bands; mouth terminal
- Southern redbelly dace - Phoxinus erythrogaster (Rafinesque)  
(= Chrosomus erythrogaster (Rafinesque))
- Minnesota to Pennsylvania and Oklahoma to West Virginia. Introduced  $\square\square\square\square\square\square$  this area. Indiana: Lake Michigan, White, Wabash and Ohio  $\square\square\square\square\square\square$ .
- 20a(18) Anal rays 9 to 15 (occasionally 8 in some species) and usually with dorsal fin origin behind pelvic fin insertion (Notropis cornutus, N. shumardi, and N. photogenis may have the dorsal fin origin even with or slightly ahead of the pelvic fin insertion) 21
- 20b Anal rays 7 or 8 (rarely 9) and dorsal fin origin ahead, even with, or behind pelvic fin insertion . . . . . 32

- 21a(20) Abdomen behind pelvic fins with a mid-line of bare skin (fleshy keel) over which scales do not pass; lower jaw projecting beyond upper jaw and ~~44~~ to ~~54~~ lateral-line scales; pharyngeal teeth ~~5-5~~

Golden shiner - Notemigonus crysoleucas (Mitchill)

Saskatchewan to Nova Scotia and Texas to Florida.  
 Indiana: all major drainages. Gerking (1945) recognized two subspecies with possible inter-gradation in the southwestern portion of the state.

- 21b Abdomen behind pelvic fins rounded and scaled normally; combination of lower jaw projecting beyond upper jaw and 44 to ~~54~~ lateral-line scales, not present; pharyngeal teeth not ~~5-5~~ .22

- 22a(21) Dorsal fin with a prominent blotch at base of anterior rays and fin origin; lateral-line scales ~~40~~ to ~~48~~ ..... 23

- 22b Dorsal fin without a blotch at base (an indistinct spot sometimes present in N. fumeus); lateral-line scales usually less than 41 . . 24

- 23a(22) Anal rays usually 11 to 13 (occasionally 10); head length usually less than body depth; saddle-bands across back faint or absent; breeding males with tubercles on cheeks

Redfin shiner - Notropis umbratilis (Girard)

Southern Minnesota through southern Ontario to western New York and Texas to Mississippi.  
 Indiana: all major drainages except the **White-water**. It has not been taken in the same locality with N, ardens in Indiana.

- 23b Anal rays 9 to 11 (rarely 12); head length usually greater than body depth; ~~8~~ to 11 saddle-bands usually prominent across back; breeding males without **tubercles** on cheeks (may be on rest of head)

Rosefin shiner - Notropis ardens (Cope)

Indiana to Virginia and northern Alabama to North Carolina. Indiana: Ohio drainage, mainly in the Whitewater and Big Blue systems.

- 24a(22) Modal anal fin ray count 9; dorsal fin origin ahead of or very slightly behind pelvic fin insertion (always behind in N. whipplei which has a produced snout) ..... 25

- 24b Modal anal fin ray count 10 to 13; dorsal fin origin well behind pelvic fin insertion (usually over pelvic fin insertion in N. photogenis which has dark crescent shaped areas between nostrils) ..... 28

- 25a(24) Dusky blotch on at least the last three rays of dorsal fin; upper jaw produced **beyond** lower jaw; pharyngeal teeth ~~1,4-4,1~~. Differs from the similar appearing *N. spilopterus* (43a) in usually having 9 anal rays, not 8, ~~15~~ pectoral fin rays, not 14 or fewer, and breeding males with an enlarged dorsal fin with a convex margin (Gibbs, 1963; **Pflieger**, 1965)

**Steelcolor** shiner - *Notropis whipplei* (Girard)

Illinois to northwestern Pennsylvania and eastern Oklahoma to northern **Alabama**. Indiana: Wabash, **White, and** Ohio drainages; unknown from the central portion and from northern tributaries of the Wabash River.

- 25b **No** dusky blotch on posterior dorsal fin; mouth terminal; pharyngeal teeth usually 2,4-4,2 ..... 26

- 26a(24) Length of anterior dorsal fin rays much exceeding posterior rays in the depressed fin and about equal to head length; distinct silvery lateral band with little or no black pigment; exposed portions of lateral scales not elevated, rounded behind; usually 9 pelvic fin rays (occasionally 8); lateral-line scales 33 to 38

Silverband shiner - *Notropis shumardi* (Girard)

Gilbert and Bailey (1962) gave reasons for placing *N. illecebrosus* (Girard) as a junior synonym of *N. shumardi*. South Dakota to Indiana and Texas to Alabama in large rivers. Indiana: known only from a 1940 collection in the Wabash River, Posey County, and a 1957 collection in Indian-Kentuck Creek (an Ohio tributary).

- 26b Length of anterior dorsal fin rays not or only slightly exceeding posterior rays in the depressed fin and much shorter than head length; lateral band dark or darkened in areas; exposed portion of lateral scales much elevated, diamond-shaped; usually 8 pelvic fin rays; lateral-line scales 37 to 40 ..... 27

27a(25) Predorsal scales (scales from occiput to dorsal origin crossing the dorsal ridge) fewer than 24; adults with dark wavy lines between the dorsal scale rows, each wavy line **on** one side of the back converges posteriorly with its corresponding line on the other side; usually a pigmented area on tip of **chin** on underside of head

Striped shiner - Notropis chrysocephalus (Rafinesque)  
(= Notropis cornutus chrysocephalus (Rafinesque))

Southeastern Wisconsin, through southern Michigan, to New York and northeastern Oklahoma to northern Georgia. Indiana: all major drainages. Hybridizes with N. cornutus in northern Indiana (Gerking, 1945; Gilbert, 1961). In area of sympatry, chrysocephalus tends to occur in warmer and slower water than cornutus.

27b Predorsal scales more than 24; wavy lines between the scale rows on each side of back lie parallel; pigment usually absent or confined to a narrow strip on tip of chin on underside of head

Common shiner - Notropis cornutus (Mitchill)  
(= N. cornutus frontalis (Agassiz))

Southern Saskatchewan to Nova Scotia and Colorado and Texas to Virginia. Indiana: Great Lakes, Kankakee, **Wabash, and White** drainages. Commonest in northern third of state and unknown from southern third. Southernmost Indiana occurrence in Eel River drainage, Hendricks and Morgan counties. Hybridizes with N. chrysocephalus in northern Indiana (Gerking, 1945; Gilbert 1961).

28a(24) More than 40 lateral-line scales; more than 23 predorsal scales

Ribbon shiner - Notropis fumeus Evermann

Illinois to Indiana and eastern Oklahoma to Tennessee River system. Indiana: first collected in 1964 in Little Pigeon Creek, Warrick County, Ohio, drainage, by P. W. Smith (McReynolds, 1966).

28b Fewer than 41 lateral-line scales; fewer than 22 predorsal scales. 29

29a(28) Peritoneum black; eye diameter usually contained less than 2.8 times in head length

Popeye shiner - Notropis ariommus (Cope)

Missouri to Indiana and Arkansas to Tennessee. Indiana: three records before 1900 in Wabash and **White** drainages (Hay, 1894; Jordan, 1877a; Eigenmann and Beeson, 1874).

29b Peritoneum silvery; eye diameter usually contained more than 2.8 times (except **in** some young less than 1 inch) in head length 30

- 30a(28) Snout length usually contained more than 1.5 times postorbital head length (distance from posterior margin of eye to end of gill membrane); mid-dorsal streak indistinct or absent; body deepest in region of dorsal fin origin
- Emerald shiner - *Notropis atherinoides* Rafinesque
- Northern Alberta to Quebec and Texas, Indiana: all major drainages except the St. Joseph and Kankakee. Gerking (1945) recognized two subspecies, N. a. acutus (Lapham) along the shores of Lake Michigan and N. a. atherinoides Rafinesque in the remainder of the 'Rate.
- 30b Snout length usually contained less than 1.5 times in postorbital head length; mid-dorsal streak usually very distinct; body deepest midway between head and dorsal fin insertion ..... 31
- 31a(29) Two distinct crescent-shaped areas (concave side outward and not touching nasal opening) of melanophores between the nostrils; eye contained 2.7 (small young) to 3.5 (large adults) times in head length; dorsal fin origin over, or slightly behind, pelvic fin insertion
- Silver shiner - *Notropis photogenis* (Cope)
- Western Indiana to western New York and Tennessee to North Carolina. Indiana: Maumee, upper Wabash, upper white, and Ohio drainages.
- 31b No crescent-shaped areas between the nostrils; eye contained 3.5 (small young) to 4.3 (large adults) times in head length; dorsal fin origin distinctly behind pelvic fin insertion
- Rosyface shiner - *Notropis rubellus* (Agassiz)
- Southern Manitoba to southern Quebec and Kansas to Virginia. Indiana: all major drainages but very rare from the southwestern part of the state.
- 32a(20) Lateral band blackish; continued forward through eye and around muzzle (may be indistinct in N. anogenus which has a small, terminal, oblique mouth) ..... 33
- 32b Lateral band dusky or indistinct, not definitely continued forward through eye and around muzzle ..... 38
- 33a(32) Peritoneum black; lateral line complete; mouth terminal ..... 34
- 33b Peritoneum silvery; lateral line incomplete; mouth terminal or subterminal ..... 35

- 314a(33) Upper jaw length contained less than 4.0 times in head length and usually equal to eye diameter; mouth nearly horizontal; teeth usually 1,4 4 1

Bigeye shiner - Notropis boops Gilbert

Eastern Oklahoma to western Pennsylvania to Tennessee. Indiana: Wabash, White, and Ohio drainages. No records from northern tributaries of the Wabash or from the ~~south-western~~ part of the state.

- 34b Upper jaw length contained more than 4.0 times in head length and usually shorter than eye diameter; mouth very oblique; teeth ~~4-4~~

Pugnose shiner - Notronis anogenus Forbes

Eastern North Dakota to Ontario to New York. Indiana: Lake Michigan, Lake Erie, and upper Wabash drainages.

- 35a(33) Tip of lower jaw not black; lateral band in encircling muzzle extends partly on snout; mouth making an angle of much less than 30 degrees with the horizontal; pharyngeal teeth ~~4-4~~; dark borders to lateral-line pores expanded to form prominent, crescent-shaped black cross-bars

Blacknose shiner - Notropis heterolepis Eigenmann and Eigenmann

Saskatchewan to Nova Scotia and Kansas to Ohio. Indiana: Lake Michigan, Kankakee, and northern Wabash drainages.

- 35b Tip of lower jaw black; lateral band in encircling muzzle does not extend on snout; mouth making an angle of more than 30 degrees with the horizontal; pharyngeal teeth 1,4-4,1 or 2,4-4,2; dark borders to lateral-line pores not expanded into crescentic bars ..... 36

- 36a(35) Jaws equal or nearly so; breast scaled; scales of next row above lateral line on trunk with dark bars alternating with the black marks on the lateral-line scales, producing a zigzag appearance

Blackchin shiner - Notropis heterodon (Cope)

Southern Ontario to Quebec and North Dakota and Iowa to New York. Indiana: northern fourth of the state in Lake Michigan, Kankakee, and Wabash drainages.

- 36b Lower jaw distinctly included; breast not scaled; scales of next row above lateral line without definite dark bars ..... 37

- 37a(35) Anal fin rays usually **8**; unpored lateral-line **scales** more than 10; oral pigmentation well-developed on inner borders of jaws, floor and roof of mouth, and on oral valve
- Ironcolor shiner - Notropis chalybaeus (Cope)
- Iowa to New Jersey and Texas to Florida. Indiana: northern fourth of the state in Lake Michigan, Kankakee, Iroquois, and upper Tippecanoe drainages.
- 37b Anal fin rays usually **7**; unpored lateral-line scales less than 10; oral pigmentation absent except for a few melanophores on oral valve
- Weed shiner - Notropis texanus (Girard)  
(= N. roseus (Jordan) and N. xaenocephalus Jordan)
- Southeastern Minnesota to Michigan and Texas to Florida. Indiana: Kankakee and Iroquois drainages and from the De Shee River, Knox County, a tributary to the Wabash. Gerking (1945) provisionally recognized two subspecies, N. t. richardsoni (Hubbs and Greene) from Kankakee and Iroquois drainages and N. t. aletes (Jordan and Evermann) from the De Shee River.
- 38a(32) Lateral-line scales less than 40; combination of **7** anal fin rays, ~~4-4~~ pharyngeal teeth, and subterminal mouth, not present . . . . 39
- 38b Lateral-line scales more than 40; combination of **7** anal fin rays, ~~4-4~~ pharyngeal teeth, and subterminal mouth, present . . . . . 49
- 39a(38) Intestine much less than twice standard length, with a **single** S-shaped loop; peritoneum silvery, or if black, then mouth terminal, small, and very oblique; lower jaw not thin, sub-orbitals 40% or less of cheek; dorsal fin origin usually above pelvic fin insertion (much ahead in some species) . . . . . 40
- 39b Intestine more than twice standard length, with several loops; peritoneum black or **dusky** and mouth subterminal and nearly horizontal; lower jaw thin; suborbitals 40% or more of cheek; dorsal fin origin ahead of pelvic fin insertion . . . . 48
- 40a(39) Pharyngeal teeth usually in two rows., or ~~1,4~~ ~~4,1~~  
(rarely ~~4-4~~ in some species) . . . . . 41
- 40b Pharyngeal teeth in one **row**, ~~4-4~~ . . . . . 45
- 41a(40) Upper jaw length (anteriormost point on premaxillary to end of maxillary) shorter than eye diameter . . . . . 42
- 41b Upper jaw length longer than eye diameter . . . . . 43

- 42a(41) Distinct rounded black caudal spot; anal fin rays usually 8; ventral edge of caudal fin usually milk-white; pharyngeal teeth 2,~~4-4~~,2 to ~~4-4~~; dorsal fin somewhat falcate

Spottail shiner - Notropis hudsonius (Clinton)

Northwestern Alberta and the Northwest Territories to Quebec, with southward extensions to Kansas and Georgia. Indiana: Lake Michigan, Kankakee, and Tippecanoe drainages.

- 42b No caudal spot; anal fin rays usually 7; ventral edge of caudal fin not milk-white; pharyngeal teeth never 2,~~4-4~~,2 - usually 1,~~4-4~~,1; dorsal fin not falcate

Pallid shiner - Notropis amnis Hubbs and Greene

Minnesota to Indiana and Texas to Louisiana. Indiana: a few localities in Iroquois, East Fork White, and Ohio drainages.

- 43a(41) Dorsal fin with black blotch on membranes between posterior rays (faint or absent in small individuals). See 25a for comparison with N. whipplei

Spotfin shiner - Notropis spilopterus (Cope)

Eastern North Dakota, through southern Quebec, to New York and northeastern Oklahoma to northern Alabama. Indiana: all major drainages.

- 43b Dorsal fin unpigmented at all ages ..... • • • 44

- 44a(43) Anal fin rays usually 8 (rarely 7); mid-dorsal stripe not surrounding base of dorsal fin; mouth horizontal; lateral-line scales 36 to 39; eyes superolateral; pharyngeal teeth usually 1,~~4-4~~,1 (similar in general appearance to Ericymba buccata).

Bigmouth shiner - Notropis dorsalis (Agassiz)

North Dakota to western New York and Colorado to Ohio. Indiana: specimens identified from a collection near South Bend (St. Joseph drainage), exact locality unknown.

- 44b Anal fin rays usually 7 (rarely 8), mid-dorsal stripe **completely** surrounding base of dorsal fin; mouth slightly oblique; lateral-line scales 34 to 37; eyes lateral; pharyngeal teeth 1,~~4-4~~,1 or 2,4-4,2 or a combination of these

River shiner - Notropis blennioides (Girard)

Southeastern Alberta to eastern Manitoba and Oklahoma to Indiana with scattered populations east to Pennsylvania. Indiana: scattered localities along or near lower West and East forks of White and ~~Wabash~~ and Ohio drainages.

45a(40) Anal fin rays usually 7 (rarely 8); exposed height of anterior lateral-line scales less than 2.0 times their width

Sand shiner Notropis stramineus stramineus (Cope)

Bailey and Allum (1962) note that the former name of the sand shiner, N. deliciosus, has been placed in synonymy with N. texanus and that the sand shiner becomes N. stramineus. They give reasons for recognizing only one subspecies in Indiana. Southeastern Saskatchewan to southern Quebec and northeastern Mexico to Mississippi. The Indiana subspecies occurs in the eastern portion, ranging west to South Dakota and Missouri. Indiana: all major drainages except from the extreme southern border.

45b Anal fin rays usually 8 (rarely 7); exposed height of anterior lateral-line scales more than 2.0 times their width (least in N. volucellus wickliffi, greatest in N. buchanani) . . . . . 46

46a(45) Melanophores along side virtually absent; body depth and head length usually equal, both usually contained less than 3.9 times in standard length; depth of caudal peduncle contained more than 2.8 times in head length; infraorbital canal incomplete

Ghost shiner - Notropis buchanani Meek  
(= N. volucellus buchanani Trautman)

Southern Wisconsin to southern Ohio and northeastern Mexico to Mississippi. Indiana: lower White and Ohio drainages.

46b Melanophores along side usually numerous; body depth usually less than head length, both averaging more than 3.9 times in standard length; depth of caudal peduncle usually contained less than 2.8 times in head length; infraorbital canal complete. . . 47

47a(46) Body depth usually contained more than 4.5 times in standard length; caudal peduncle depth usually contained more than 2.5 times in head length; height of depressed dorsal fin usually more than 2.5 times in predorsal length

Northern mimic shiner - Notropis volucellus volucellus (Cope)

Southern Manitoba to southern Quebec and northeastern Mexico to Mississippi. The above subspecies occupies the range of the species. Indiana: all major drainages.

47b Body depth usually contained less than 4.5 times in standard length; caudal peduncle depth usually contained less than 2.5 times in head length; height of depressed dorsal fin usually less than 2.5 times in predorsal length

Channel mimic shiner - Notropis volucellus wickliffi Trautman

See N. v. volucellus for range of species. This subspecies occurs along the Ohio and Missouri rivers and in adjacent large rivers. Indiana: lower White and lower Wabash River area.

- 48a(39) Length of dorsal fin usually 2.1 to 2.4 in predorsal length; gut tract length more than 7 times standard length; body shape subterete and snout somewhat pointed, projecting anteriorly beyond the upper lip by about twice the thickness of the upper lip

Silvery minnow - Hybognathus nuchalis Agassiz

Fingerman and Suttkus (1961) give details in separating this species from H. hayi. Eastern Montana to southern Ontario and Quebec and Texas to Georgia. Indiana: White, Wabash, and Ohio drainages.

- 48b Length of dorsal fin usually 1.9 to 2.1 in predorsal length; gut tract length less than 6.5 times standard length; body shape compressed and snout rounded, snout scarcely seen from ventral view

Cypress minnow - Hybognathus hayi Jordan

Southern Illinois to Indiana and northeast Texas to western Florida. Indiana: first recorded by Gerking (1945) from collections in Warrick County, Ohio drainage.

- 49a(38) Fleshy lips restricted to lobes on the posterior halves of lower jaw; prominent black lateral band and large black caudal spot; basic body color silvery; peritoneum silvery; dorsal fin origin ahead of pelvic fin insertion; intestine not spirally looped around swimbladder

Suckermouth minnow - Phenacobius mirabilis (Girard)

South Dakota to Ohio and eastern Texas to Louisiana. Indiana: Kankakee, Iroquois, White, Wabash (except Tippecanoe), and Ohio drainages.

- 49b Cartilaginous sheath instead of fleshy lips; no distinct lateral band or caudal spot; basic body color brownish; peritoneum black; dorsal fin origin behind pelvic fin insertion; intestine spirally looped around swimbladder

Stoneroller - Campostoma anomalum (Rafinesque)

North Dakota to New York and northeastern Mexico to Georgia. Indiana: all major drainages. Gerking (1945) recognized two subspecies, C. a. anomalum (Rafinesque) in Whitewater drainage and possible intergrades between this and C. a. pullum (Agassiz) occupying the rest of the state.

## Sucker family - CATOSTOMIDAE

China, Siberia, and North and Central America. Cycleptus is in the subfamily Cycleptinae. Ictiobus and Carpiodes are in the subfamily Ictiobinae, while the remaining genera are in the subfamily Catostominae. Freshwater

- 1a Dorsal fin rays more than 20; dorsal fin base contained less than  $\frac{1}{4}$  times in standard length; supraorbital bone present . 2
- 1b Dorsal fin rays less than 19; dorsal fin base contained more than  $\frac{1}{4}$  times in standard length; supraorbital bone absent . . . . 8
- 2a(1) Lateral-line scales more than 50; eye closer to posterior edge of opercle membrane than to tip of snout; lips papillose; body depth contained more than  $\frac{1}{4}$  times in standard length; head more slender than body
- Blue sucker - Cycleptus elongatus (Lesueur)
- South Dakota to Ohio and northeastern Mexico to Louisiana. Indiana: Wabash, East Fork White, and Ohio rivers.
- 2b Lateral-line scales less than 50; eye closer to tip of snout than to posterior edge of opercle membrane; lips smooth or weakly plicate; body depth contained less than  $\frac{1}{4}$  times in standard length; head not more slender than body . . . . . 3
- 3a(2) Distance from eye to posterior angle of preopercle about equal that to upper corner of gill-cleft; subopercle broadest below its middle; mouth inferior; anterior frontanelle well developed (opening between nasals and frontals); body color silvery; pharyngeal arch very thin; intestines forming a definite helix when viewed from below . . . . . 4
- 3b Distance from eye to posteroventral angle of preopercle about  $\frac{3}{4}$  that to upper corner of gill-cleft; subopercle broadest at middle; mouth terminal to inferior; anterior frontanelle absent or much reduced; body color darkish, not silvery; pharyngeal arch triangular in cross-section; intestinal loops longitudinal, paralleling the sides of the body cavity . . . . . 6

- 4a(3) Lateral-line scales 36 to 40; no small knob-like projection on anterior end of lower lip; anterior end of lower lip definitely in advance of anterior nostril; dorsal rays 25 or more

Quillback - Carpiodes cyprinus (Lesueur)

C. forbesi Hubbs is no longer considered distinct from C. cyprinus (Bailey and Allum, 1962). Southeastern Alberta to southern Quebec and eastern Missouri to Virginia. Indiana: Maumee, Kankakee, White, Wabash, and Ohio drainages.

- 4b Lateral-line scales 33 to 37; small knob present on anterior end of lower lip; anterior end of lower lip scarcely or not at all in advance of anterior nostril; dorsal rays 27 or fewer .....

- 5a(4) Longest anterior dorsal ray when depressed usually extends less than 2/3 length of the base; body depth usually contained from 2.7 (in young) to 3.3 (in adults) times in standard length; eye length contained from 3.0 (in young less than 3 inches) to 6.2 (in adults) times in head length. Young less than 3 inches standard length can seldom be separated from young C. velifer using the above characters

Northern river carpsucker Carpiodes carpio carpio (Rafinesque)

Eastern Montana to Pennsylvania and northeastern Mexico to Tennessee. This subspecies occupies the northern range, extending south to northern Texas and Tennessee. Indiana: southern Wabash and Ohio drainages.

- 5b Longest anterior dorsal ray when depressed in fish over 4 inches standard length is usually longer than fin base; body depth usually contained from 3.0 (in young) to 2.2 (in adults) times in standard length; eye length contained from 3.0 (in young less than 3 inches) to 4.8 (in adults) times in head length

Highfin carpsucker - Carpiodes velifer (Rafinesque)

Minnesota to Pennsylvania and Oklahoma to Tennessee. Indiana: White, Wabash (except tributaries from the north), and Ohio drainages.

- 6a(3) **Mouth** terminal and oblique; tip of **upper jaw about level** with lower margin of eye; upper jaw about as long as **snout**; first arch **gillrakers** in adult more than 80 as counted from posterior face of arch
- Bigmouth buffalo - Ictiobus cyprinellus (Valenciennes)  
( Megastomatobus cyprinella (Valenciennes))
- Southeastern Saskatchewan to Ohio and Texas to Alabama. Indiana: Tippecanoe and Wabash drainages.
- 6b Mouth sub-terminal and nearly horizontal; tip of upper jaw far below lower margin of eye; upper jaw definitely **shorter** than length **of snout**; **first** arch **gillrakers** less than 60 as counted from posterior face of jaw ..... 7
- 7a(6) Body depth contained 2.6 to 3.5 times in standard length; eye length, in specimens over 6 inches in standard length, contained 5.1 to 7.4 times in head length and is equal to, or shorter than, length of upper jaw; basic color usually olive brown to darkish. Specimens less than 12 inches standard length may not be separable from I. bubalus using the above characters
- Black buffalo - Ictiobus niger (Rafinesque)
- Eastern Nebraska and Minnesota to Ohio and northeastern Mexico to Alabama. Indiana: **three** records from **Wabash** and Ohio drainages.
- 7b Body depth contained 2.2 to 3.0 times in standard length; eye length, in specimens over 6 inches in standard length, contained 4.4 to **6.0** times in head length and is equal to, or longer than, length **of upper jaw**; basic color usually bronze or golden
- Smallmouth** buffalo - Ictiobus bubalus (Rafinesque)
- North** Dakota to Pennsylvania to northeastern Mexico. Indiana: White, Wabash, and Ohio drainages. Unknown from the eastern 2/3 of the state, except from the Ohio River.
- 8a(1) Lateral-line scales (or scales in normal position of lateral line) less than 50 ..... 9
- 8b Lateral-line scales more than 50 ..... 20
- 9a(8) Lateral line **incomplete** (confined anteriorly in adults) or absent; lips plicate ..... **10**
- 9b Lateral line complete and well developed; lips plicate or papillose ..... 12

10a(9) Lateral scale rows (scales in normal position of lateral line) **42** to **47**; distinct blackish spot (except in small young) on each scale base; body depth usually contained more than **4.0** times in standard length; distal edge of dorsal fin slightly falcate (concave) in adults and almost straight in small young

Spotted sucker - Minytrema melanops (Rafinesque)

Minnesota to Pennsylvania and Texas to northern Florida. Indiana: all major drainages except the Whitewater.

10b Lateral scale rows 33 to **43**; no blackish spot on scale bases; body depth usually contained less than **3.5** times in standard length; distal edge of dorsal fin convex (rounded) in adults and almost straight in young ..... 11

11a(10) Dorsal fin rays 10 to **13**; lateral scale rows 33 to **40**; body depth contained from 2.4 to **3.5** times in standard length; continuous blackish lateral **band very** distinct in young

Western lake chubsucker Erimyzon sucetta kennerlyi (Girard)

Iowa to New York and Texas to Florida. The **sub-species** occupies the western range, occurring as far east as southern Ontario and **Alabama**. Indiana: Lake Michigan, Kankakee, and Tippecanoe drainages.

11b Dorsal fin rays 8 to 11; lateral scale rows 37 to **43**; body depth usually contained from 3.3 to **4.2** times in standard length; dusky lateral band broken into a series of blotches, most distinct in young, may be absent in adults

Western creek chubsucker Erimyzon oblongus claviformis (Girard)

Wisconsin to Nova Scotia and Texas to western Florida. The subspecies occupies the western range, occurring as far east as Pennsylvania and western Florida. Indiana: all major drainages except the **Whitewater**. Unknown from the extreme northwestern portion of the state and the upper Tippecanoe and Eel drainages.

12a(9) Premaxillaries protractile and interorbital area of head rounded (convex) when viewed anteriorly; swim bladder divided into 3 chambers ..... 13

12b Either premaxillaries **nonprotractile** or interorbital area of head depressed (concave); swim bladder divided into 2 or 3 chambers ..... 19

- 13a(12) Bases of body scales without dark spots; tail slate colored in life **14**
- 13b Bases of body scales with distinct dark spots; tail pinkish or reddish in life, palest in young ..... 16
- 14a(13)** Pelvic rays usually 10 in either or both fins (extremes 8 to 11); eye length usually less than  $\frac{1}{2}$  snout length in large young and less than  $\frac{2}{5}$  snout length in small adults; least caudal peduncle depth less than 2.3 caudal peduncle length (distance from posterior end of the anal fin base to the structural end of the caudal fin); snout usually longer than postorbital head length; lateral-line scales **42 to 49**

Black redhorse - Moxostoma duquesnei (Lesueur)

Southern Minnesota to southern Ontario and Oklahoma to Alabama. Indiana: Kankakee, Maumee, White, Wabash, and Ohio drainages.

- 14b** Pelvic rays usually 9 in each fin (extremes 7 to 10); eye length usually more than  $\frac{1}{2}$  snout length in young and more than  $\frac{2}{5}$  snout length in small adults; least caudal peduncle depth more than  $\frac{2}{3}$  caudal peduncle length; snout usually shorter than postorbital length; lateral-line scales 38 to 47 ..... **15**

- 15a(14)** Plicae of lips with papilla-like elements; dorsal fin rays **14** to 17; depressed dorsal fin length more than  $\frac{2}{3}$  distance from dorsal origin to snout tip

Silver redhorse - Moxostoma anisurum (Rafinesque)

Saskatchewan to southern Quebec and Missouri to northern Alabama. Indiana: a few localities in Maumee, White, Wabash, and Whitewater drainages. Unknown from the northern and southern fourths of the state.

- 15b** Plicae of lips without papilla-like elements, except at angle of mouth; dorsal fin rays 11 to 15; depressed dorsal fin length less than  $\frac{2}{3}$  distance from dorsal origin to snout tip

Golden redhorse - Moxostoma erythrurum (Rafinesque)

Minnesota to southern Ontario and Pennsylvania and Oklahoma to Georgia. Indiana: all major drainages except the Kankakee. Unknown from the extreme northwestern and southwestern portions of the state.

16a(13) Head usually contained 4.3 to 5.4 times in standard length in specimens more than 2.5 inches standard length and 3.5 to 4.3 in specimens less than 2.5 inches; distal edge of dorsal fin falcate (concave); mouth small ..... 17

16b Head usually contained less than 4.3 times in standard length in specimens more than 2.5 inches standard length and 3.0 to 3.8 in specimens less than 2.5 inches; distal edge of dorsal fin straight or convex, slightly falcate only in small young; mouth large ..... 18

17a(16) Pelvic rays typically 9 in each fin; anterior rays (longest fin rays) of depressed dorsal fin not extending to end of last ray

Northern redhorse Moxostoma macrolepidotum (Lesueur)  
(= Moxostoma aureolum (Lesueur))

Alberta to Quebec and New York and Oklahoma to Tennessee. Indiana: a few localities in the St. Joseph and West Fork White drainages. Some specimens previously identified to this species have been found to belong to other species. Its status in Indiana requires further study.

17b Pelvic rays usually 10 in either or both fins; anterior rays of depressed dorsal fin extending to, or beyond, end of last ray

Ohio redhorse - Moxostoma breviceps (Cope)

Indiana to New York and Alabama to West Virginia. Indiana: Laughery Creek and Big Blue River (Ohio drainage) and perhaps from Big Walnut Creek (Wabash drainage) and East Fork White drainage. Trautman's (1957) Ohio distribution of the species suggests its presence in the Indiana portion of the Ohio River.

18a(16) Eye contained in head length 4.0 times or less in specimens less than 6 inches standard length, 5.0 times or less in specimens less than 12 inches, 7.0 times or less in specimens more than 15 inches long; interorbital and occipital region flattened; lower pharyngeal arch very heavy and teeth squarish

River redhorse - Moxostoma carinatum (Cope)  
(= Placopharynx carinatus Cope)

Iowa to southern Quebec and northeastern Oklahoma to Georgia and North Carolina. Indiana: a few localities in the Wabash and Ohio drainages. The species was first described from an Indiana specimen (Cope, 1871) and was reported in the state until 1909 with no further captures until 1957 (McReynolds, 1966).

- 18b Eye contained in head length 4.0 times or more in specimens less than 6 inches standard length, 5 times or more in specimens over 7 inches, 7.0 times or more in specimens more than 15 inches; interorbital and occipital region convex; lower pharyngeal arch moderately weak and teeth compressed

Greater redhorse - Moxostoma valenciennesi Jordan  
(= Moxostoma rubreque Hubbs)

Minnesota to southern Quebec and Illinois to Ohio. Indiana: known from one small specimen thought to be of this species taken in Cass County, Eel River, Wabash drainage (Gerking, 1945) and a report in Vigo County, Wabash drainage (Whitaker and Wallace, 1965).

- 19a(12) Premaxillaries nonprotractile (upper lip connected with snout by a broad frenum); head rounded (convex) between the eyes; swim bladder divided into 3 chambers

Harelip sucker - Lagochila lacera Jordan and Brayton

Indiana to Ohio and Arkansas to Georgia. No specimens have been taken since about 1900 and the species may be extinct. Indiana: Decatur and Tippecanoe counties (Evermann and Jenkins, 1892).

- 19b Premaxillaries protractile (upper lip separated from snout by a groove); head strongly depressed (concave) between the eyes; swim bladder divided into 2 chambers

Hog sucker- Hypentelium nigricans (Lesueur)

Southern Minnesota to southern Ontario and New York and eastern Oklahoma to Georgia. Indiana: all major drainages. Not reported from the Iroquois River or the extreme southwestern portion of the state.

- 20a(8) Lateral-line scales more than 88; scales in diagonal row from dorsal fin origin to lateral line more than 14; peritoneum dusky to black; snout projecting well beyond upper lip

Longnose sucker - Catostomus catostomus (Forster)

Eastern Siberia through the northern Northwest Territories to Nova Scotia and Idaho to New York, **Indiana:** Lake Michigan drainage (Lake and La Porte counties).

20b **Lateral-line** scales less than 85; scales in diagonal row from dorsal fin origin to lateral line less than 12; peritoneum silvery, dusky in areas; **snout** projecting slightly beyond upper lip

White sucker - Catostomus commersonii (Lacepède)

Central British Columbia through the southern Northwest Territories to Nova Scotia and New Mexico to northern Georgia. Indiana: all major drainages. Not reported from the southwestern portion of the state.

Suborder: **Siluroidei**

Catfish family - ICTALURIDAE (= AMETURIDAE)

North America. **Freshwater**. An undescribed species of Noturus is **known** from the Wabash River, Wabash County, Illinois (Smith, 1965) but is not included in the key. It has three dark vertical, curved stripes on the tail fin and a dark marking that does not extend to edge of adipose fin.

- 1a Adipose fin (Fig. 2) with its posterior margin free, not fused to or continuous with caudal fin; first arch **gillrakers** usually more than 10 ..... 2
- 1b Adipose fin with a low keel-like fleshy ridge which is fused to or continuous with caudal fin; first arch gillrakers usually less than 11 ..... 8
- 2a(1) Caudal fin rounded (convex), straight or only slightly emarginate (very slightly concave), not deeply forked ..... 3
- 2b Caudal fin distinctly forked ..... 6
- 3a(2) Anal fin rays 13 to 17 (rudiments included); lower jaw distinctly projecting beyond upper jaw; premaxillary band of teeth with backward lateral extensions; head flattened between the eyes; pectoral spines with barbs on both the anterior and posterior edges; adipose fin very large; maximum weight up to 80 pounds

Flathead catfish - Pylodictis olivaris (Rafinesque)

South Dakota to western Pennsylvania and northeastern Mexico to Georgia. Indiana: White, Wabash, and Ohio drainages.

- 3b Anal fin rays 17 to 28 (rudiments included); jaws equal or upper jaw projecting slightly beyond lower jaw; premaxillary band of teeth without backward lateral extensions; head rounded between the eyes; pectoral spines, if present, not developed on anterior edge; adipose fin normal; maximum weight less than 4 pounds ..... 14

- 4a(3) Chin barbels whitish; anal fin rays 24 to 27 (including rudiments); caudal in distinctly rounded

Yellow bullhead - Ictalurus natalis (Lesueur)  
(= Ameiurus natalis (Lesueur))

North Dakota to southern Ontario and New York and northeastern Mexico to Florida. Introduced into many areas outside of its range. Indiana: all major drainages.

- 4b Chin barbels gray or black; anal fin rays 16 to 24 (including rudiments); caudal fin slightly emarginate ..... 5

- 5a(4) Pectoral spines with sharp stout barbs on posterior edge, except in some old adults; anal fin rays 21 to 24 (including rudiments); no light, vertical bar at caudal base; sides of body usually mottled; posterior edge of adipose fin usually somewhat pointed; anal fin usually darkest next to body

Brown bullhead - Ictalurus nebulosus (Lesueur)  
Ameiurus nebulosus (Lesueur))

Southeastern Saskatchewan to Nova Scotia and Oklahoma to Florida. Introduced into areas outside its range. Indiana: Lake Michigan, Maumee, White, Wabash, and Ohio drainages. Gerking (1945) recognized two subspecies, I. n. marmoratus (Holbrook) in the south and I. n. nebulosus (Lesueur) in the north.

- 5b Pectoral spines usually without sharp stout barbs on posterior edge, may have small serrations; anal fin rays 16 to 22 (including rudiments); light, vertical bar at caudal base; sides of body usually not mottled; posterior edge of adipose fin usually rounded; anal fin usually lightest next to body

Black bullhead - Ictalurus melas (Rafinesque)  
(= Ameiurus melas (Rafinesque))

Southern Manitoba to southern Ontario and New York and Colorado and northeastern Mexico to Alabama, Introduced into areas outside its range. Indiana: all major drainages. Gerking (1945) recognized two forms, I. m. melas (Rafinesque) in the north and intergrades between I. m. melas and I. m. catulus (Rafinesque) in the southwest.

- 6a(2) Anal fin rays 30 to 36 (including rudiments); distal (outer) edge of anal fin nearly straight; eyes appearing in ventral half of body; maximum weight up to 100 **pounds**
- Blue catfish - Ictalurus furcatus (Lesueur)
- South Dakota to Ohio to southeastern Mexico.  
Indiana: Wabash River in Gibson County and  
in the Ohio River off Jefferson County.
- 6b Anal fin rays less than 31 (including rudiments); distal edge of anal fin convex; eyes definitely in dorsal half of head; maximum weight up to 40 pounds ..... 7
- 7a(6) Anal fin rays 24 to 30 (including rudiments); caudal fin deeply forked and tail lobes pointed; blackish spots on **sides**, except in adults; maximum weight up to 40 pounds
- Channel catfish - Ictalurus punctatus (Rafinesque)
- Manitoba to southern Quebec and northeastern Mexico to Florida. Introduced into areas outside its range. Indiana: all major drainages. Gerking (1945) provisionally recognized two subspecies, I. . punctatus (Rafinesque) from southern Indiana and I. p. lacustris (Walbaum) from northern Indiana.
- 7b Anal fin rays 18 to 24 (including rudiments); caudal fin moderately forked and tail lobes rounded; no distinct spots on sides; maximum weight up to 4 pounds
- White catfish Ictalurus catus (Linnaeus)
- Atlantic coast from New York to Florida. Introduced into areas outside its range. Indiana: introduced in northern and southern parts, mostly in ponds; stocks are mostly from southeastern Virginia.
- 8a(1) Pectoral spines without strong barbs on posterior edge (spine must be dissected loose from membrane--a few short, sharp teeth usually present in N, nocturnus); saddle-bands crossing back faint or absent ..... 9
- 8b Pectoral spines with barbs on posterior **edge**; saddle-band crossing back conspicuous ..... 11

- 9a(8) Lower jaw **much** shorter than upper jaw and **premaxillary band** of teeth without lateral backward extensions (**maximum length 3 inches; belly, at least on sides, with blackish dots; caudal fin roundish; axial dark streak inconspicuous**)

Freckled **madtom** - Noturus nocturnus (Jordan and Gilbert)

**Illinois** to southwestern Indiana and Texas to **Alabama**. Indiana: the only report that has not been re-interpreted as young of *N. flavus* is the record of Jordan (1890) from Big Pigeon Creek, VanderburdCounty, Ohio River drainage.

- 9b Combination of lower jaw much shorter than upper jaw and premaxillary band of teeth without lateral backward extensions not present ..... 10

- 10a(9) Lower jaw much shorter than upper jaw; premaxillary band of teeth with backward extensions; adipose fin very low; caudal fin somewhat squarish; no dark streak along lateral line; maximum length up to 12 inches

Stonecat Noturus flavus Rafinesque

Southern Alberta and northern Montana **to** southern Quebec and Oklahoma to Tennessee. Indiana: all major drainages.

- 10b Lower and upper jaws equal in length; premaxillary **band of teeth without** backward extensions; adipose fin high; caudal fin roundish; conspicuous dark streak along lateral line; maximum length up to **5** inches

Tadpole madtom - Noturus gyrinus (Mitchill)  
(= Schilbeodes mollis (Hermann))

Southern Saskatchewan to southern Quebec and Texas to Florida. Introduced into Oregon and Idaho. Indiana: all major drainages. Absent from the southeastern and certain central portions of the state.

- 11a(8) Distal edge of adipose fin with continuous whitish or light border (dark marking is not continuous to edge); light blotch behind occiput extending to origin of dorsal fin; distal edge of dorsal fin with whitish border, below which are dark markings; eye length usually **contained** 2.0 or more times in snout length, except in **small young**; caudal fin squarish

**Mountain madtom** Noturus eleutherus (Jordan)  
Schilbeodes eleutherus (Jordan)

**Eastern Illinois to Ohio and to northern Alabama** with a disjunct **distribution in the southeastern Oklahoma area. Indiana: a few localities in the Wabash (including Tippecanoe), White, and Ohio drainages.**

11b

Distal edge of adipose fin without continuous light border but with a dark saddle bar extending to the edge; distal half of the first 4 dorsal fin rays with a roundish, blackish spot; eye length usually contained 2.0 or less times in snout length; caudal fin roundish

Brindled madtom - Noturus miurus (Jordan)  
(= Schilbeodes miurus (Jordan))

Illinois to southern Ontario and New York and eastern Oklahoma to Mississippi. Indiana: **Maumee, Wabash,** White, and Ohio drainages.

Order: Percopsiformes

Suborder: Amblyopsoidei

Cavefish family - **AMBLYOPSIDAE**

Three genera, freshwater United States. Poulson (1963) and Woods and Inger (1957) discuss various aspects of the species.

- 1a Pelvic fins present, small and close to anal fin; postcleithrum absent (determined by slitting the skin of the axilla, lifting the fin base, and gently dragging a needle across the area thus opened); none or one row of sensory papillae on each half of caudal fin; dorsal fin rays (counting all bases separately and including rudimentary rays) usually 10 (range 9 to 11)

Northern cavefish - Amblyopsis spelaea De Kay

Restricted to streams in limestone caves in southern Indiana and in the Mammoth cave area of Kentucky. Indiana: caves in Crawford, Harrison, Lawrence, Orange, and Washington counties. Dispersal of this and the following species has probably been through subterranean channels below the water table (Woods and Inger, 1957).

- 1b Pelvic fins absent; postcleithrum present; two or three rows of sensory papillae on each half of caudal fin; dorsal fin rays usually 8 or 9 (range 7 to 10)

Southern cavefish - Typhlichthys subterraneus Girard

Restricted to limestone caves, spring mouths, and wells from southern Indiana and from southeastern Oklahoma to northern Alabama. Typhlichthys wyandotte Eigenmann was described from its single known locality at Corydon, Harrison County, Indiana (Eigenmann, 1905, 1909). The type is lost and the type locality, a well, sealed over. Woods and Inger (1957) regard T. wyandotte as the same as T. **subterraneus**.

Suborder: Aphrederoidei

Pirate perch family - APHREDODERIDAE

One species

Pirate perch - Aphredoderus sayanus (Gilliams)

Southeastern Minnesota to western Ohio and eastern Texas to Florida and along the Atlantic coast from New York to Florida. Indiana: Kankakee, Lake Michigan, Wabash, and **Maumee** drainages in the northern quarter of the state and from Wabash, White, and Ohio drainages in the southern half of the **state**.

Suborder: Percopsoidei

Trout-perch family - PERCOPSIDAE

Two species, North America, freshwater

Trout-perch - Percopsis omiscomaycus (Walbaum)

Alaska to Quebec and south from Kansas to West Virginia. **Indiana:** the shores of Lake Michigan, Whitewater drainage, and Little Blue River (Crawford **County**, Ohio drainage).

Order: Gadiformes

• Cod family - GADIDAE

'Ranging from **Arctic to** Antarctic seas, marine with one freshwater species.

Burbot Lota lota (Linnaeus)

Circumpolar in fresh water. In North America from Alaska to northeastern Quebec and Oregon to Missouri. Indiana: Lake Michigan, reported recently from Whitewater River (Franklin County), **Muscatatuck** River (Jennings County), and East Fork White River (Jackson County), all of the the White and Ohio drainages.

Order: Atheriniformes

Suborder: Cyprinodontoidei

**Killifish** family - **CYPRINODONTIDAE**

Europe, Asia, Africa, North and South America. Mostly freshwater.

1a Dorsal fin rays 12 to 16; dorsal fin origin above or in front  
of anal fin origin 2

1b Dorsal fin rays 6 to 10; dorsal fin origin behind **anal** fin  
origin (rarely above in Fundulus notatus) ..... 3

**2a(1)** Vertical bars absent on the sides; anal fin rays **15** to 19;  
orange or dark flecks in orderly parallel lines following  
scale rows; snout short; scales in lateral series more than  
42; maximum size about 7 inches

Northern **studfish** - Fundulus catenatus (Storer)

Southern Indiana to Virginia and Kansas to Alabama.  
Indiana: East Fork **White** River drainage in Flat  
Rock River, Bartholomew County and Lewis and Sugar  
creeks, Shelby County.

2b Vertical bars present on the sides; anal fin rays 9 to 12; no  
flecks in orderly parallel lines following scale rows; snout  
long; scales in lateral series less than **44**; maximum size  
about 3 inches

Western banded killifish - Fundulus diaphanus menona  
Jordan and Copeland

North Dakota to Nova Scotia and Newfoundland and  
South Dakota to North Carolina. The subspecies  
occupies the western range of the species, occurring  
as far east as southern Ontario and westernmost New  
York. Indiana: Great Lakes, Iroquois, and Tippecanoe  
drainages. Some Indiana populations have lower lateral-  
line scale counts (31 to **41**) than published counts from  
elsewhere.

- 3a(1) Body with a broad continuous black: lateral band, broken into nearly isolated vertical bars in some males, lateral-line scales 30 to 37; no black blotch below eye; no light spot in life at dorsal fin origin and on top of head

Blackstripe topminnow - Fundulus notatus (Rafinesque)

Northeastern Iowa and southern Michigan to Ohio and eastern Texas to Alabama. Indiana: all major drainages, except the Whitewater. Considerable color variation exists between populations in Indiana. Braasch and Smith (1965) discuss the relationships between this species and the closely related F. olivaceus, which has not been recorded from Indiana but does occur in Illinois.

- 3b Body with many longitudinal, dark lines in females, vertical lines in males; lateral-line scales 37 to 41; black blotch below the eye usually distinct; light spot in life at dorsal fin origin and on top of head

Northern starhead topminnow - Fundulus notti dispar (Agassiz)  
(= Fundulus dispar dispar (Agassiz))

Iowa to Michigan and Texas to western Florida and along the Atlantic coast from Virginia to Florida. The subspecies ranges from Iowa to Michigan and south from Arkansas to Tennessee. Indiana: St. Joseph (Jordan, 1877 ), Lake Michigan, Kankakee, and upper Wabash (primarily Tippecanoe) drainages. Recorded from the southwestern portion of the state before 1900 but not since.

Livebearer family - POECILIIDAE

United States, Mexico, Central and South America; viviparous.  
Freshwater.

Mosquitofish - Gambusia affinis affinis (Baird and Girard)

Southern Illinois to southern Indiana and Mexico to Florida and along the Atlantic coast from New Jersey to Florida. Introduced outside the above range throughout the world. The subspecies occupies the western part of the range. Indiana: Wabash drainage in the extreme southwestern portion of the state.

Suborder: Atherinoidei

Silverside family - ATHERINIDAE

Tropical and subtropical coast fishes, some in fresh water.

Brook silverside - Labidesthes sicculus (Cope)

Minnesota, into southern Ontario and Quebec, to New York and Texas to **Florida**, Indiana: all major drainages except the **Whitewater**.

Order: Gasterosteiformes

Suborder: Gasterosteoidae

Stickleback family - GASTEROSTEIDAE

Five genera; world-wide; marine, **anadromous**, and freshwater.

Isolated dorsal spines **4** to **6**, in a straight line; caudal peduncle without a lateral keel; caudal fin rounded; caudal peduncle deeper than wide

Brook stickleback - Culaea inconstans (Kirtland)  
(= Eucalia inconstans (Kirtland))

Ranges from northeastern British Columbia to New Brunswick and from Nebraska to **Maine**. Koster (**1957**) reports collection from north-eastern New Mexico. Indiana: Flat Rock River drainage, Decatur County; Lake Maxinkuckee, Marshall County; Kentner Creek, **Wabash** County; **Whitewater** River drainage, **Wayne** County; Big Blue River, Henry County; Pretty Lake, La Grange County; and Crooked Lake, Noble County (Nelson, 1968a).

Isolated dorsal spines 7 to 11, divergent; caudal peduncle with a lateral keel; caudal fin lunate; caudal peduncle wider than deep

Ninespine stickleback - Pungitius pungitius (Linnaeus)  
(= Pygosteus pungitius (Linnaeus))

Circumpolar in the northern hemisphere from tidal and inland waters. Ranges in North America along the northern coastal area from the Aleutian Islands to New Jersey. Penetrates inland from eastern British Columbia to western Quebec, extending south to Minnesota and northern Indiana. The first verifiable record from Indiana and second record from Mississippi drainage is from Crooked Lake, Noble County (Nelson, **1968b**).

Order: **Scorpaeniformes**

Suborder: **Cottoidei**

Sculpin family - COTTIDAE

World-wide, mostly marine in the North Pacific

- 1a Lateral line complete or nearly so; pectoral rays 16 or more; black blotch on spinous dorsal not well developed

Banded sculpin - Cottus carolinae (Gill)  
(= Cottus bairdii carolinae (Gill))

Eastern Kansas to West Virginia and northeastern Mississippi to Georgia. Indiana: south-central portion in White and Ohio drainages. Often found in the outlet creeks of caves.

- 1b Lateral line incomplete on posterior part of body; pectoral rays **15** or less; well-developed black blotch on spinous dorsal

Mottled sculpin - Cottus bairdii Girard

Northern Saskatchewan to New **Brunswick** and Alabama to **Virginia**. Discontinuous populations also occur in Montana and Missouri. Indiana: all major drainages. Absent from the south-central portion and most abundant in northern Indiana.

Order: Perciformes

Suborder: Percoidei

Superfamily: Percoidae

59 families, mostly marine, world-wide

Sea bass family - SERRANIDAE

Gosline (1966) has revised the family limits of the Serranidae and under his system Morone falls in the family Percichthyidae

Mostly tropical and subtropical marine fishes, some freshwater.

□□  First anal spine about 1 the length of the second, and the second distinctly shorter than the third; lower jaw projecting beyond upper; dorsal fins separated; base of tongue with single patch of teeth; anal fin soft rays 10 to 13; stripes along side usually bold and continuous

White bass - Morone chrysops (Rafinesque)  
 (= Roccus chrysops (Rafinesque))  
 = Lepibema chrysops (Rafinesque))

Minnesota, into southern Ontario and Quebec, to New York and eastern Texas to Alabama. Indiana: Kankakee, Tippecanoe, Wabash, lower White, and Ohio drainages.

□□  First anal spine about 1/3 the length of the second, and the second almost if not equal in length to the third; jaws almost equal; dorsal fins slightly connected with a membrane; base of tongue without teeth; anal fin soft rays 9 to 10; **stripes along side usually not bold and continuous**

Yellow bass - Morone mississippiensis Jordan and Eigenmann  
 (= Roccus mississippiensis (Jordan and Eigenmann))  
 = Morone interrupta Gill)

Southern Minnesota to Indiana and eastern Texas to Alabama. Indiana: southwestern part of the state from **Wabash** and Ohio drainages.

#### Sunfish family - **CENTRARCHIDAE**

North America; freshwater; 7 genera  
 Hybrids are particularly common in this family (Childers, 1967).

- Anal spines 3 or less; dorsal spines usually 10 ..... 2
- 1b Anal spines **5** or more; dorsal spines usually less than or more than 10 ..... 13
- 2a(1) Lateral-line scales more than 55; body depth contained **2.5** (large adults) to **5.0** (small young) times in standard length . 3
- 2b Lateral-line scales less than **55**; body depth contained 1.8 (large adults) to 3.0 (small young) times in standard length . 5

- 3a(2) Notch between the 2 dorsal fins almost completely dividing the fins; the shortest dorsal spine at center of notch usually less than half as long as the longest dorsal spine; distal edge of spinous dorsal fin greatly curved; pyloric caeca usually branched at base; caudal fin color uniform in young (lateral-line scales 58 to 69; posterior end of upper jaw extends well past the posterior edge of eye in specimens more than 5 inches standard length, longitudinal dark band on side usually prominent; 9 to 12 scale rows on cheek from eye to angle of preopercle; dorsal soft rays 11 to 14; scales usually absent from interradiial membranes; about 20 to 33 pyloric caeca in young 16 to 30 mm, total length)

Northern largemouth bass - Micropterus salmoides salmoides  
(Lacepede)  
(a Huro salmoides (Lacépède))

Minnesota to southern Quebec and northeastern Mexico to Florida. The subspecies occurs in all the above range except Florida. Widely introduced outside range. Indiana: all major drainages. Gammon and Gerking (1966) give information on its life history.

- 3b Notch between the 2 dorsal fins shallow; the shortest dorsal spine at center of notch usually more than half as long as the longest dorsal spine; distal edge of spinous dorsal fin slightly curved; pyloric caeca not usually branched at base; caudal fin tricolored in young, distal third whitish, middle third dusky •

- 4a(3) Side with dark blotches along the lateral line which tend to be confluent and to form an irregular longitudinal stripe; longitudinal streaks or dark spots usually prominent on scales between lateral line and anal fin; large black caudal spot in young; young never black; dorsal soft rays 11 to 13; anal soft rays 9 to 11; lateral-line scales 55 to 77 (posterior end of upper jaw usually extending to beneath posterior half of eye in young and adults, slightly beyond posterior edge of eye in largest adults; about 10 to 13 pyloric caeca in young between 16 and 30 mm, total length; seldom over 15 inches in standard length)

Northern spotted bass - Micropterus punctulatus punctulatus  
(Rafinesque)

Illinois to Pennsylvania and Texas to Georgia. The subspecies occupies the northern part of the range of the species. Indiana: Wabash (as far north as Tippecanoe County), White, and Ohio drainages.

- 4b Side uniformly **colored**, lightly mottled, or with vertical bars but never with a tendency to form a longitudinal stripe; no longitudinal streaks between the lateral line and anal fin; caudal spot faint or absent in young; young usually blackish; dorsal soft rays **13 to 15**; anal soft rays 10 to 12; lateral-line scales 67 to 81 (posterior end of upper jaw usually extending to beneath center of eye in specimens less than **5** inches standard length, beneath posterior half of eye in young adults, slightly beyond posterior edge of eye in large adults)
- Smallmouth bass - Micropterus dolomieu Lacépède**
- Northern Minnesota to southern Quebec and eastern Oklahoma to northern Alabama. Widely introduced outside range. Indiana: all major drainages, but rare in the **southwestern** corner of the state.
- 5a(2) Tip of pectoral fin rounded, rarely reaching to vertical line through anal fin origin and never past it (longest rays near middle); pectoral fin length contained about **4** times in standard length (teeth present on tongue in one species) ..... **6**
- 5b Tip of pectoral fin somewhat pointed, usually reaching past vertical line through anal fin origin (longest rays near dorsal side); pectoral fin length contained about 3 times in standard length (teeth never present on tongue) ..... **11**
- 6a(5) Opercle flap stiff, inflexible (not including membrane), cannot be bent forward upon itself (opercular membrane with white border) ..... **7**
- 6b Opercle flap at least partly flexible, may be bent forward upon itself (opercular membrane black or with white or red border). **9**
- 7a(6) Band of tiny teeth on tongue and on pterygoids; supramaxillae (lying on top of maxillae) length greater than greatest width of maxillae (posterior end of upper jaw extending at least well beyond anterior edge of eye; dark bands radiating backward from snout and eye; longest **gillrakers** as long as pupil diameter)
- Warmouth - Chaenobryttus gulosus (Cuvier)  
Chaenobryttus coronarius (Bartram)
- Wisconsin to New York and Texas to Florida. Indiana: known up to **1945** in the northern and southern thirds from all major drainages except the **Maumee** and White-water. Introduced in certain central portions of Indiana.
- 7b Teeth usually absent from tongue and pterygoids; supramaxillae (if present) length less than greatest width of maxillae ..... **8**

- 8a(7) Lateral-line scales more than 43; longest gillrakers when depressed reaching base of 2nd or 3rd raker below and as long as pupil **diameter**; supramaxillary length about 2/3 the greatest maxillary width (posterior end of upper jaw extending well beyond anterior edge of eye; dusky spot usually present on last three rays of dorsal and anal fins; whitish margin usually present on dorsal, caudal, and anal fins)

Green sunfish - Lepomis cyanellus Rafinesque

South Dakota to western New York and New Mexico ~~to~~ Georgia. Introduced outside range. Indiana: all major drainages.

- 8b Lateral-line scales less than 44; longest **gillrakers** when depressed usually not reaching base of 2nd raker below and shorter than pupil diameter; supramaxillary length about 1/3 the greatest maxillary width (mouth small; body sometimes with red or brown spots)

Spotted sunfish - Lepomis punctatus (Valenciennes)

Illinois to Indiana and Texas to Florida.  
Indiana: lower Wabash River (Jordan, 1890)  
and from Shriner Lake (Whitley County).

- 9a(6) Longest gillrakers when depressed reaching base of 2nd or 3rd raker below and about as long as pupil diameter; sensory pores along posterior and ventral edges of preopercle elongate, the longest usually longer than diameter of anterior nasal opening; cheeks and body with orange spots in males, brownish in females and young (anal soft rays 7 to 9; palatine teeth present; opercular membrane with white border)

Orangespotted sunfish - Lepomis humilis (Girard)

Southeastern North Dakota to western Ohio and western Texas to Alabama. Indiana: all major drainages except those of Lake Michigan. Not known from Tippecanoe drainage before 1945.

- 9b Longest gillrakers when depressed not reaching base of 2nd raker below and much shorter than pupil diameter; sensory pores along posterior and ventral edges of preopercle circular, the longest much shorter than diameter of anterior nasal opening; cheeks usually with several wavy bars which radiate backward from mouth to eye ..... 10

- 10a(9) Lateral-line scales 39 to 44; diagonal scales from dorsal fin origin posteriorly to but not including lateral line 6 to 8; adult males with opercle flap greatly elongated horizontally, with entire margin whitish or with small orange-red spots; adults usually 3 to 7 inches standard length

Central longear sunfish - Lepomis megalotis megalotis (Rafinesque)

Minnesota to southern Quebec and northeastern Mexico to Georgia. The subspecies ranges from Illinois to Pennsylvania and Louisiana to Georgia. Indiana: throughout central and southern areas.

- 10b Lateral-line scales 33 to 38; diagonal scales from dorsal fin origin posteriorly to but not including lateral line 5 or 6; adult males with opercle flap not greatly elongated, extending upward at about a 45° angle, with a red or orange posterior margin, bordered by white; adults usually less than 4 inches standard length

Northern longear sunfish - Lepomis megalotis peltastes Cope

Range of species given under 10a. The subspecies ranges from Minnesota to southern Quebec and Iowa to northern Ohio. Indiana: Lake Michigan drainage.

- 11a(5) Longest gillrakers when depressed reaching base of 2nd or 3rd raker below and about as long as pupil diameter; dark blotch on posterior part of soft dorsal fin; opercle flap without red or orange spot on posterior membrane (opercle flap flexible and entirely black; anal soft rays 10 to 12; palatine teeth absent; posterior end of upper jaw rarely extending as far back as anterior edge of eye; young between 3/4 and 1 inches total length with 10 or more vertical bars on sides)

Bluegill Lepomis macrochirus Rafinesque

Minnesota to southern Quebec and northeastern Mexico to Florida. Introduced outside range. Indiana: all major drainages.

- 11b Longest gillrakers when depressed not reaching base of 2nd raker below and much shorter than pupil diameter; no dark blotch on posterior part of soft dorsal fin; opercle flap with conspicuous red or orange spot on posterior membrane . . . 12

12a(11) **Opercle** flap stiff, inflexible (not including membrane), cannot be bent forward upon itself; soft dorsal fin heavily and distinctly spotted; side of head in adult with wavy bands radiating backward from snout and eye; opercular spot elliptical, not forming a broad margin (reddish in mature males, orangish in mature females); nape area strongly indented; pectoral fin length in adults usually less than 1/3 standard length

**Pumpkinseed** - Lepomis gibbosus (Linnaeus)

Southeastern Manitoba to New Brunswick and eastern Nebraska to northern Georgia. Introduced **outside** range. Indiana: all major drainages in the northern quarter and introduced in southern artificial lakes.

12b **Opercle** flap flexible, may be bent moderately forward upon itself; soft dorsal fin without definite spots; side of head in adult with dark olive spots, wavy bands faint or absent; opercular spot forming a broad margin, not elliptical (reddish in mature males; orangish in mature females); nape area weakly indented; pectoral fin length in adults usually more than 1/3 standard length

Redear sunfish - Lepomis microlophus (Günther)

Southern Indiana to North Carolina and eastern Texas to Florida. Introduced outside range. Indiana: perhaps native only in the southern parts, where it was recorded by Jordan (1890). Propagated and presently widely distributed in northern **Indiana**, where it was first recorded by Kirsch (1895a) from Round Lake (Whitley County). Stocked in southern farm ponds and reservoirs.

13a(1)	Dorsal fin spines 10 to 13 . . . . .	14
13b	Dorsal fin spines 5 to 8 (branchiostegal rays 7; <b>first</b> arch <b>gillrakers</b> more than 28; length of anal fin base about equal to dorsal fin base) . . . . .	15

14a(13) Anal fin spines usually 6 (range 5 to 7), soft rays usually 10 or 11; dorsal fin spines 10 or 11; first arch gillrakers less than 15; pectoral fin short, rounded; body moderately compressed, depth less than standard length; length of anal fin base little longer than  $\frac{1}{2}$  that of dorsal fin base; margin of preopercle smooth

Northern rock bass - Ambloplites rupestris rupestris (Rafinesque)

Southern Manitoba to southern Quebec and eastern Oklahoma to western Florida. The subspecies occupies the northern part of the species range, south to northern Alabama. Introduced outside range.  
Indiana: all major drainages.

14b Anal fin spines usually 7 or 8, soft rays usually 13 to 15; dorsal fin spines 12 or 13; first arch gillrakers more than 18; pectoral fin long, pointed; body strongly compressed, depth about standard length; length of anal fin base about equal to that of dorsal fin; margin of preopercle finely serrate

Flier - Centrarchus macropterus (Lacépède)

Southern Illinois to southern Indiana and eastern Texas to Virginia. Indiana: East Fork White and Ohio drainages only since Gerking (1945).

15a(13) Length of dorsal fin base much less than distance from dorsal fin insertion to eye (measured in straight line); dorsal fin spines 4 to 7; chain-like bands on sides usually distinct and regular; mouth moderately oblique; body depth contained more than 2.4 times in standard length, except in some large adults

White crappie - Pomoxis annularis Rafinesque

Eastern South Dakota to southern Ontario and Texas to Georgia. Introduced outside range.  
Indiana: all major drainages, most abundant in the south.

15b Length of dorsal fin base about equal to distance from dorsal fin insertion to eye; dorsal fin spines 6 to 9; chain-like bands on sides either absent or irregular in shape; mouth strongly oblique; body depth contained less than 2.4 times in standard length, except in small young

Black crappie - Pomoxis nigromaculatus (Lesueur)

Southeastern Manitoba to southern Quebec and Texas to Florida. Introduced outside range. Indiana: all major drainages, most abundant in the north.

## Perch family - PERCIDAE

Northern hemisphere, freshwater.

- 1a **Preopercle** with strongly serrated edge; branchiostegal rays 7 (rarely 8); tail deeply forked; no distinct urogenital papillae; top of skull ridged, supraoccipital crest high; posterior end of upper jaw usually extending to at least below middle of eye; adults usually more than 6 inches standard length ..... 2
- 1b **Preopercle** with smooth edge; branchiostegal rays 6 (rarely 5); tail rounded or weakly emarginate (concave); prominent urogenital papillae; top of skull nearly smooth; supraoccipital crest low or absent; posterior end of upper jaw not usually extending to below middle of eye; adults usually not more than 4 inches standard length, rarely over 5 inches ..... 4

- 2a(1) No large, sharp, canine teeth on jaws; pelvic fins so close together that the inner edges of their bases almost touch; soft anal fin rays 6 to 8; back and sides with 6 to 8 black, vertical bars; pseudobranchiae rudimentary (young 7 to 35 mm total length: about 16 to 21 postanal myomeres, articulation of lower jaw below the orbit, and body pigmentation generally poorly developed)

Yellow perch - *Perca fluviatilis flavescens* (Mitchill)  
(= *Perca flavescens* (Mitchill)) - see  
Svetovidov and Dorofeena, 1963

Northern Alberta to Nova Scotia and northern Missouri to western Pennsylvania to South Carolina. Introduced outside range. Indiana: northern third, introduced in southern areas of the state although Plummer (1851) recorded it from Wayne County.

- 2b Large, sharp, canine teeth on jaws; distance between pelvic fin origins almost equal to the width of the base of either fin; soft anal fin rays 12 or 13; back and sides without distinct, regular vertical bars, pseudobranchiae well developed . 3
- 3a(2) Spinous dorsal fin with oblique rows of round, black spots (not evident in young under 6 inches); spinous dorsal without prominent black blotch on posterior end; soft dorsal fin rays 17 to 21; pyloric caeca 3 to 9, the longest much shorter than length of stomach

Sauger - *Stizostedion canadense* (Smith)

Central Alberta to southern Quebec and eastern Texas to West Virginia. Indiana: lower Wabash, East Fork White, and Ohio drainages.

3b Spinous dorsal fin with only obscure mottlings; spinous dorsal with prominent black blotch on posterior end (not prominent in young under 6 inches); soft dorsal fin rays 19 to 23; pyloric caeca 3, each about as long as stomach; (young 10 to 32 mm total length with: about 22 to 29 postanal myomeres, articulation of lower jaw below posterior margin of orbit, and body pigmentation generally well developed)

Walleye - Stizostedion vitreum vitreum (Mitchill)

Northeastern British Columbia to Quebec and Nebraska to northern Georgia. Introduced outside range. The above subspecies occupies the above range, the other subspecies occurs in Lake Erie and Ontario but is very rare (U.S. Sport Fisheries and Wildlife Bureau, 1966). Indiana: a few localities in Lake Michigan, Kankakee, Wabash, and Ohio drainages. Stocked in some localities.

4a(1) Flesh somewhat translucent, appearing glassy, body very elongate, depth 7.1 to 10.0 in standard length; one weak anal spine ..... 5

4b Flesh opaque; body not extremely elongate, depth 5.0 to 7.0 in standard length; usually 2 anal spines except in Etheostoma nigrum ..... 7

5a(4) Premaxillaries nonprotractile (upper lip connected with snout by a broad frenum, a vertical bridge of tissue across which the premaxillary groove does not cross); lateral-line scales 85 to 97; anal rays 12 to 14; dorsal spines 12 to 15

Crystal darter - Ammocrypta asprella (Jordan)  
(= Crystallaria asprella (Jordan))

Southern Wisconsin to southern Ohio and eastern Texas to Alabama. Indiana: lower Wabash and Ohio drainages only from the reports of Jordan (1890) and Evermann and Jenkins (1892). Also not known from Illinois or Ohio since 1900 (Smith, 1965; Trautman, 1957).

5b Premaxillaries protractile (upper lip separated from snout by a groove); lateral-line scales 67 to 78; anal rays 8 to 10; dorsal spines 7 to 11 ..... 6

- 6a(5) Dots along the lateral band oblong and sharply defined, not connected by a row of melanophores; nape, cheeks, and opercles scaly; opercle with a flattened triangular spine; markings on snout lengthwise and paired

Eastern sand darter - Ammocrypta pellucida (Baird)

Southern Ontario to southern Quebec and southern Illinois to West Virginia. Indiana: Maumee, Wabash (including Tippecanoe), White, and Ohio drainages.

- 6b Dots along the lateral band irregular in outline and connected by a row of melanophores; nape, cheeks, and opercles mostly scaled; opercle with a sharp pin-like spine; markings on snout weak, often arranged in a rosette

western sand darter - Ammocrypta clara Jordan and Meek

Minnesota to southwestern Indiana and eastern Texas to Arkansas. Indiana: one 1927 collection from the Wabash River (Posey County).

- 7a(4) Midline of belly with a definite single file of scales which are more or less enlarged, thickened, deciduous, and separated by a slight groove from the scales on either side (these scales are only weakly specialized in some Percina and sometimes a little modified in females of other genera); one specialized scale between pelvic fins; pelvics separated by a space at least 3/4 as wide as base of either fin; anal fin usually almost as large as second dorsal, sometimes even larger, body typically elongate and little compressed .....

- 7b Midline of belly without a median file of specialized scales; no specialized scale between pelvic fins; pelvics separated by a space less than 3/4 as wide as either fin (except in Etheostoma nigrum); anal fin smaller in area than second dorsal fin; body typically deeper and more compressed ..... 15

- 8a(7) Snout extended forward as a small conical protuberance beyond upper jaw; mouth horizontal; anal spines very flexible; lateral-line scales 78 to 103; cross bars numerous and narrow; interorbital space slightly depressed

Logperch - Percina caorodes (Rafinesque)

Saskatchewan to Quebec and Texas to western Florida. Indiana: all major drainages. Gerking (1945) recognized 2 subspecies, P. c. caorodes (Rafinesque) in the south and central portion of the state and this and P. c. semifasciata (De Kay) and their intergrades north of the 41 parallel.

- 8b Snout not projecting beyond upper jaw; mouth more or less oblique; anal spines stiff; lateral-line scales less than 78; cross bars either broad or obsolete; interorbital space usually rounded .....

- 9a(8) Premaxillaries nonprotractile (upper lip connected with snout by a broad frenum), frenum width usually 1.8 or more times as wide as the diameter of the anterior nostril; combination of **11 to 16** dorsal fin spines and 52 or more lateral-line scales . . . 10
- 9b Premaxillaries either protractile (upper lip separated from snout by a groove) or with a frenum width less than 1.5 times the diameter of the anterior nostril; combination of 9 to 12 dorsal fin spines and less than 60 lateral-line scales . . . . . 13. . . . .
- 10a(9) Gill-membranes not connected (Fig. 3) or slightly connected to each other . . . . . 11
- 10b Gill-membranes broadly connected to each other (Fig. 3); (dorsal spines **11 to 13**; lateral-line scales 59 to 71) . . . . . 12
- 11a(10) Gill-membranes not connected with each other, membranes attached to isthmus far forward; dorsal spines 12 to 16; lateral-line scales 63 to 81; cheeks usually scaled; upper jaw usually projecting beyond lower jaw; dark lateral blotches more or less confluent, never forming vertical bars

Blackside darter - Percina maculata (Girard)  
(= Hadropterus maculatus (Girard))

Southern Saskatchewan to Ontario and eastern Texas to northern Alabama. Indiana: all major drainages.

- 11b Gill-membranes slightly connected with each other; dorsal spines 10 to 13; lateral-line scales 52 to 67; cheeks usually scaleless; upper jaw projecting at most only very slightly beyond lower jaw; black lateral blotches vertically elongate, tending to be continuous over back

Gilt darter - Percina evides (Jordan and Copeland)  
(= Hadropterus evides (Jordan and Copeland))

Wisconsin to western New York and Missouri to northern Georgia. Indiana: Maumee, Wabash, and White drainages. Not collected in recent decades from Illinois, Indiana, or Ohio (Smith, 1965; Gerking, 1945; Trautman, 1957).

- 12a(10) Snout sharply produced; ventral surface of head gently rounded; body depth of **adults** usually contained **1.5** or more times in head length; cheeks usually poorly scaled; sides with 11 to 16 small vertically oblong blotches

**Slenderhead** darter - *Percina phoxocephala* (Nelson)  
(= *Hadropterus phoxocephalus* (Nelson))

Southeastern Minnesota to western **Pennsylvania** and eastern Oklahoma to northern Georgia. Present status unknown (**U.S.** Sport Fisheries and Wildlife Bureau, 1966). Indiana: Kankakee, Iroquois, White, Wabash (but not **Tippecanoe**), and Ohio drainages.

- 12b Snout rounded and blunt; ventral surface of head flat; body depth of adults usually contained **1.5** or less times in head length; cheeks **usually** well **scaled**; sides with 8 to 12 large dark horizontally oblong blotches

Northern dusky darter - *Percina sciera sciera* (Swain)  
(= *Hadropterus scierus scierus* (Swain))

Illinois to southern Ohio and southeastern Texas to Alabama. This subspecies occupies all but the extreme southwestern range of the species. Indiana: White and Wabash (including Tippecanoe) drainages.

- 13a(9) Premaxillaries usually protractile, frenum, if present, crossed by a shallow groove; posterior anal fin rays of adults extending very slightly, if at all, behind posterior end of depressed soft dorsal fin; (dorsal fin spines 9 to 12; lateral-line scales **45 to 55**)

Channel darter - *Percina copelandi* (Jordan)  
(= *Hadropterus copelandi* (Jordan)  
= *Cottogaster copelandi* (Jordan))

Southernmost Ontario and Quebec and southeastern 'Oklahoma to northern **Alabama**. Indiana: a few localities in the East Fork White and Wabash rivers, and Big Pine Creek Wabash drainage, Fountain County).

- 13b Premaxillaries usually bound to snout by a narrow frenum which may be crossed by a shallow groove; posterior anal fin rays of adult males extending behind posterior end of depressed soft dorsal fin; (midline of belly virtually naked, lacking the specialized scales characteristic of other *Percina*) . . . . . 11

11a(13) Spinous dorsal fin with a conspicuous black spot on its posterior rays and a **smaller** one on the anterior end; sides with 10 to 15 short, vertical bars; nape scaleless

River darter - Percina shumardi (Girard)  
 (= Hadropterus shumardi (Girard))  
 = Imostoma shumardi (Girard))

Southern Manitoba to Ontario and southeastern Texas to northern Alabama. Indiana: a few localities in the Wabash, West Fork White, and East Fork White rivers.

14b Spinous dorsal fin without conspicuous blotches confined to anterior and posterior ends; sides with 8 or 9 blotches; nape scaled

Stargazing darter - Percina uranidea (Jordan and Gilbert)  
 (= Hadropterus uranidea (Jordan and Gilbert))  
 = Imostoma uranidea (Jordan and Gilbert))

Southern Indiana and Arkansas to Alabama. Indiana: lower Wabash River (Jordan, 1890; Forbes and Richardson, 1920).

15a(7) Groove separating the maxillary from skin of the preorbital portion of snout restricted to the posterior third of the maxillary; color predominantly green or olive-green; both 2 anal spines and deep groove separating upper lip from snout; mouth almost horizontal; tip of upper lip produced into a knob; snout blunt and rounded; (gill-membranes broadly connected to each other; lateral line with 58 to 68 scales)

Greenside darter - Etheostoma blennioides Rafinesque

Southeastern Michigan to southernmost Ontario and Illinois to western New York, Indiana: Maumee, White, Wabash (including Tippecanoe), and Ohio drainages.

15b Groove separating the maxillary from skin of the preorbital portion of snout extends along the entire length of the maxillary; color not predominantly green (except Etheostoma zonale); combination of 2 anal spines and groove separating upper lip from snout, not present; mouth usually somewhat oblique; no knob on tip of upper lip; snout usually somewhat pointed ..... 16

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Zorach and Raney (1967) report 2 specimens of Etheostoma maculatum, the spotted darter, collected in 1899 by P. Kirsch from Tippecanoe River at Delong (Fulton County) in the U.S. National Museum (No. 69233). E. maculatum has 2 anal spines, a frenum, gill-membranes not connected to each other, 55 to 62 scales along an incomplete lateral line, rounded caudal fin, sharp snout, and whitish border to ventral fin.

- 16a(15) Anal **spine** single, thin, and flexible; premaxillaries protractile, separated from snout by a groove . . . . . 17
- 16b Anal spines 2, the first heavy and **stiff**; premaxillaries nonprotractile, bound to snout by a frenum (small in Etheostoma histrio) 18
- 17a(16) Lateral line extending only to about middle of spinous dorsal fin; dorsal fins widely separated; infraorbital canal with 1 or no pores; dark bridle continuous across front of snout above lip from eye to eye
- Bluntnoso darter - Etheostoma chlorosomum (Hay)  
(= Boleosoma chlorosomum (Hay))
- Southeastern **Minnesota** to southern Indiana and Texas to Alabama. Indiana: southwestern area in White, Wabash, and Ohio drainages.
- 17b Lateral line complete or nearly so; dorsal fins little separated; infraorbital canal with 2 or 3 pores behind the eye; dark bridle on **snout** interrupted at midline
- Johnny darter - Etheostoma nigrum (Rafinesque)  
(= Boleosoma niRrum (Rafinesque))
- Alberta to Quebec and southeastern Oklahoma to northern Florida. Indiana: all major drainages. **Gerking (1945)** recognized 2 subspecies, E. nigrum eulepis Hubbs and Greene from northwestern Indiana and E. nigrum nigrum (Rafinesque) elsewhere.
- 18a(16) Lateral line absent or with less than 8 pores; dorsal fin spines 5 to 8; lateral scale rows 39 or less; standard length less than 1.5 inches; (gill-membranes rather broadly connected to each other; cheeks, breast, and anterior half of belly **scaleless**)
- Least darter - Etheostoma microperca Jordan and Gilbert  
(= Microperca microperca (Jordan and Gilbert))
- Minnesota to southern Ontario and southern Oklahoma to Kentucky. Indiana: northern 2/3 of the state from Lake Michigan, Iroquois, **Maumee**, White, and Wabash drainages.
- 18b Lateral line complete or at least with more than 10 pores; dorsal fin spines usually 8 or more; lateral-line scales 38 or more . . . . . 19

- 19a(18) Lateral line incomplete with an upward curve anteriorly, close to back (3 scale rows from fin) at highest point; (a high, expanded soft dorsal with 10 to 12 rays; faint lateral bands, body only lightly pigmented; gill-membranes narrowly connected to each other)
- Slough darter - Etheostoma gracile (Girard)  
(= Hololepis gracilis (Girard))
- Southern Illinois to southwestern Indiana and Texas to Alabama. Indiana: southwestern quarter of the state from ~~White~~, Wabash, and Ohio drainages.
- 19b Lateral line (complete or incomplete) parallel to back or only slightly decurved ..... 20
- ~~20a~~(19) Dorsal fin spines 9 to 14 (rarely 8), not ending in fleshy knobs; lower jaw scarcely or not at all projecting; head partially scaled; males brilliantly colored ..... 21
- 20b Dorsal fin spines 7 to 9 and ending in fleshy knobs in breeding males; lower jaw projecting, or the jaws about equal; head completely scaleless; males without bright colors . . . 29
- 21a(20) Gill-membranes broadly connected to each other ..... 22
- 21b Gill-membranes at most slightly connected to each other ..... ~~24~~
- 22a(21) Cheek and opercle scaled; color predominantly green; (dorsal fin spines 9 to 12; dorsal fin soft rays 10 to 12; lateral line complete; pectoral fin length longer than head; lateral-line scales ~~40~~ to ~~50~~)
- Banded darter - Etheostoma zonale (Cope)  
(= Poecilichthys zonalis (Cope))
- Minnesotato New York and eastern Oklahoma to Mississippi. Indiana: Kankakee drainage and a few localities in the Iroquois and Ohio (mainlyWhitewater) drainages.
- 22b Cheek and opercle naked or very sparsely scaled; color not predominantly green ..... 23

- 23a(22) Anal fin soft rays 5 to 7; dorsal fin spines 9 or 10; breast scaleless; black spot on anterior and posterior spinous dorsal; (lateral-line scales 48 to 54; dorsal blotches or saddle-bands usually 6)

Harlequin darter - Etheostoma histrio Jordan and Gilbert  
(= Ulocentra histrio (Jordan and Gilbert))

Eastern Illinois to southwestern Indiana and eastern Texas to Georgia. Indiana: Patoka River, White drainage, in Gibson County (Jordan, 1890).

- 23b Anal fin soft rays 8 to 10; dorsal fin spines 11 to 14; breast with scales which may be imbedded; no black spots on spinous dorsal (horizontal stripes present); (lateral-line scales 48 to 60; dorsal blotches or saddle-bands 4 to 6)

Variiegated darter - Etheostoma variatum (Kirtland)  
(= Poecilichthys variatus (Kirtland))

Southern Indiana to western New York and to Kentucky. Indiana: Ohio drainage, primarily in the Big Blue and Whitewater drainages.

- 24a(21) Lateral line complete; males with blue breast in life

Bluebreast darter - Etheostoma camurum (Cope)  
(= Poecilichthys camurus Cope)

Eastern Illinois to Pennsylvania and Tennessee to North Carolina. Indiana: White, Wabash (including Tippecanoe), and Ohio (except eastern portions) drainages.

- 24b Lateral line incomplete, pores lacking on posterior part of body; breast not blue in life .....

- 25a(24) Dorsal fin spines 8 to 10; dorsal fin soft rays 10 to 12; body slender, greatest depth 5.4 to 6.8 times in standard length

Iowa darter - Etheostoma exile (Girard)  
(= Poecilichthys exilis (Girard))

Alberta to Quebec and Colorado to Ohio. Indiana: Lake Michigan, Kankakee, and Tippecanoe drainages.

- 25b Dorsal fin spines usually 9 to 14; dorsal fin soft rays 12 to 14; body deep ..... 26

26a(25) Cheeks covered with ctenoid scales; 49 to 57 scales in lateral line, 17 or less without pores

Mud darter - Etheostoma asprigene (Forbes)  
(= Poecilichthys jessiae asprigenis Forbes)

Iowa to southwestern Indiana and Texas to Alabama.  
Indiana: Wabash drainage in Carroll (Evermann and Jenkins, 1892), Gibson (Hubbs and Lagler, 1942), Knox and Posey (Jordan, 1890) counties.

26b Cheeks scaleless or with a few embedded scales around the eye; 39 to 52 scales in lateral line, usually 25 or more without pores 27

27a(26) Mouth large, the posterior angle reaching to below middle of pupil; caudal peduncle deep, its depth contained 1.5 to 1.9 times in the greatest depth of body; size very small, under 1 inches standard length; dorsal fin spines 11 to 14; (breeding males with blue bands which encircle the body on the posterior half; breast blue-black)

Tippecanoe darter - Etheostoma tippecanoe (Jordan and Evermann)  
(= Poecilichthys tippecanoe (Jordan and Evermann))

Indiana to western Pennsylvania and Kentucky.  
Indiana: Tippecanoe River in Fulton County and East Fork White River in Martin County.

27b Mouth small, the posterior angle not reaching to below middle of pupil; caudal peduncle narrow, its depth contained 2.0 to 2.6 times in the greatest depth of body; dorsal fin spines 9 to 12; (scales in lateral series 39 to 50) ..... 28

28a(27) Infraorbital branch of lateral line complete; gill-membranes slightly connected; pectoral rays 13 or 14; bars nearly complete around the caudal peduncle; greatest body depth under spinous dorsal fin; (breeding males with blue-green bands which encircle the body on the posterior half, interspaces of red and orange; breast blue-green, belly and lower sides of body greenish; anal fin a deep green, with middle portion a brick red)

Rainbow darter - Etheostoma caeruleum Storer  
(= Poecilichthys caeruleus (Storer))

Minnesota to southern Quebec and Arkansas to Alabama. Indiana: all major drainages, but not from the extreme northwestern and southwestern portions of the state.

28b Infraorbital branch of lateral line interrupted below eye, leaving an isolated group of 4 pores on preorbital region; gill-membranes not connected, slightly overlapping at an angle; pectoral rays 11 or 12; bars short, not circling the caudal peduncle; greatest body depth before dorsal fin origin; (breeding males with olive-green blotches which do not encircle the body, interspaces of red, orange, and yellow; **breast** deep orange, belly and lower sides of body yellowish; anal fin green on basal 2/3 and whitish-green on distal 1/3)

Orangethroat darter - Etheostoma spectabile spectabile (Agassiz)  
(= Poecilichthys spectabilis spectabilis (Agassiz))

Eastern Colorado to western Ohio and eastern Texas to Virginia. The subspecies occupies the northeastern portion of the species range, occurring as far west as Iowa and as far south as Tennessee. Indiana: all major drainages except Lake Michigan and Kankakee. Rare in the southwestern portion of the state.

29a(20) Gill-membranes not broadly joined at isthmus; dorsal **spines** 8 or 9; dorsal rays 12 to 14; body lightly pigmented but 2 to L. distinct black spots at caudal base; cheeks and **opercles** scaly

Spottail darter - Etheostoma squamiceps (Jordan)  
(= Catonotus squamiceps (Jordan))

Southeastern Illinois to southwestern Indiana to Alabama. Indiana: Gresham's Creek and Black River, Wabash drainage, in Posey County (Jordan, 1890).

29b Gill-membranes broadly united at isthmus; dorsal spines 7 or 8; dorsal 12 to 14; body heavily pigmented, black spots at caudal base indistinct or lacking; cheeks and **opercles** scaleless

Fantail darter - Etheostoma flabellare Rafinesque  
(= Catonotus flabellaris (Rafinesque))

Minnesota to southern Quebec and northeastern Oklahoma to North Carolina. Indiana: all major drainages except Lake Michigan. Gerking (1945) recognized 2 subspecies, E. f. flabellaris Rafinesque from **Whitewater** and White drainages and E. f. lineolatus (Agassiz) and possible **intergrades** from all but the Whitewater drainage.

## Drum family - SCIAENIDAE

Primarily in tropical and subtropical Atlantic, Indian, and Pacific oceans, some species in freshwater.

Freshwater drum - Aplodinotus grunniens Rafinesque

Southwestern Saskatchewan to southern Quebec and Guatemala to **Alabama**, Indiana: Lake Michigan drainage (Meek and Hildebrand, 1910) and the southern **half** of the state from **Wabash**, White, and Ohio drainages.

1

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## INDEX

- Acipenser, 21  
 Acipenseridae, 13, 21  
 Alosa, 24  
Ambloplites, 68  
Amblyopsidae, 14, 56  
Amblyopsis, 56  
Amia, 22  
 Amiidae, 13, 22  
Ammocrypta, 70, 71  
Anguilla, 23  
 Anguillidae, 14, 23  
Aphredoderidae, 15, 57  
Aphredoderus, 57  
Aplodinotus, 80  
 Atherinidae, 17, 60  
Campostoma, 44  
Carassius, 30  
Carpiodes, 46  
 Catostomidae, 16, 45  
Catostomus, 51, 52  
 Centrarchidae, 17, 62  
Centrarchus, 68  
Chaenobryttus, 64  
 Clupeidae, 16, 23  
 Coregonus, 25  
 Cottidae, 15, 61  
Cottus, 61  
Culaea, 60  
Cycleptus, 45  
 Cyprinidae, 16, 30  
 Cyprinodontidae, 17, 58  
Cyprinus, 30  
  
Dorosoma, 23  
  
Ericymba, 35  
Erimyzon, 48  
 Esocidae, 16, 28  
 Esox, 28, 29  
Etheostoma, 74, 75, 76, 77, 78, 79  
  
Fundulus, 58, 59  
  
 Gadidae, 16, 57  
Gambusia, 59  
 Gasterosteidae, 15, 60  
 Gila, 35  
  
Hiodon, 27  
 Hiodontidae, 16, 27  
Hybognathus, 44  
Hybopsis, 32, 33  
Hypentelium, 51  
  
Ichthyomyzon, 18, 19  
Ictaluridae, 14, 52  
 Ictalurus, 53, 54  
Ictiobus, 47  
  
Labidesthes, 60  
Lagochila, 51  
Lampetra, 20  
 Lepisosteidae, 13, 21  
Lepisosteus, 21, 22  
Lepomis, 65, 66, 67  
Lota, 57  
  
Micropterus, 63, 64  
Minytrema, 48  
Morone, 62  
Moxostoma, 49, 50, 51  
  
Nocomis, 32  
Notemigonus, 36  
Notropis, 36, 37, 38, 39, 40, 41, 42, 43  
Noturus, 55, 56  
  
Oncorhynchus, 25  
Opsopoeodus, 34  
 Osmeridae, 14, 27  
Osmerus, 27  
  
Perca, 69  
Percidae, 17, 69  
Percina, 71, 72, 73, 74  
 Percopsidae, 14, 57  
Percopsis, 57  
Petromyzon, 19  
 Petromyzontidae, 13, 18  
Phenacobius, 44  
Phoxinus, 35  
Pimephales, 34  
 Poeciliidae, 17, 59  
Polyodon, 20  
Polyodontidae, 13, 20  
Pomoxis, 68  
Pungitius, 60  
Pylodictis, 52

Rhinichthys, 31  
Salmo, 26  
Salmonidae, 14, 24  
Salvelinus, 26  
Scaphirhynchus, 21  
Sciaenidae, 17, 80  
Semotilus, 31  
Serranidae, 17, 61  
Stizostedion, 69, 70  
  
Typhlichthys, 56  
  
Umbra, 28  
Umbridae, 16, 28