

GETTING A START ON FISH IDENTIFICATION

By Jim Pitts

To the aquarist who cares little about the distribution and taxonomy of fishes, identifying his fishes may seem an unnecessary bother. Such pure and uncompensated dedication to the aesthetic quality of fishes is admirable, yet most of us are curious creatures, and are unsettled by not knowing that iridescent shiner or colorful darter by name. With a certain amount of practice and a tremendous amount of patience, there is no reason why you can't identify 90% of the freshwater fishes in North America. The only reason 100% is hard to achieve is that there are difficulties with immatures, hybrids, aberrant individuals, and as yet undescribed fishes.

There are a few tools necessary to identify fishes. Probably the most important is a good key. Keys are books or sections of field guides that systematically tell you what fish you have. The most comprehensive and inexpensive key available for North American freshwater fishes is the famous How to Know the Freshwater Fishes by Samuel Eddy. The book is part of the Picturedkey Nature Series and is generally available at bookstores, especially bookstores associated with large universities. If you aren't in reach of a bookstore write to William C. Brown Company Publishers in Dubuque, Iowa. The price is around \$5.00.

Another key that deals with most of the described freshwater species in North America is Vertebrates of the United States by W. F. Blair et al. The section devoted to fishes is by George A. Moore and is intended for those who are serious students of fishes. Unlike Eddy, Moore's keys attempt to separate fishes on a more or less phylogenetic basis. Moore uses pharyngeal tooth counts to key Cyprinidae, while Eddy does what is possible to avoid this. It seems that Moore's key depends less on the subjective opinion of the identifier than Eddy's. It is not as well illustrated as Eddy's key. The two books complement each other well. Vertebrates of the United States is published by McGraw-Hill Book Co., Inc. in New York. The price is over twenty dollars.

Regional or state keys that cover your area may be just as useful to you, so check the library and write your state department of fishes to find out what is available. A list of several good books is presented at the end of this article.

The other tools you need are all pretty much optional or may be substituted for.

1. Ruler--clear plastic is best
2. Magnifying lens (or dissecting scope)
3. Scalpel or surgical scissors
4. White-enamel pan
5. Forceps or tweezers
6. Isopropyl alcohol and jars for specimens
7. Dividers
8. Dissecting needle

If you do not want to kill the fish to identify it, you may let it live a full life in the tank. When the fish dies of natural causes; deterioration, fungus and the nibbling of other fishes may soon make the fish unidentifiable. However, I try to keep a close eye on the fish and place it in alcohol as soon as possible after it expires. If the fish has any

distinguishing colors, make note of them. The colors may fade in the alcohol and in your memory. Coloration is often helpful in keying. If you collect large numbers of a species and don't mind using a few for immediate identification, you may want to kill them. There are a couple of ways to do this. One is to simply drop them directly into alcohol. The second way is for softies like me. Wrap the fish in plastic bags with a small amount of water and place them in the freezer. Close the door, run into the living room and try to forget what you've done. Thaw and allow the fish to sit overnight in alcohol. Be careful not to damage fins when handling the fish.

Keys work on a very simple principle of giving you two opposite characters to select from and sending you on to another set of opposites, according to your choice. By choosing the proper options as characters of the unidentified specimen, you should eventually arrive at its proper identity. Let's go over the procedure with a hypothetical example.

- 1a. Dorsal fin with spines. Go to 2
- 1b. Dorsal fin without spines. Go to 10

You should read both options. After looking at the fish you decide that the dorsal fin possesses spines, so you go to the pair of opposites 2a and 2b.

- 2a. Lateral line present. Go to 5
- 2b. Lateral line absent. Go to 3

Your fish has a lateral line so you skip over 3a, 3b, 4a, and 4b to proceed to the pair of opposites 5a and 5b.

Eventually you will arrive at a fish in the key that should agree with your specimen. Check the illustration and distribution given (if they are). If all seems to agree, you in all probability have correctly keyed out your fish. If there is a disagreement between the illustration, distribution, or general remarks and your fish, start again at the beginning of the key and recheck.

Keys are often filled with vague spots, and characters that are not so easily checked for. Sometimes it is best to consult several keys before deciding the identity of your fish. Most keys will work better for you if you use adult, sexually mature fishes. Males are often more distinctive to a species than females.

The mechanics of examining fishes for taxonomic characters are often the big hold-back for the beginner. A discussion of some of these mechanics follows.

Measuring Proportions--It is often necessary to decide how many times the body depth goes into the length. If you use dividers instead of a ruler you will find you have a more exact approximation. A dime store compass with a nail used to replace the pencil will work in place of dividers. Use this instrument to find all proportional measurements, being careful not to puncture the fish.

Fins--You will need to know in most cases whether or not the fins possess spines or rays. Hold the fin up to a light and spread the fins with your forceps. Clasp the anterior portion of the fin near its base (see fig. 1). Holding the fin near the top will usually cause it to tear. If the supporting structures appear segmented, they are rays. Non-segmented structures

are spines. Rays may be modified into hard structures as in the carp's first dorsal ray. Counting spines, needs no explanation, however, rays are often branching structures and should be counted near their bases.

Scales—Scales are commonly one of three types as illustrated in fig. 2. The only North American fishes with ganoid scales are the Paddlefish, Gars, and Sturgeons. You don't have to remove scales in order to see whether or not they are cycloid or ctenoid. Simply rub the fish with your hand from the tail towards the head. If the scales are ctenoid the body will feel scratchy and rough. Cycloid scales will feel smooth.

Counting scales should be done in accordance with the key's counting instructions, since counts may be made in different ways by different authors. On small fishes with indistinct scales try wiping or blowing the moisture off the fish and looking at the fish from different angles to see the scales better. Imbedded scales may be scrapped out with a needle.

Pigmentation-- If you are using body pigmentation as a character for identification, use your hand lens or magnifying glass. Pigments may fade and discolor in alcohol. In some minnows you may have to check the pigmentation of the peritoneum or lining of the body cavity. In order to do this, make an incision with a scapel, razor blade, or scissors from the anus to below the pectoral fins. Another incision should be made from the anus dorsally about half the height of the body. You may now lift the flap of muscle to see the peritoneum clinging to it on the inner surface. (see fig. 3)

Intestine and stomach structure--These often give hints to the identification of a fish. For example, the intestine of the stoneroller, Campostoma anomalum, is a very long coiled structure wrapped around the other organs. Dissect the fish as before but make an additional incision from the anterior portion cut vertically about midway up the body. Most of the internal organs will now be exposed by pulling back at the flap. Pyloric caeca (fig. 4) are finger-like structures attached at the juncture of the stomach and intestines. Counts of these structures are sometimes warranted.

Pharyngeal teeth--Probably the most difficult count you will ever have to make to identify a fish is that of the Pharyngeal teeth. This count is made to help identify suckers and minnows. The pharyngeal teeth are situated on two curved bones that lie behind the gill arches. The procedure goes as follows:

1. Take your thumb and bend the opercle foward to a position where the entire gill chamber is exposed.
2. The pharygeal arch may be exposed by placing a needle or probe behind the last filament covered arch and placing it foward.
3. With a scalpel, forceps, or pointed surgical scissors, remove the fleshy arch from its attachment to the top and bottom of the cavity.
4. Carefully remove the arch with forceps and clean the flesh from it with a needle.
5. Repeat the procedure on the other side.

After examining the teeth, place them back into the chamber and close the opercles. You will have to practice and develop your own technique to achieve proficiency.

Dr. J. S. Ramsay of Auburn University suggests that anyone who plans to work with pharyngeal teeth should culture his thumbnail so that it is long enough to be of use as a tool. In working with the teeth the thumbnail makes possible manipulating the arch without tying up your hands with forceps.

Very often a tooth formula is given in the description that appears something like this: 2,4-4,1. Such a formula indicates that the left arch contains two rows of teeth, one row has two teeth, the other row on the same arch contains four. The right arch has a row with four teeth and one row with only one tooth. Teeth are easily broken away from the arch, leaving a bare socket. Be sure to count these sockets when making tooth counts. Typical pharyngeal arches are illustrated in fig. 5.

Samuel Eddy provides excellent instructions on general measurements in his key. Again, be sure to check any key you use for the methods that author uses in determining characters.

Now we come to the subject of identifying fishes that are still alive. You may learn to identify many fishes on sight. Every time you find that your mind is idle, pick up an illustrated text of native fishes and browse through the pictures. Color plates will more effectively place the fish in your memory. Slide programs, museums, and exchanging live identified specimens will all help in the effort. Don't just look at the fish you see in your tank in the way you would a painting. Study their habits, the way they swim, eat, school, and pawn. Soon you will find yourself identifying fishes in the wild at only a glance.

Learning "field characters" of fishes will make the job of identifying live and preserved fishes much easier. "field characters" are characters or short combinations of characters that tell the identifier the identity of a fish without resorting to keys. These characters in fact are not very often found in keys. In the Georgia swamps, for example, two pickereels occur commonly, The chain pickerel (Esox niger) and the grass pickerel (Esox americanus). Eddy's key uses a lateral line scale count and the color pattern of adults to separate the two species. In juveniles, the patterns are quite variable and a scale count is a great bother. They may be easily separated by a single field character that is consistent in juveniles and adults. The snout of E. niger is very exaggerated in length when compared to E. americanus. The difference is so dramatic that once you see two side by side you will probably never again have trouble separating them.

When you are keying fishes it is very beneficial to make note of these field characters as you come to develop them. A card file of each fish's field characters is very handy. You might also note them in your key's page margin by the fish. Notes may be made on drawings to call the characters to your attention. Make notes of colors, complicated patterns, pore arrangements, distinctive body shapes and proportions, areas with crowded or sparse scales, sizes and distribution of breeding tubercles, etc. Especially useful are drawings that you can make of characters of juveniles, since sub-adults are so often neglected in keys.

You will undoubtedly make mistakes in identifying some fishes. Professional ichthyologists are not exempt from an occasional misidentification, if that is any consolation. If you are unsure of your identification of a fish, get another opinion from another NANFA member. Ichthyologists at a nearby university are almost always willing to take out a few minutes to help you. In any case, don't let the ordeal of "beginning" your study of fish taxonomy discourage you. Develop a systematic way of approaching fish identification that best suits your desires and needs, and enjoy what you are doing.

Some Books of North American Fishes

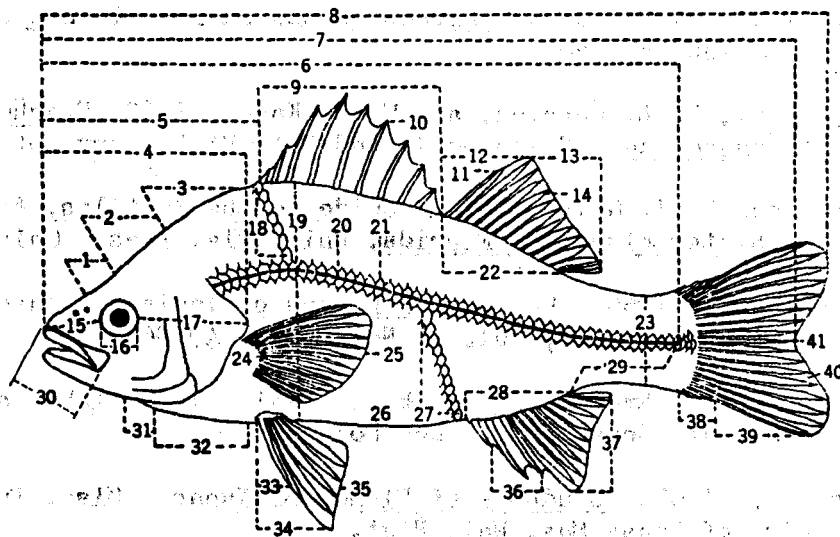
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A spiny-rayed fish illustrating parts and methods of counting and measuring: 1—interorbital; 2—occipital; 3—nape; 4—head length; 5—predorsal length; 6—standard length; 7—fork length; 8—total length; 9—length of base of the spinous or first dorsal fin; 10—one of the spines of the first dorsal fin; 11—spine of the second dorsal fin; 12—height of second dorsal fin; 13—length of the distal, outer or free edge of second dorsal fin; 14—one of the soft-rays of the second dorsal fin; 15—snout length; 16—eye length; 17—post-orbital head length; 18—scales above the lateral line or lateral series which are counted; 19—body depth; 20—one of the lateral line pores in a complete lateral line; 21—one of the lateral scales which with the remainder form the lateral series; 22—length of base of the second or soft dorsal fin; 23—least depth of the caudal peduncle; 24—the pectoral fin; 25—one of the soft-rays of the pectoral fin; 26—abdominal region (belly); 27—scales below the lateral line or lateral series which are counted; 28—length of the base of the anal fin; 29—length of the caudal peduncle; 30—length of the upper jaw; 31—isthmus; 32—breast; 33—height of pelvic spine; 34—height of pelvic fin; 35—one of the soft-rays of the pelvic fin; 36—spines of the anal fin; 37—soft-rays of the anal fin; 38—rudimentary rays of the tail (caudal) fin; 39—one of the principal, unbranched soft-rays of the caudal fin; 40—branched soft-ray of caudal fin; 41—the caudal fin with numeral at fork of fin. (Source: Trautman, 1957).

Fig. 1. Typical dorsal fin of a cyprinid. "p" indicates position of forceps in spreading fin for examination; "R" is the rudimentary ray; "a-g" are rays counted by their bases; "h" is usually counted as a single ray since the branches join below the skin. Drawing by author.

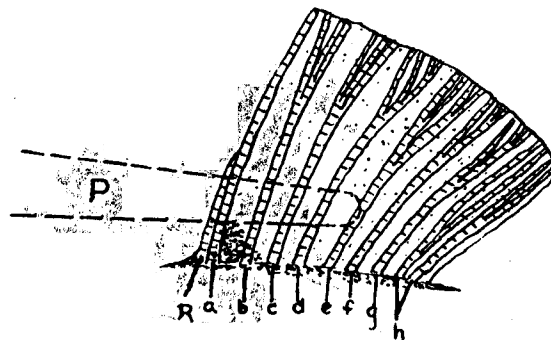


Fig. 2. Typical scale types: a. cycloid (carp) b. ctenoid (perch) c. ganoid (gar). Drawings from Lagler, Bardach, Miller 1962

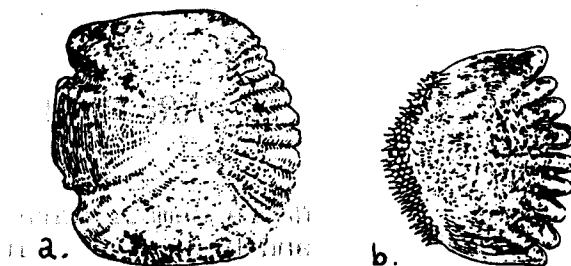


Fig. 3. Minnow dissected to show the peritoneum. Drawing by author.

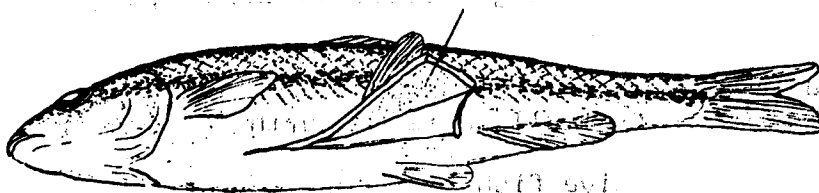


Fig. 4. Pyloric caeca (c) in position relative to stomach (s) and intestine (I). Above unbranched form, below branched form. Drawings by author.

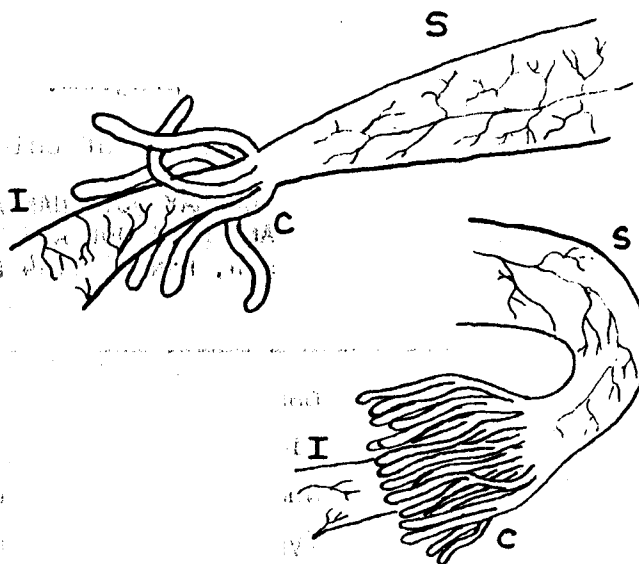


Fig. 5. Typical pharyngeal arches and teeth of minnows and a sucker. Drawings based on Grasse', 1958

