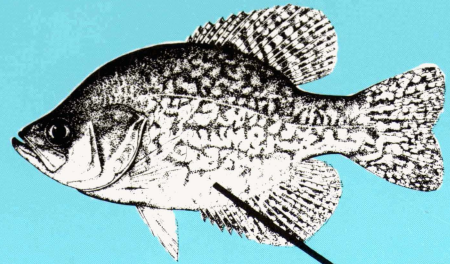
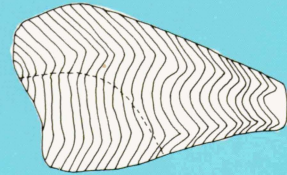
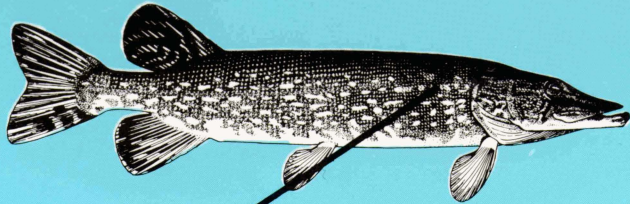


Field Manual
for the
Identification of Selected North American Freshwater Fish
by Fillets and Scales



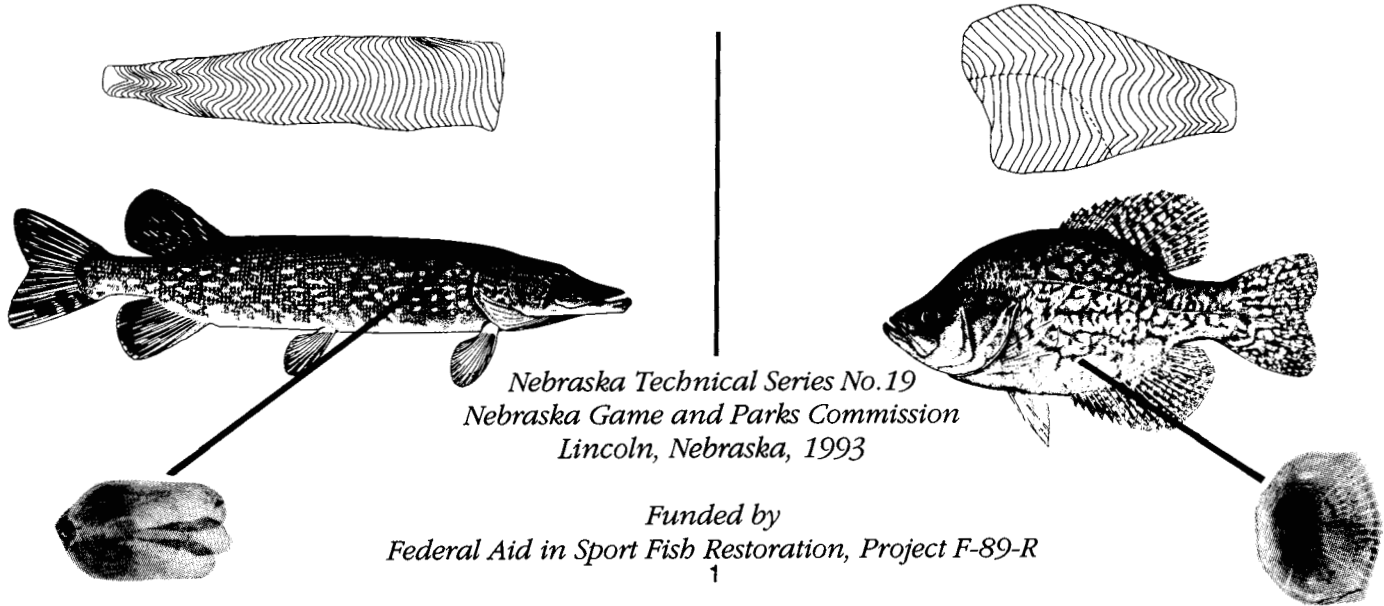
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Field Manual
for the
Identification of Selected North American Freshwater Fish
by Fillets and Scales

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INTRODUCTION

This manual is designed for use in the field to help conservation officers identify fish that have been filleted or skinned. Many North American freshwater gamefish and those caught by commercial fishermen are included.

Our goal was to collect six fish of each species for measurement purposes. Several states and provinces including Alaska, Colorado, Florida, Idaho, Iowa, Michigan, Missouri, Nebraska, New York, Ontario, Saskatchewan, Texas, Virginia, Washington, Washington D.C., Wisconsin and Wyoming furnished samples. Fish may vary from location to location; these differences were not corrected for in this manual.

For identification of fish, we will first examine fillets. Fish fillets, in most connotations, are of a fish skinned and cut along one side of the vertebrae. Two fillets (right and left side) are found on an individual fish (two left sides equal two fish, not one). Identification is much easier if the fish is scaled (number of scales may be counted vertically or horizontally) or if ribs are kept with the fillets. Some states and provinces require a one-inch patch of scales to be retained with each fillet. If this skin is removed, you have an illegal, unidentified fish. Some groups of fishes look so much alike that a close examination of scales or a laboratory

analysis of flesh is necessary for identification.

Shape of fillet, color and rib numbers can vary from species to species. Patterns on scales differ between species and can be used like human fingerprints. Many people fillet fish differently, and pieces can be fit together if necessary. Larger fillets may be cut up into smaller sections, but with smaller fish, the fillet is frequently kept whole. Can fillets be identified? Using an electrophoresis technique, some fish species have been identified by flesh alone. This can take a great deal of time and many forensic laboratories are not equipped or able to perform this service.

Very little research, except for identification of larval fish, has examined the use of muscle segments or myotomes. A study in France by Blin, Balea and Prudhomme (1953) examined cross-sections of major fish sold at the market place. Cross-sections just behind the head (the end of sternum), at the tip of the anus and midway between anus and tail were taken. This comparison was taken for some of the fish examined and identification can be made to families.

Can these fillets be identified without employing any fancy scientific equipment? For many species, the answer is yes. This manual was designed to aid in this task.

GLOSSARY

Abdomen (belly) — the lower surface of the body, especially the part between the pectoral fins and the anus

Abdominal pelvic fins — said of pelvic fins when located on abdomen, far removed from head

Accessory caudal rays — short rays on the upper and lower anterior portions of the caudal fin

Accessory pectoral scale — an enlarged or elongated scale at dorsal base of pectoral fin in some herringlike fishes

Adipose fin — a fleshy fin on the back behind the dorsal fin, as in trouts, salmons, whitefishes, smelts and catfishes

Anal — referring to the anus or vent

Anal fin — the fin on the median ventral line behind the anus

Annulus (plural annuli) — a mark or marks formed on a fish scale or bone each year

Anterior — the front portion; in front

Anterior field — unexposed part of the scale which is toward the head of the fish, bounded by imaginary lines from the front corners (or their equivalent on rounded scales) to focus

Anus — the posterior, external opening of the alimentary canal: the vent

Axillary process — a daggerlike projection at the base of the pectoral or pelvic fins

Barb — hooklike serration, as on pectoral and dorsal fin spine of carp and catfishes

Barbel — an elongated, hairlike projection, usually about the mouth, chin, or nose, as in the cods, sturgeons and catfishes

Basal — (of fins) skeletal support of fin ray(s)

Belly — see *abdomen*

Branchial — of the gills

Breast — see *pectoral*

Canines — conical teeth which are larger than the rest

Cardiform — brushlike; said of fine teeth of uniform length in brushlike bands or patches

Carinate — keeled: having a sharp median ridge as on the belly of certain herringlike fishes

Caudal — pertaining to the tail or caudal fin

Caudal peduncle — the fleshy end of the body behind the anal fin and before the caudal or tail fin: the tail minus the tail fin: the "wrist"

Chin — anterior ventral portion of the lower jaw

Circuli — raised markings on the outer surface of the scale, usually appearing as lines which more or less follow the outline of the scale

Collagen — gelatinous substance found in connective tissue, found on either side of myomeres

Color of fillet — flesh of fish can be different colors. Sometimes these colors are dietary, such as the orange-pink of trout or salmon. Other colors that may occur are yellow, white, pink and shades in between

Crenate — with a scalloped or notched margin (as on opercular flap at edge of gill cover of sunfishes)

Ctenii — tooth-like structures on posterior portion of scale

Ctenoid — said of scales of most spiny-rayed fishes having posterior margin of scale with needlelike projections

Cycloid — said of the scales (having smooth margins) of typical soft-rayed fishes

Deciduous — said of scales that are easily rubbed off and thus not firmly attached

Dentition — said of teeth, their arrangement and structure

Depth — the vertical diameter or distance through, as of the body of fishes

Distal — farthest from the center; peripheral

Dorsal — pertaining to the back

Dorsal aorta — main artery along back

Dorsal fin — a fin on the back, usually central in position supported by rays or spines

Dorsal fin spine — see *barb*

Exposed portion — that part of the outer surface of overlapped scales visible when scales are in place on a fish; may be smaller or larger than posterior field; in ctenoid scales ctenii occur on this portion

Eye diameter — the horizontal diameter of the eyeball — in contrast to iris diameter, which is the distance across the black aperture in the center of the eye, or orbit diameter, which is the horizontal distance between anterior and posterior margins of the socket

Fields — quadrants on the surface of the scale, either real as shown by the angulation of the circuli at the four principal corners (forming diagonal lines), or imaginary if the corners or configuration of the circuli are missing (such as a circular type of scale)

Filament — slender or threadlike, said of certain elongated fin rays in some fishes

Fillet myomeres — the number of myomeres usually found in a fillet. There are never more fillet myomeres than fish myomeres

Fingerling — young fish, usually late in first year

Fish bones — bones other than ribs found in a fillet. The Y-bones in northern pike, for example

Fish myomeres — the total number of myomeres found in a fish. Myomeres are muscle segments. They form the segments seen when a fish is skinned or filleted. These segments are usually shaped like a W or V lying on its side

Fish record weight — refers to the largest fish of that species on record

Focus — first part of scale to appear in growth; it is often centered in the scale

Fork length — distance from the anteriormost margin of head to tip of middle ray of the caudal fin

Fry — young fish, newly hatched, after yolk has been used up and active feeding has commenced

Gill arches — the bony supports of the gills

Gill cover — the bony covering of the gill cavity, composed of opercular bones (see *operculum*)

Gill membrane — the thin wall of skin supported by the bony-support rods, and closing the gill cavity below

Gill rakers — a series of bony projections along the anterior edge of the gill arch. Gill-raker counts are usually made on the left anterior arch. Every raker is counted, including the bony rudiments at the ends of the series that

may be difficult to see except under magnification

Graduated — regular or steady increase in length, as of the spines in the fins of some fishes

Gular plate — bony plate or plates located behind the chin and between the sides of the lower jaw

Head length — distance from the most anterior point of the head to the posterior edge of the opercle

Heterocercal — unequally lobed; said of the tail or caudal fin of a fish where the upper lobe is larger than the lower, and in which the last few vertebrae of the vertebral column are bent upward

Homocercal — equally lobed; said of the tail or caudal fin when upper and lower lobes are more or less equal, and the backbone or vertebral column ends at the middle of the base of the fin

Imbedded portion — all of scale other than exposed part, usually including most of the lateral fields and all of the anterior field

Imbricated — overlapping, like shingles on a roof

Immaculate — without spots or pigment pattern, usually white or colorless

Inferior — used in reference to mouth when snout projects beyond lower jaw

Interneurals — the bones to which the dorsal fin rays are attached

Isocercal — with the vertebrae becoming progressively smaller backward, as in the codfishes

Isospondylous — with the anterior vertebrae simple; said of the herringlike fishes which lack the Weberian apparatus

Isthmus — the fleshy space beneath the head and between the gill openings

Jugular — pertaining to the throat; said of the pelvic fins when located ahead of the point of attachment of the pectorals

Keel — a sharp, compressed edge on the ventral surface between the paired fins or the lateral surface of the caudal peduncle

Larva (plural *larvae*) — the young of an animal when differing markedly from the adult

Lateral field — top and bottom fields remaining after marking off anterior and posterior fields

Lateral line — series of porelike openings (to sensory canal) along the sides of a fish

Lateral line scales — the single row of scales that make up the lateral line

Lingual — pertaining to the tongue

Lingual teeth — teeth on tongue: the serrated teeth on the tongue of lampreys

Lunate — crescentlike, in reference to shape of caudal or tail fin

Major rays (or principal rays) — longer (at least $\frac{3}{4}$ height of fin), obvious fin rays as opposed to anterior rudiments often not visible; often comprise all branched rays plus one anterior unbranched ray

Mandible — the lower jaw

Mandibular (or submandibular) pore — small sensory opening in the undersurface of the bones of the lower jaw

Maxillary — the posterior and lateral element of the upper jaw

Median — lying in the midline that divides an animal into right and left halves

Midline — divides the fillet in half and can always be seen on the fillet. The midline is not necessarily the lateral line

Mouth (inferior) — mouth below snout; snout obviously overhanging mouth

(*oblique*) — line of the mouth (when closed) at an angle of 45° or greater

(*subterminal*) — mouth slightly overhung by snout, not quite terminal

(*terminal*) — tips of upper and lower jaw forming foremost part of the head

(*ventral*) — mouth on ventral surface of head, as in sturgeons

Myomere — see *myotome*

Myotome — a muscle plate; a section of the repeated muscle units corresponding to the flakes of a cooked fish

Nasal — one of the paired bones on front of a fish's head, usually beside the nostril

Notochord — the embryonic cartilaginous vertebral column persistent in paddlefish

Opercle — the large rectangular bone of the gill cover

Opercular flap — a backward prolongation of the posterior angle of the opercle

Operculum (also called *gill cover*) — the bony covering of the gill cavity composed of opercular bones, i.e. preopercle, interopercle, subopercle, opercle

Opisthocoelous — convex in front, concave behind. The condition in the vertebrae of gars

Origin — (of a fin) the anterior end of the base; the end of base nearest the head

Paired fins — pectoral and pelvic fins, in contrast to vertical fins

Papilla (plural *papillae*) — a small fleshy projection or ridge

Papillose (or *papillate*) — covered with papillae

Pectinate — having teeth like a comb

Pectoral — the anterior ventral portion of a fish; the breast

Pectoral arch — shoulder girdle; the complex of bones usually connected with the skull, to which the pectoral fins are attached

Pectoral fins — the most anterior or uppermost of the paired fins, usually dorsal to pelvic fins

Pectoral fin spine — see *barb*

Peduncle — the fleshy end of the body behind the anal fin (see *caudal peduncle*)

Pelvic arch (or *girdle*) — the bones to which the pelvic fins are attached; pubic bones

Pelvic axillary process (*scale*) — a slender scale-like process or tab of tissue that develops at the base of the pelvic fins of many salmonid and other bony fishes

Pelvic fin — ventral, paired fin lying below the pectoral fin or between it and the anal fin

Plate — hard, bony shield in various places on body, usually larger than scales, found especially in sturgeons and sticklebacks

Plicate — with wrinkle-like folds

Posterior — behind

Posterior field — exposed part of the scale toward the tail of the fish, bounded by imaginary lines from the back corners to focus

Pre-maxillary—the paired bones usually bearing teeth that form the front of the upper jaw in troutlike fishes, and the entire lower border of the upper jaw in higher percomorph fishes

Preopercle—the most anterior of the opercular series, the bone of the cheek

Primary radii—radii that extend from the focus to the edge of the scale

Principal rays—longer (at least $\frac{3}{4}$ height of fin) obvious fin rays as opposed to anterior rudiments often not visible; often comprise all branched rays plus one anterior unbranched ray

Procurent—the stiff rays at base of caudal fin

Proximal—nearest the point of attachment

Pyloric—the pylorus; that section of the intestinal tract immediately following the stomach

Pyloric caeca—fingerlike extensions attached to the pylorus

Radii—grooves or lines, usually more or less radiating from the focus to the edge of the scale

Ray—an articulated or jointed rod that supports the membrane of a fin

Replacement scale—a scale which has formed in the place of one lost; it lacks the pattern of radii and circuli in an area about the size of the original scale when lost

Rhombic (or rhomboid) scale—the type of heavy, bony, diamond-shaped, nonoverlapping scales found in gars

Scales taken from different parts of the same fish can vary greatly in size, shape and structure. Fish with ctenoid scales will often have cycloid scales on certain parts of the body such as the breast or belly. The scales examined for the keys in this manual were those more apt to be found in fillet cuts. The scales were taken from the top and bottom of the fish near the head and the top and bottom of the fish near the tail. The most typical scale used for research is taken on the side of the fish between the dorsal fin and midline

Scale radius—line radiating from the focus of a scale The angle subtended by the outer two is used to distinguish between species

Scute—a bony or horny plate

Secondary radii—radii that do not originate at the focus

Snout—technically that part of the head of a fish in front of the eyes

Snout length—distance from the most anterior point of the head or upper jaw to the front margin of the eye socket

Soft dorsal—the dorsal fin or portion of it that consists of soft rays only (*cf. spinous dorsal*)

Spine — fin rays that are not branched, without obvious segments, and more or less stiffened and sharpened at the apex; or similar straight or curved, sharp structures on other parts of the body (*operculum, cheek*)

Spinous dorsal — the dorsal fin or portion of it which consists of spines only

Standard length — distance from the most anterior part of the head to the posterior margin of the last whole vertebral centrum

Striations — grooves or streaks

Subopercle — the bone below the opercle (see *operculum*)

Subspecies — a group of local populations of a species, inhabiting a geographic subdivision of the range of the species, and differing taxonomically from other populations of the species

Swim bladder (also called *gas bladder, air bladder*) — gas-filled sac in dorsal portion of body cavity of most fishes which aids in buoyancy, and in respiration in some

Teleost — a name applied to fishes having the skeleton fully ossified; in other words a “bony fish” in contrast to a shark, which is a cartilaginous fish

Terminal — at the end (see *mouth*)

Thoracic — pertaining to the chest or thorax; anterior to the abdomen

Thoracic pelvic fins — pelvic fins which are attached far forward below the pectorals; the pelvic bones usually connected with the shoulder girdle

Tubercle — a soft or hardened lump or projection on the surface; usually a modified scale

Vent — the external opening of the alimentary canal; the anus

Ventral — on the lower surface; pertaining to the abdomen or belly

Vermiculations — markings resembling worm tracks

Vertebra (plural *vertebrae*) — a single bone of the spinal column



Vertical fins — the fins (dorsal, anal and caudal) on the median (center) line of the body, in contrast to the paired fins (pectorals and pelvics)

Vomer — the anterior bone on the roof of the mouth

Weberian apparatus — the modified, first four or five vertebrae in minnows, suckers, carps, catfishes and their relatives (*Ostariophysi*) that connect the swim bladder to the inner ear by a series of small bones or ossicles

FILLET IDENTIFICATION

Several items are useful in fillet identification.

Shape of fillet — The shape of the fillet can refer to species type involved. For example, a short, wide fillet () can refer to a sunfish or a crappie; a long, narrow shape () can refer to northern pike or a gar. See fish and fillets for this distinction.

Color of a fillet — The color of a fillet can be related to type of fish or diet. Just as crappie tend to be white-fleshed, trout and salmon tend to have reddish or orangish flesh, and bullheads and pike (*Esox*) tend to have yellowish flesh. Fish like carp, buffalo, suckers, redhorse, usually scavenger fish have a reddish layer of muscle next to the skin.

Ribs found in a fillet — The size and number of ribs left in a fillet may aid in identification. Different fish have specific numbers of ribs present, and some have finer bone elements than other species. The length and depth of the stomach cavity relates to species as does the color of the stomach lining when present. Normally, after the anal opening, the myotomes are more W shaped. One may approximate the number of ribs that can be estimated by using this characteristic (one rib per myotome).

Fins/rays — Fin placement can sometimes be visible on a fillet. Dorsal and anal fins can be useful because their location varies on different species of fish (see fish pictures).

Bones found in a fillet — Bones other than rib bones are often found in fillets. Frequently, these are found in canned or smoked fish. Species in the pike family (*Esox*) have Y bones. Carp, suckers, goldeye and buffalo have free-floating, intermuscular bones in their fillets. Identifying these bones in the fillet can eliminate species such as bass, crappie, sunfish, walleye, catfish, perch etc.

Myotomes (Myomeres) — A key feature in identifying fish fillets is the number of myotomes. Myotomes can vary from species to species. To function properly, myotomes don't run perpendicular to the body axis and are structurally more complicated. They are bent in a zig-zag shape and frequently look like a misshaped W on its side. On most fish, the best shaped W is from anus to tail. The Ws are usually less well defined near the head (**Figure 1**). Observations are most obvious with an extra light source.

There are two types of myomeres. One consists of broad fibers of white muscle; the second is a narrow fiber containing myoglobin which provides the red color (red muscle).

The white fibers contain no fat and contract rapidly for a short period of time. Fish considered capable of quick movements and incapable of sustained activity are included in this group (pike, sunfish, crappie and perch). Red

muscles are slower than white ones but are capable of prolonged performance because of the increased blood supply (drum). They are also found in continuous food-seeking species (carp and buffalo) and scavenger fish.

Reading myotomes — From tail to head, count the W-like segments. Even if the tail is partially removed, the segments can sometimes be observed by slicing overlapping myotomes (Figure 2). The head area may be more difficult. You may have to check the cut nearest the head to get a final count. Turn it and look at the fillet head on. Count collagen lines carefully — may be two lines for each myotome (Figure 3).

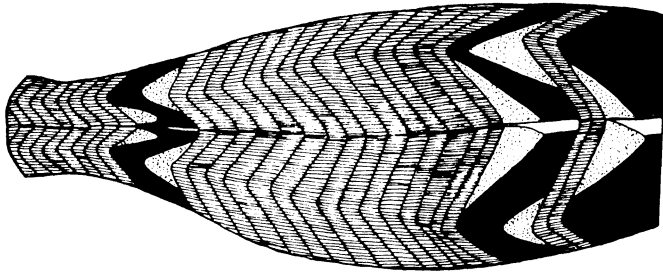


Figure 1. Fresh fillet shows Ws on head and tail sections and overlapping of myotomes.



Figure 2. The W-shaped segments at tail of fish. Myotomes

5
4
3
2
1
1
2

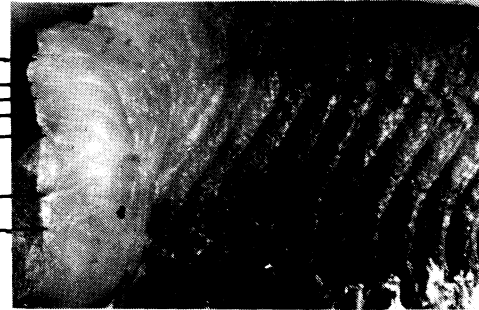


Figure 3. Collagen lines on a fish.

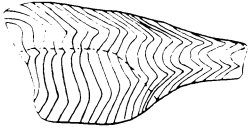

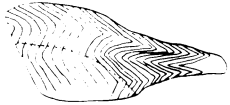

A listing of fish species and the typical number of myotomes is presented in **Table 1**.

An identification of fish using myotomes is found in **Table 2**.

Table 1. Myotomes found in live fish (fillets have the same or fewer myotomes)

25 or Less	26-33	33-40	40-45	45-50	50-55	55-60	60-80
Freshwater Drum	Black Crappie	Black Buffalo	Brown Bullhead	Alewife	Brown Trout	Alligator Gar	Arctic Char
Striped Bass	Goldfish	Black Bullhead	Grass Carp	Blue Sucker	Chain Pickerel	American Shad	Bowfin
White Bass	Largemouth Bass	Brown Bullhead	Northern Hog Sucker	Channel Catfish	Goideye	Arctic Char	Lake Sturgeon
White Perch	Rock Bass	Common Carp	Redhorse	Gizzard Shad	Lake Whitefish	Arctic Grayling	Lake Trout
Wiper	Smallmouth Bass	Highfin Carpsucker	(Black, Copper,	Grass Pickerel	Mooneye	Atlantic Salmon	Longnose Gar
(White Bass	Sunfish	Largemouth Buffalo	Gray, Greater,	Largescale Sucker	Mountain Whitefish	Brook Trout	Muskellunge
X	(Bluegill, Green,	Quillback	River, Shortnose,	Longnose Sucker	Paddlefish	Chinook Salmon	Northern Pike
Striped Bass)	Pumpkinseed,	River Carpsucker	Silver, etc.)	White Sucker	Shovelnose Sturgeon	Chum Salmon	Rainbow Smelt
Yellow Bass	Red-eared Sunfish,	Smallmouth Buffalo	Sauger			Coho Salmon	Rainbow Trout
	Warmouth, etc.)	Spotted Sucker	Saugeye			Cutthroat Trout	Tiger Muskie
	White Crappie	Yellow Perch	(Sauger			Goideye	(Northern Pike
			X			Inconnu	X
			Walleye)			Lake Sturgeon	Muskellunge)
			Walleye			Longnose Gar	
			Yellow Bullhead			Pink Salmon	
			Yellow Catfish			Rainbow Smelt	
						Round Whitefish	
						Shortnose Gar	
						Sockeye	
						(Kokanee Salmon)	
						Spotted Gar	

Table 2. Identification of fish using myotomes (myomeres) 25 or less.

Species	Fillet	Color	Size*	Bones**	Scales	Remarks
Temperate Bass White Perch White Bass Yellow Bass Wiper Striped Bass		Red midline Pinkish white	A A A A,B A,B	No No No No No		Myotomes widely spaced. Scales from white bass can be separated from wiper and striped bass, see page 131. Striped bass and wiper can be longer in length versus height, than the other Temperate Bass.
Freshwater Drum		Red midline Whitish	A,B	No		Myotomes widely spaced, myotomes differ from Temperate Bass near tail of fish

*Fish usually weigh under five pounds = A

Fish can be under or over five pounds = A, B

**Bones found in a fillet with ribs and vertebrae removed

Table 2. Identification of fish using myotomes (myomeres) 26 to 33.

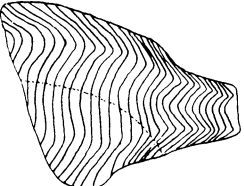

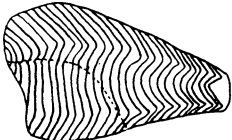





Species	Fillet	Color	Size*	Bones**	Scales	Remarks
Sunfish Bluegill Fish with Sunfish in name		Red midline Whitish yellow	A A	No No		Fish can be scaled, head and intestines removed, fillet height compared to length is important.
Black Crappie White Crappie		Whitish	A A	No No		Scales can be differentiated between white and black crappie. White flesh frequently has dark lines on outside of fillet (blood vessels). Fillet height to width is important.
Bass Largemouth Bass Smallmouth Bass		Red midline Whitish gray	A,B A	No No		Top line above midline usually well defined. Fillet has similar myotomes to crappie and bluegill, but length is longer than height for same size fish.
Goldfish		Red outside Yellowish pink	A	Yes		Only fish with this number of myotomes with bones in fillet and this color.

Table 2. Identification of fish using myotomes (myomeres) 33 to 40.

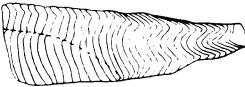

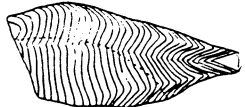

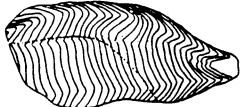


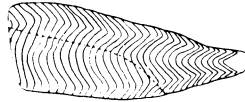

Species	Fillet	Color	Size*	Bones**	Scales	Remarks
Common Carp		Red outside Yellowish pink	A,B	Yes		Color of flesh differs from suckers, buffalo and carsuckers
Buffalo		Red outside	A,B	Yes		Scales large and roundish for these species.
Black Buffalo		Yellowish	A,B	Yes		
Largemouth Buffalo		white	A,B	Yes		
Smallmouth Buffalo			A,B	Yes		
Carp sucker		Yellowish	A,B	Yes		Usually weigh less than five lbs.
Highfin Carp sucker		white	A,B	Yes		
Quillback			A,B	Yes		
River Carp sucker			A,B	Yes		
Spotted Sucker			A,B	Yes		
Black Bullhead		Yellowish	A	No	None	Fish skinned, may be whole, fish fins may be attached, not always filleted. Dorsal fin removal may be obvious.
Brown Bullhead			A	No		
Yellow Perch		Red midline Whitish	A	No		Ribs, scales and myotomes differentiate yellow perch from walleye and sauger (ribs are twice as heavy for same length walleye).

Table 2. Identification of fish using myotomes (myomeres) 40 to 45.



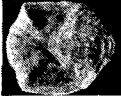




Species	Fillet	Color	Size*	Bones**	Scales	Remarks
Brown Bullhead Yellow Bullhead		Yellowish Yellowish pink	A A	No No	None	Fish skinned, may be kept without filleting
Yellow Catfish		Yellowish	A,B	No	None	Fish skinned, very large stomach muscle, can be large fish
Grass Carp		Red outside Yellowish pink	A,B	Yes		Fish long and lean, looks like a torpedo.
Redhorse			A,B	Yes		Scales large and roundish. Usually weighs under five lbs.
Black Redhorse			A,B	Yes		
Copper Redhorse			A,B	Yes		
Gray Redhorse			A,B	Yes		
Greater Redhorse		Red outside Whitish	A,B	Yes		
River Redhorse			A,B	Yes		
Shortnose Redhorse			A,B	Yes		
Silver Redhorse etc. Redhorse			A,B	Yes		
Sauger Saugeye Walleye		Red outside Whitish	A,B A,B A,B	No No No		Fish may be filleted around ribs leaving more stomach muscle.

Table 2. Identification of fish using myotomes (myomeres) 45 to 50.

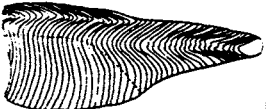






Species	Fillet	Color	Size*	Bones**	Scales	Remarks
Alewife Gizzard Shad		Red outside Whitish	A A	Yes Yes		Thin fish, not much thickness if filleted, many bones, usually forage fish.
Blue Sucker Largescale Sucker Longnose Sucker White Sucker Other Suckers		Red outside, Whitish	A,B A,B A,B A,B A,B	Yes Yes Yes Yes Yes		Usually less than five lbs., big scales, when more abundant, blue sucker was considered an excellent eating fish.
Catfish Channel Catfish Blue Catfish		Yellowish	A,B A,B	No No	None	Frequently skinned, on larger fish fat in front of dorsal fin and by adipose fin. Myotomes in front of dorsal not easy to see. Small fish may be kept as whole fish, fins not removed in many fillets, sold in stores.
Grass Pickerel		Yellowish	A	Yes		Small fish has Y- bones like northern pike

Table 2. Identification of fish using myotomes (myomeres) 50 to 55.







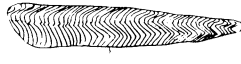
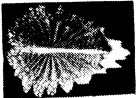


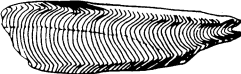

Species	Fillet	Color	Size*	Bones**	Scales	Remarks
Chain Pickerel		Red midline Yellowish	A,B	Yes		Small, thin fish, may be smoked, many bones in these fish. Scales may be present if smoked.
Goldeye Mooneye		Red outside Whitish yellow	A A	Yes Yes		
Paddlefish		Yellowish white	A	No		This fish is uncommon, collected by poaching for eggs (caviar), fish destroyed after eggs taken, red midline usually removed to improve flavor.
Shovelnose Sturgeon		Yellowish white	A	No		May be difficult to skin and some of the top muscles on back may be removed because of dorsal scales.
Brown Trout		Pinkish orange	A,B	Yes		On smaller fish, scales may not be removed.
Whitefish Lake Whitefish Mountain Whitefish		Red midline Yellowish white	A,B A	Yes Yes		Can be similar to trout except for scales and color.

Table 2. Identification of fish using myotomes (myomeres) 55 to 60.



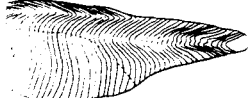

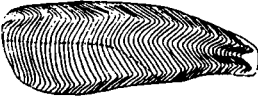

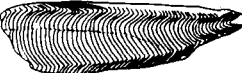



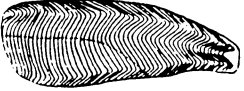




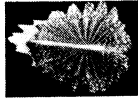





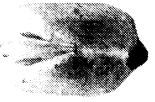
Species	Fillet	Color	Size*	Bones**	Scales	Remarks
Gar Alligator Gar Longnose Gar Spotted Gar Shortnose Gar		Whitish	A,B A,B A, A	No No No No		Difficult to remove scales, once filleted may see lines on flesh where scales were attached, on larger fish, may just keep meat above stomach cavity.
American Shad		Red outside Whitish	A,B	Yes		Thin fish, not much thickness of fillet, many bones, usually a forage fish
Salmon Arctic Char Arctic Grayling Atlantic Salmon Chinook Salmon Chum Salmon Coho Salmon Pink Salmon Sockeye Salmon Inconnu Brook Trout		Pinkish orange	A,B A,B A,B A,B A,B A,B A,B A,B A,B A,B	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes		Pinkish-orange color is diet related, sometimes hatchery fish may have lighter colored meat. Scales left on smaller fish — can aid in species identification.
Round Whitefish		Red midline Whitish	A	Yes		Troutlike (except for color). Scales, if present, can aid in identification.
Rainbow Smelt		Whitish yellow	A	Yes		Small fish, kept whole with head and entrails removed, scales left attached.



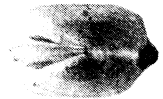
Table 2. Identification of fish using myotomes (myomeres) 60-80.

Species	Fillet	Color	Size*	Bones**	Scales	Remarks
Arctic Char Lake Trout Rainbow Trout		Pinkish orange	A,B A,B A,B	Yes Yes Yes		Smaller fish may be gutted and gills removed, scales may be left on fish making identification easier.
Bowfin		Yellowish	A,B	Yes		My fillets were very mushy (texture of baby food).
Lake Sturgeon		Yellowish	A,B	Yes		Difficult to fillet, flesh on top of fillet may be removed, large fish steaked, has notochord
Longnose Gar		Whitish	A,B	No		Difficult to remove scales, may see marks on fillet showing scale patterns.
Rainbow Smelt		Yellowish white	A	Yes		Head or entrails frequently removed, scales and vertebrae left intact.
Northern Pike Tiger Muskie Muskellunge		Yellowish	A,B A,B A,B	Yes Yes Yes		Y-bones in fillet can be removed, structure of fillet can change if Y-bones are removed.

Points To Remember About Fillets

1. Myotomes vary with fish species
2. Catfish and fish with ctenoid scales have no bones in fillet with vertebrae and ribs removed
3. The number of ribs is dependent on species (not always counted at first but can be important if left on fillet)
4. Bones (free floating bones) other than rib and vertebrae are very important for eliminating species and keying in on potential suspects
5. A large size fillet can eliminate some species
6. Width over length of fillet can eliminate some species
7. Length of stomach section removed can be important for identification
8. Lines more W shaped behind anus
9. Some fish small at head end, others larger
10. Number of myotomes behind anus can sometimes be guessed from fillet drawings or from larval fish guides
11. Heavy rib bones hard to cut through, usually filleted out
12. Big fish cut in pieces (can fit pieces together)
13. Y-bones can be filleted out of *Esox*
14. Different front end (myotomes) on northern pike family and gars (see cross-section near head on northern pike)
15. Wide band of red near skin on carp, buffalo, goldeye, suckers and redhorse
16. Bigger fish of same species have more red muscle on outside of fillet than a smaller fish
17. Sharpness of W varies with fishes
18. Fish are filleted differently by various people
19. In scaled fish (skin present), one can possibly pick up number of vertical and horizontal scales
20. Pieces cut off of head can give you odd pieces of head flesh (catfish and cheek meat on a walleye [one on each cheek])
21. Color of stomach section, if left intact, can be important — can be white, gray or black

22. To remove bones, fish sections normally kept may be eliminated and small boneless pieces kept
23. Any scales left on fish especially helpful if attached to skin
24. Myotomes not easy to see on catfish family (dorsal fin toward head)
25. Red muscle may be removed from exterior of fillet and high areas of fat removed
26. Small fish — scales or skin removed may be kept with vertebrae and ribs included
27. Fish may be filleted differently, especially if bone removal is required, ie. Y-bones in northern pike, bones along ribs in walleye and one-fourth inch cross sections across fillet in fish with free floating bones in the fillet
28. Some fish have flesh more difficult to obtain (Ganoid scales on gar can be difficult to remove and skin on whole sturgeon)
29. Heaviness of ribs, if left, can be important (can tell walleye from perch)
30. Stomach on flathead catfish can be separated from fillet (heavy piece of boneless meat)
31. Fin placement important — pectoral fin placement is important to differentiate species
32. Dorsal fin placement also important as is adipose fin
33. Don't try to match fish from fillet sizes, depending on how fish are filleted — one side can differ in length from opposite side
34. Bottom of W sometimes not seen on bottom of fish because of stomach removal
35. At tail end of some fish, lines, but W may not be obvious
36. Fish can be skinned, scaled, filleted with a knife or dipped in hot water so skin is easier to remove or methods not covered here
37. Scales sometimes present on fish fillets
38. On pieces with the vertebrae present — the fish can be fluoroscoped to view ribs and vertebrae. At University of Nebraska Dental School, we used DF 75 film, a distance of 2 feet and exposure of 1/15 or 1/30 second
39. Fins in scaled fish can help point to species involved

40. Round scales  only from cycloid fish
41. Scales  only from ctenoid fish
42. Scales  only from pike family (*Esox*)
43. Fish with unremoved red myotomes along entire surface next to skin can be pike, walleye, perch, sunfish, crappie, black bass, smallmouth bass, temperate bass
44. Small fish — like trout or smoked fish may have skin left with flesh
45. Some fish are saved for smoking, if not normally saved otherwise. Many of these fish have free floating bones in their musculature. Some of these fish are good eating
46. Fish can also be scored or canned with spices to remove bones
47. Lateral line may be present on fillets

48. Some dark lines along myotomes typical in crappie
49. Parasites (white grub, black grub) may be present in flesh, may be present in only certain species of fish
50. Sandy flesh in walleye
51. To mark fish, a chemical can be used to be fluorescent in the bone — may make some identifications exact
52. Heads cut off fish with fins attached much easier to identify
53. Some whole fish are placed in a grinder to make Vietnamese sauce. I can't identify species but scales will be present
54. Best identification is with a whole fillet, not pieces
55. The first fillet I was supposed to identify as a walleye (15 years ago) was not a walleye but after examining the fish for this study, I know it was not even a freshwater fish

A rough key covering 23 commonly caught fish species is presented in **Table 3**.

Table 3. Rough key for fish fillet identification.



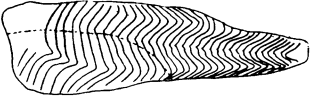
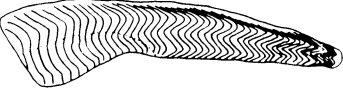

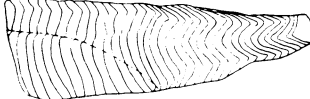


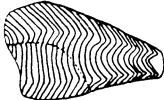

Common Names	Typical Myotomes	Fillet Shape	Flesh Color	Bones In Fillet	Scale Type	Typical Scale Shape
Bowfin	~ 60		Yellowish	Yes	Cycloid	
Bullhead	~ 40		Yellowish, yellowish pink	No	None	
Burbot	~ 55		Whitish	No	Cycloid	
Common Carp	~ 35		Red outside, yellowish pink	Yes	Cycloid	
Catfish	~ 50		Yellowish	No	None	
Crappie	~ 30		Whitish	No	Ctenoid, Cycloid	

Table 3. Rough key for fish fillet identification.

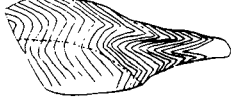





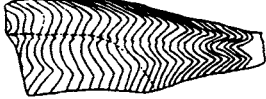





Common Names	Typical Myotomes	Fillet Shape	Flesh Color	Bones In Fillet	Scale Type	Typical Scale Shape
Freshwater Drum	~ 25		Red midline, whitish	No	Ctenoid	
Gar	~ 60		Whitish-yellow	No	Ganoid	
Goldeye	~ 55		Red outside, whitish-yellow	Yes	Cycloid	
Largemouth Bass	~ 30		Red midline, whitish-gray	No	Ctenoid, Cycloid	
Northern Pike	~ 60		Red midline, yellowish	Yes	Cycloid	
Redhorse	~ 40		Red outside, whitish	Yes	Cycloid	

Table 3. Rough key for fish fillet identification.

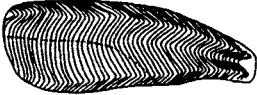

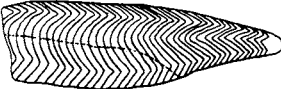


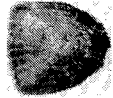












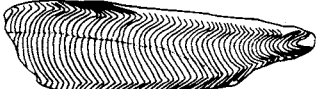



Common Names	Typical Myotomes	Fillet Shape	Flesh Color	Bones In Fillet	Scale Type	Typical Scale Shape
Salmon	~60		Pinkish-orange	Yes	Cycloid	
Sauger	> 40		Light red outside, whitish-yellow	No	Ctenoid	
Smallmouth Bass	~ 30		Red midline, whitish-gray	No	Ctenoid, Cycloid	
Sturgeon	~ 55		Yellowish-white	No	Ganoid	
Sucker	~ 45		Red outside, whitish	Yes	Cycloid	
Sunfish	~ 30		Red midline, whitish-yellow	No	Ctenoid, Cycloid	

Table 3. Rough key for fish fillet identification.

Common Names	Typical Myotomes	Fillet Shape	Flesh Color	Bones In Fillet	Scale Type	Typical Scale Shape
Trout	~ 60		Pinkish-orange	Yes	Cycloid	
Walleye	> 40		Light red outside, whitish-yellow	No	Ctenoid	
White Bass	~ 25		Red midline, pinkish-white	No	Ctenoid	
Whitefish	~ 55-60		Red midline, yellowish-white	Yes	Cycloid	
Yellow Perch	< 40		Red midline, whitish	No	Ctenoid	

SCALES

Scales are often found sticking to fillets and these can be very helpful in identifying the species from which the fillet was taken. Consideration must be given to contamination from other fish, however. Fish are commonly filleted at fish-cleaning stations where scales from many different species are present.

Scales are not uniform in size, shape or structure over the surface of a fish. Since filleting results in cuts through skin in consistent locations, certain scales are routinely dislodged. Scales displayed in this manual are from the following locations on the body of a fish (**Figure 4**).

Two types of fish scales are found in our manual, ganoid and bony-ridge. Bony-ridge scales are divided into cycloid and ctenoid scales.

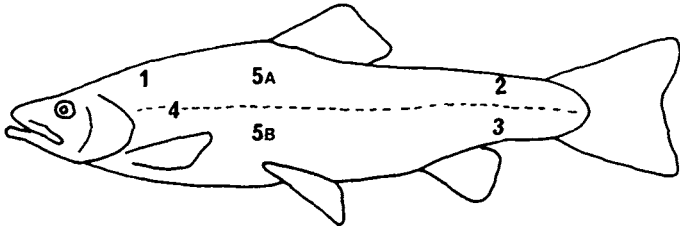


Figure 4. Locations where scales were removed.

Ganoid scales are frequently thick and diamond shaped (rhomboid). They provide the armor-like protection that is found on gar. They also occur on selected areas of sturgeon and paddlefish (not diamond shaped). Ganoid scales are sometimes referred to as scutes.

Bony-ridge scales are thin and transparent or translucent. They have ridges on their exposed surface that may resemble a human fingerprint. Ctenoid scales characteristically have rough projections resembling teeth (exposed area of scale — posterior edge). By contrast, cycloid scales are smooth. Many fish that have ctenoid scales also have a few cycloid scales (Sunfish Family, *Centrarchidae*). However, we are not familiar with fish dominated by cycloid scales that also have ctenoid scales.

Fish scale research by Seyler (1931), Takos (1942), Lagler (1947, **Figure 5**), Galkin (1958), McCully (1961), Bilton (1964) and Casteel (1972, 1973) was helpful with this project. More detailed works by DeLamater and Courtenay (1973, 1974) using electron microscopy and Emery and Strange (1984) examining scale microstructure were most useful. Unfortunately, many of these useful materials were not published in American journals (e.g. Seyler, Takos, McCully, Galkin [Russian], Emery and Strange).

Characteristic Features Of A Fish Scale

Circuli — raised markings on the surface of the scale, usually appearing as lines which more or less follow the outline of the scale.

Focus — first part of scale to appear in growth, it is often centered in the scale, can be more anterior or posterior.

Annuli — markings on the surface of the scale which coincide with years of growth for many fishes; characterized by various features of the ridges and often by a difference in deeper structure of the scale

Radii — grooves or lines, usually more or less radiating from the focus to the edge of the scale

Primary radii — radii that extend from the focus to the edge of the scale

Secondary radii — radii that do not originate at the focus

Ctenii — tooth-like structures on posterior portion of scale

Fields — quadrants on the surface of the scale, either real as shown by the angulation of the circuli at the four principal corners (forming diagonal lines) or imaginary if the corners or configuration of the circuli are missing (such as a circular type of scale)

Anterior field — unexposed part of the scale which is toward the head of the fish, bounded by imaginary lines from the front corners (or their equivalent on rounded scales) to focus

Posterior field — exposed part of the scale which is toward the tail of the fish, bounded by imaginary lines from the

back corners to focus

Lateral field — top and bottom fields remaining after marking off anterior and posterior fields

Exposed portion — that part of the outer surface of overlapped scales visible when scales are in place on a fish; may be smaller or larger than posterior field; in ctenoid scales, ctenii occur on this portion

Imbedded portion — all of scale other than exposed part, usually including most of the lateral fields and all of the anterior field, section used for aging fish

Replacement scale — a scale which has formed in the place of one lost; it lacks the pattern of radii and circuli in an area about the size of the original scale when lost

Scales taken from different parts of the same fish can vary greatly in size, shape and structure. Fish with ctenoid scales will often have cycloid scales on certain parts of the body such as the breast or belly. The scales examined for the keys in this manual were those more apt to be found in fillet cuts. The scales were taken from the top and bottom of the fish near the head and the top and bottom of the fish near the tail. The most typical scale used for aging is taken on the side of the fish between the dorsal fin and above midline (cycloid fish). Just posterior to pectoral fin and below midline (ctenoid fish).

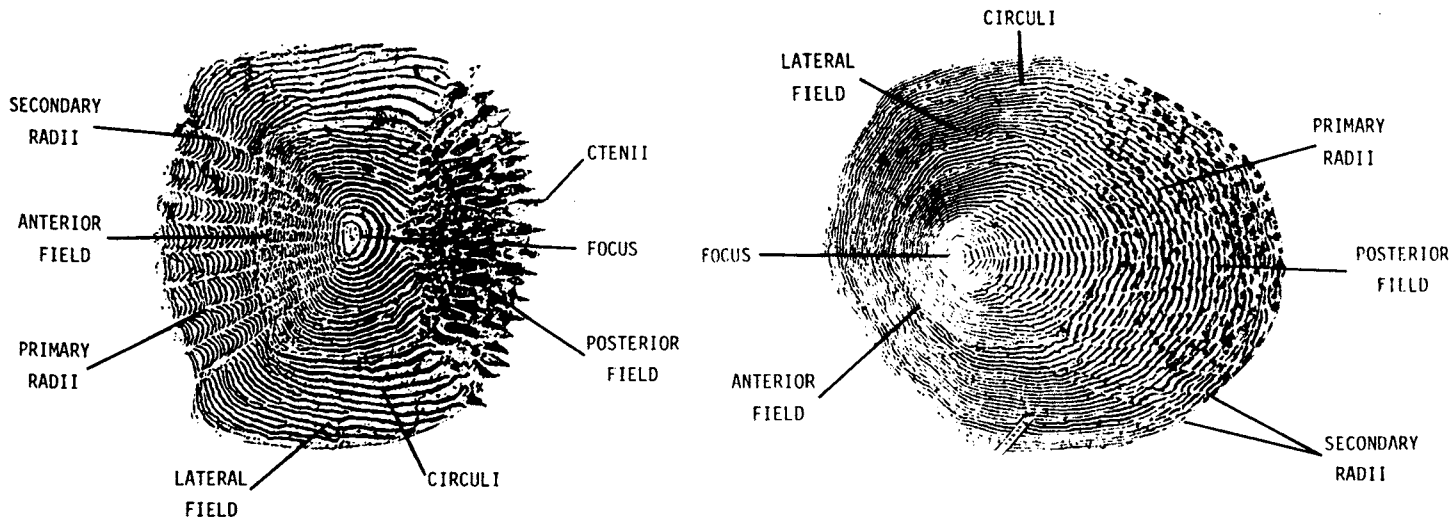


Figure 5. Character features of fish scales, Lagler, 1947.

Points To Remember About Scales

As fish vary in size so does the size of scales (the number of scales in the lateral line gives you an idea of scale size). Here are a few helpful hints to help you identify or eliminate families.

Game fish includes: Sunfish Family — pages 118-127, Temperate Bass Family — pages 112-116, Drum Family — page 133 and Perch Family — pages 128-131.

1. Fish with ctenoid scales, flatter surface on anterior end and radii toward anterior edge are game fish.



2. Fish with this shape are in the Pike Family — pages 81-85.



3. The Salmon Family have smaller scales, 100 to 200 in

lateral line. Scales are irregularly shaped ovals or rings (trout, salmon) no radii.



4. Large roundish scales with both anterior and posterior radii (30-45 scales in lateral line). Common carp or Sucker Family — pages 86-101.



5. Gar Family have squarish, rectangular ganoid scales, no radii — pages 45-49.



Several points need to be considered when examining scales; some of the features to be noted are presented in **Table 4.**

Table 4. Summary of scale characteristics of North American fishes.

	Scaleless or Apparently	Bony Scutes	Ganoid Scales		Cycloid Scales		Ctenoid Scales	Radii						
			Entire Body	Extremity of Caudal Peduncle Only	Overlapping	Non-Overlapping		Become Apparent	Anterior	Posterior	Lateral			
Sturgeon Family — <i>Acipenseridae</i>		.X												
Paddlefish Family — <i>Polyodontidae</i>	X*			X										
Gar Family — <i>Lepisosteidae</i>			X											
Bowfin Family — <i>Amiidae</i>					X									
Mooneye Family — <i>Hiodontidae</i>					X					X		X		
Herring Family — <i>Clupeidae</i>					X									X
Salmon Family — <i>Salmonidae</i>					X									
Whitefish Family — <i>Coregonidae</i>					X				X			X		
Grayling family — <i>Thymallidae</i>					X									
Smelt Family — <i>Osmeridae</i>					X									
Pike Family — <i>Esocidae</i>					X						X			
Sucker Family — <i>Catostomidae</i>					X					X		X		x
Minnnow Family — <i>Cyprinidae</i>					X					X		x		x
Catfish Family — <i>Ictaluridae</i>		.X												
Cod Family — <i>Gadidae</i>														X
Perch Family — <i>Percidae</i>								X				X		
Sunfish Family — <i>Centrarchidae</i>								X				X		
Drum Family — <i>Sciaenidae</i>								X				X		

*Some non-apparent scales are on the top front surface of caudal peduncle

X = For all species

x = For some species

TERMS USED IN FISH TABLES

Fish record weight — Fish record weight refers to the largest fish of that species on record (National Fresh Water Fishing Hall of Fame, 1992).

Typical lengths — Approximate lengths of fish typically caught, not the largest fish.

No. of ribs — Though this value was not always counted initially, it was found to be important if ribs were left in the fillet. The approximate number of ribs is presented. Fillets may have fewer ribs than mentioned because of individual filleting procedures. This may also help in identifying fillets; i.e. a fillet with 30 ribs can't belong to a fish that may only have 20.

Lateral line scales — The single row of scales that make up the lateral line.

Scale type — Scales typically found on this fish will be (a) ganoid, (b) cycloid or (c) ctenoid (most ctenoid fish examined have some cycloid scales).

Vertebrae — The literal number of vertebrae found in this fish.

Color of fillet — The flesh of fish can be different colors. This color may be due to diet or type of fish. Some have a reddish color because of red muscle next to the skin, and the rest of the flesh can be colored differently. The fillet may be red on the outside, reddish down midline or have no

obvious red present. Age of fish or injuries may affect flesh colors.

Larval myotomes — The values presented represent the number of pre-anus and post-anus myotomes (myomeres) found in larval fish for identification purposes. The line for dividing pre-anus from post-anus is a vertical line drawn upward from the anus to where it meets a myotome at the midline. This result may help separate some unknown fish from others. Primary sources of information were Auer, 1982, Hogue, 1976 and Lundberg, 1982.

****The values don't have to represent the values on a whole adult fish. As a general rule, the numbers given represent the same or smaller number found on an adult fish.**

Fish myotomes — These numbers are usually taken from literature. Numbers can vary because of genetics and/or water temperatures upon hatching and larval stage. Some of the numbers presented come from sources for identifying larval fish. The total number of myotomes was not always given but the myotomes pre-anus and post-anus were presented. Numbers taken were the minimal pre-anus and post-anus for minimal numbers and maximal was the maximal pre-anus and post-anus. The actual value is between these minimal and maximal numbers.

Fillet myotomes — Refers to the number of myotomes observed in fillet examination.

Bones In fillet. — This represents a fillet with the ribs and vertebrae removed.

Cross-sections of a fillet — Fish can be cross-sectioned across the vertebrae at head, anus and between anus and tail. A few fish were examined by this technique. Making cross-sections in the exact locations can vary. If this is done at home, use a meat slicer and a frozen fish (Appendix 1).

Fish scales — Fish scales are sometimes presented to give an idea of what fish scales from selected species represent. Twenty common fish were selected to point out what scales from filleting may resemble. Five scale samples are presented for each species. These fish are maintained at the Royal Ontario Museum, if reference is needed. A computer record is also kept for these scales.

Sturgeon Family — *Acipenseridae*

The sturgeon family has a shovel-shaped snout, an extendible mouth, large fleshy barbels located on the bottom of the head and an upturned tail. Distinguishing features are five rows of bony plates (scales or scutes) on the body (one on top, two on the midline and two on the sides of the belly). Sturgeon have a skeleton which is more cartilage than bone and a spinal notochord or supporting rod in the back of adult fish. The fish tend to be bottom feeders.

The flesh is excellent eating and their eggs are used for caviar. Unfortunately, populations have been depleted by overharvesting and the effects of pollution and habitat degradation. In specific areas in the United States, both the pallid and lake sturgeon are on the endangered species list.

Three freshwater species exist in central North America (**shovelnose sturgeon**, *Scaphirhynchus platorynchus*; **lake sturgeon**, *Acipenser fulvescens*; and **pallid sturgeon**, *Scaphirhynchus albus*). Those found on the east and west coasts are found in both marine and freshwater (**shortnose sturgeon**, *Acipenser brevirostrum*; **green sturgeon**, *Acipenser medirostris*; **Atlantic sturgeon**, *Acipenser oxyrinchus* and **white sturgeon**, *Acipenser transmontanus*).



A 60 cm (24") shovelnose sturgeon was x-rayed. At least seven cartilaginous ribs were observed. This x-ray is not presented.

Description: Large fish (steaked) • Has notochord (may be cartilage), no vertebrae • Skin removal difficult • No scales • Bony plates less obvious on large fish • Bony plates have several rows • Lateral line straight and not visible on fillet because of midline • Bony plates unique, unlike those of other fish • Five primary rows of bony plates (1) dorsal - top of back, (2) along each midline, (3) one on each outside edge of stomach • Bony plates similar to those found on shovelnose sturgeon • Bony plates posterior to anus may help identify fish • Bony plates similar to those found on shovelnose sturgeon.



**Fillet similar to
shovelnose sturgeon**

Common Names: Freshwater, Great Lakes, rock, red, stone, ruddy, common, shell back, bony smoothback, black, dogface, or rubber-nose sturgeon

Lake Sturgeon *Acipenser fulvescens*

External Characteristics

Record Weight

92 lbs. 4oz.

Typical Lengths (in.)

36-48

No. of Ribs

7+

Lateral Line Scales

28-42

Scale Type

ganoid

Fillet Characteristics

Vertebrae

notochord

Color

yellowish-white

Larval Myotomes

Pre 40-43 Post 17-22

Fish Myotomes

57-64

Fillet Myotomes

Bones in Fillet

No

Species

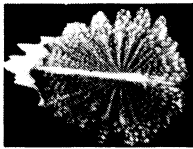
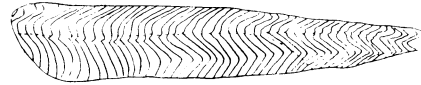
Lake Sturgeon

Shovelnose Sturgeon

Scaphirhynchus platorynchus

Common Names: Hackleback, switchtail, sand, duck-billed or flathead sturgeon

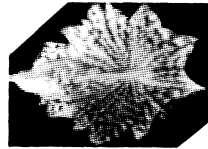
Description: Small fish • Has notochord (may be cartilage), no vertebrae • Skin removal difficult • Removal of flesh under dorsal bony plates difficult • Lateral line straight and not visible on fillet because of midline • Complete bony plates behind anus • Five primary rows of bony plates (1) dorsal - top of back, (2) along each midline (3) one on each outside edge of stomach • Bony plates.



Dorsal



Midline



Stomach

Magnification 0.5-1.5X for 50 cm (20") fish

External Characteristics

Record Weight
4 lbs. 8oz.

Typical Lengths (in.)
16-24

No. of Ribs
7+

Lateral Line Scales
41-46

Scale Type
ganoid

Fillet Characteristics

Vertebrae
notochord

Color
yellowish

Larval Myotomes
not found

Fish Myotomes
50-53

Fillet Myotomes
50-52

Bones in Fillet
No

Species
Shovelnose Sturgeon

Paddlefish Family — *Polyodontidae*

This large fish is found in the Mississippi River system. It is distinguished by an elongated snout (rostrum) which may cover one-third of its body length, large pointed gill covers, shark-like body, the absence of any scales except a few ganoid scales just preceding the top base of tail. The skeleton is cartilaginous. The fish swims through the water with its mouth open to filter out food such as plankton and crustacea. They cannot be caught on a hook and line with bait but can be snagged. Their meat is excellent, and their roe can be collected for caviar. They can be illegally obtained by gill nets — roe is collected for caviar and dead fish returned to the river. Sex is not obvious so both sexes are destroyed by egg collection activities. Refrigeration is necessary for storage of eggs. On the Missouri River, this illegal activity is a major problem.

The paddlefish family contains only one American species (*Polyodon spathula*).



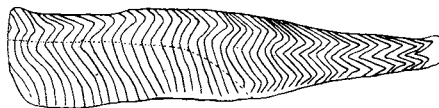
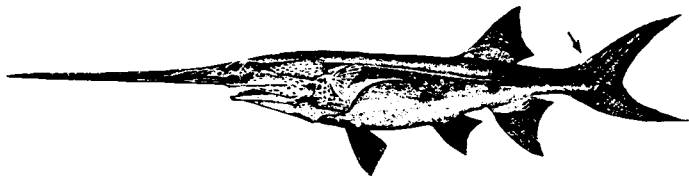
A 30 cm (12") paddlefish was x-rayed. No ribs were visible on this small fish. This x-ray is not presented.

Paddlefish

Polyodon spathula

Common Names: Spoonbill, boneless, duck-billed, shovel-billed cat or catfish, oarfish, spadefish, spatula fish or shovelfish

Description: Can be over 20 pounds • Not caught on hook and line except by snagging • Red midline usually removed from large fish • Can be cut into 1-inch chunks and deep-fat fried • Has notochord (may be cartilage), no vertebrae • Bony plate insert • Can be illegally seined and eggs kept for caviar, both males and females killed • Eggs need refrigeration • A few bony plates at top of tail.



Magnification 1-2X for 60 cm (24") fish

External Characteristics

Record Weight
142 lbs. 8oz.

Typical Lengths (In.)
24-36

No. of Ribs

Lateral Line Scales
none

Scale Type
ganoid

Fillet Characteristics

Vertebrae
notochord

Color
whitish with red midline

Larval Myotomes
Pre 31-35 Post 20-22

Fish Myotomes
51-57

Fillet Myotomes
53-57

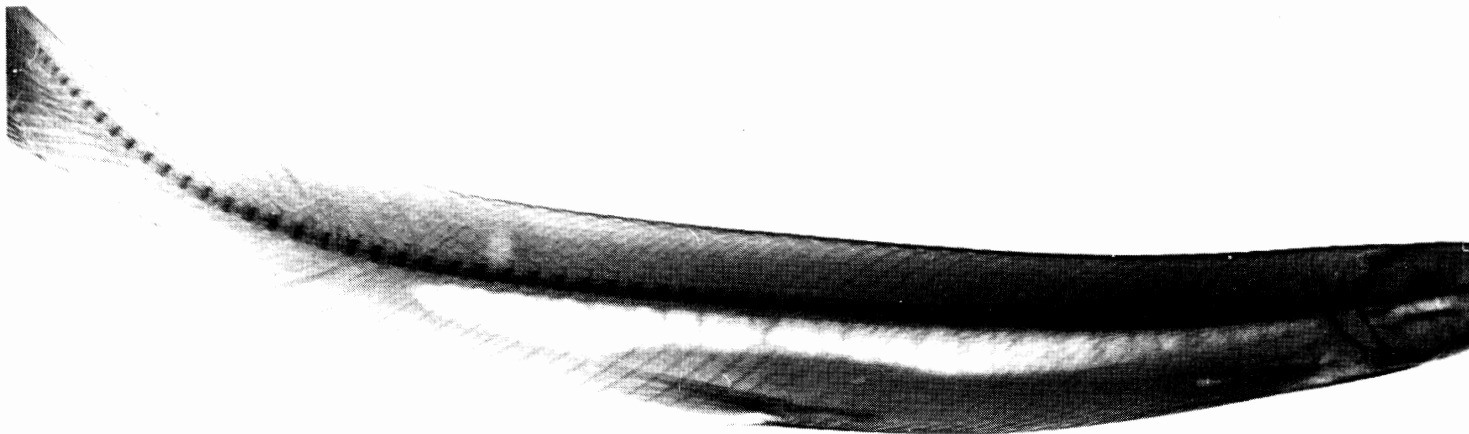
Bones in Fillet
No

Species
Paddlefish

Gar Family — *Lepisosteidae*

The gar family is a primitive species characterized by long, sharply toothed jaws, a long, cylindrically shaped body covered with non-overlapping, rectangular ganoid scales, a dorsal fin just above anal fin and rounded tail. They have a spiral valve and a lung-like gas bladder and can make use of surface air. They often suspend near the surface and feed on other fish species. Most humans don't eat gar. The meat is difficult to obtain because of the ganoid scales, but it can be very tasty.

Species in North America are **alligator gar**, *Lepisosteus spatula*; **longnose gar**, *Lepisosteus osseus*; **shortnose gar**, *Lepisosteus platostomus*; **spotted gar**, *Lepisosteus oculatus*; **Florida gar**, *Lepisosteus platyrhincus*.



Shortnose gar

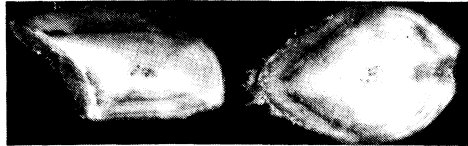
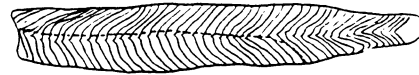
Longnose Gar

Lepisosteus osseus

Common Names: Billfish, scissorbill, northern mailed fish, bonypike, gar-pike, common gar-pike, needle-nose, billy or pin-nose gar

Description: Scale removal may be difficult — scales cut on back (tin snips, wire cutters or axe); ganoid scales can be removed with a knife • Large fish may be cut into steaks • Meat above ribs considered excellent eating • Upon removal of skin, placement of scales may be visible • Many people destroy this fish without attempting to eat it — try one to check edibility • Lateral line straight and not visible on fillet because of midline.

Scales: Ganoid plates • Diamond-like shape • Posterior and anterior margins pointed • No focus • No radii • Scales difficult to cut • A side and dorsal scale are presented below.



Side

Dorsal

Magnification 2-4X on 50 cm (20") fish

External Characteristics

Record Weight
50 lbs. 5 oz.

Typical Lengths (In.)
24-36

No. of Ribs
~ 35+

Lateral Line Scales
57-63

Scale Type
ganoid

Fillet Characteristics

Vertebrae
61-66

Color
whitish

Larval Myotomes
Pre 39-44 Post 11-16

Fish Myotomes
58-59

Fillet Myotomes
52-57

Bones in Fillet
No

Species
Longnose Gar

Description: Scale removal may be difficult — scales cut on back (tin snips, wire cutters or axe); ganoid scales can be removed with a knife • Meat above ribs considered excellent eating • Upon removal of skin — placement of scales may be visible • Many people destroy this fish without attempting to eat it — try one to check edibility • Lateral line straight and not visible on fillet because of midline • See longnose gar for example of gar scales.

Scales: Ganoid plates • Diamond-like shape • Posterior and anterior margins pointed • No focus • No radii • Very difficult to cut.



Common Names: Billy, shortbill, stubnose, billfish or duck-billed gar

Shortnose Gar *Lepisosteus platostomus*

External Characteristics

Record Weight
5 lbs.

Typical Lengths (In.)
16-24

No. of Ribs
~ 35+

Lateral Line Scales
59-65

Scale Type
ganoid

Fillet Characteristics

Vertebrae
60-64

Color
whitish

Larval Myotomes
Pre 39-44 Post 11-16

Fish Myotomes
59-62

Fillet Myotomes
52-56

Bones In Fillet
No

Species
Shortnose Gar

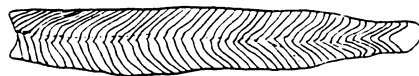
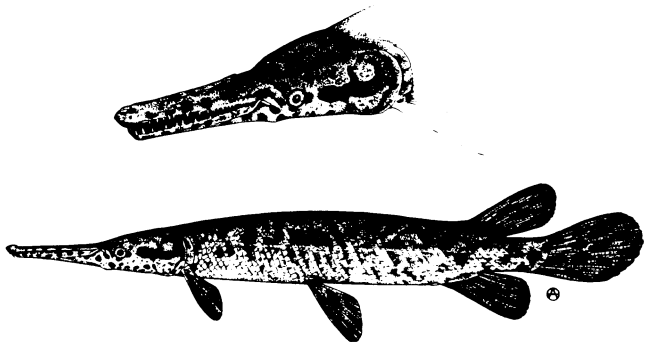
Spotted Gar

Lepisosteus oculatus

Common Names: Shortnose and short-nosed gar, billfish

Description: Scale removal may be difficult — scales cut on back (tin snips, wire cutters or axe); ganoid scales can be removed with a knife • Meat above ribs considered excellent eating • Upon removal of skin — placement of scales may be visible • Many people destroy this fish without attempting to eat it — try one to check edibility • Lateral line straight and not visible on fillet because of midline • See longnose gar for example of gar scales.

Scales: Ganoid scales • Diamond-like shape • Posterior and anterior margins pointed • No focus • No radii • Very difficult to cut.



External Characteristics

Record Weight
28 lbs. 8 oz.

Typical Lengths (in.)
18-30

No. of Ribs
~ 35+

Lateral Line Scales
53-59

Scale Type
ganoid

Fillet Characteristics

Vertebrae
58-59

Color
whitish

Larval Myotomes
Pre 39-44 Post 11-16

Fish Myotomes
58-59

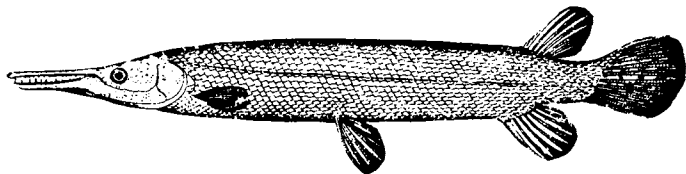
Fillet Myotomes
52-55

Bones in Fillet
No

Species
Spotted Gar

Description: Scale removal may be difficult — scales cut on back (tin snips, wire cutters or axe); ganoid scales can be removed with a knife • Large fish may be cut into steaks • Meat above ribs considered excellent eating • Upon removal of skin, placement of scales may be visible • Many people destroy this fish without attempting to eat it — try one to check edibility • Lateral line straight and not visible on fillet because of midline • See longnose gar for example of gar scales.

Scales: Ganoid scales • Diamond-like shape • Posterior and anterior margins pointed • No focus • No radii • Very difficult to cut.



Common Names: Gator, Mississippi alligator, great gar or marjauri

Alligator Gar

Lepisosteus spatula

External Characteristics

Record Weight
279 lbs.

Typical Lengths (In.)

No. of Ribs
~ < 35

Lateral Line Scales
60

Scale Type
ganoid

Fillet Characteristics

Vertebrae

Color
whitish

Larval Myotomes
Pre 39-44 Post 11-16

Fish Myotomes
55-59

Fillet Myotomes
52-55

Bones in Fillet
No

Species
Alligator Gar

Bowfin Family — *Amiidae*

This archaic, predatory fish is characterized by a rounded semi-cartilaginous skull, a bony plate under the throat, a cartilaginous skeleton, a long ribbon-like dorsal spine, and a gill-breathing air bladder so it may make use of low oxygen concentrations by “breathing” surface air. They have a circular tail and the male has an eye spot at the base of the caudal fin.

They feed on small animals, especially fish. To most people, the meat is not very palatable. I couldn't fillet a fish for drawings unless it was frozen; the meat was as soft as baby food and fell apart on frozen specimens.

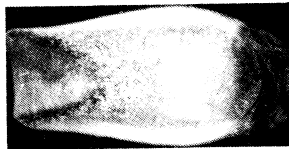
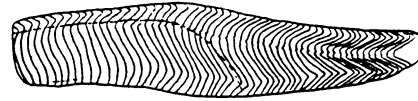
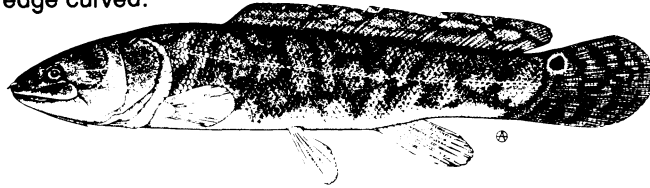
Species found in North America is the **bowfin**, *Amia calva*.



Bowfin

Description: Dorsal bones above vertebrae split • Vertebral bones jointed behind anus • To obtain good sample for drawing myotomes, fish was skinned frozen because myotomes were very soft (almost like baby food) • Lateral line straight and not visible on fillet because of midline • Scales unique, the height is much less than length.

Scales: Average to large • Anterior edge almost squared • Anterior edge and lateral sides straight • Focus definitely posterior • No radii • Circuli run horizontal — no curving on anterior or posterior margins • Posterior edge curved.



5A

Magnification 3-4X for 50 cm (20") fish

Common Names: Dogfish, freshwater dogfish, mudfish, shoepike, western mudfish, cottonfish, blackfish, John A. Grindle, grindle, grinnel, speckled cat, scaley cat, beaverfish, lawyer scaled ling, cypress trout, blackfish or choupique, German bass or brindle fish

Bowfin *Amia calva*

External Characteristics

Record Weight

21 lbs. 8 oz.

Typical Lengths (In.)

18-24

No. of Ribs

~ 35

Lateral Line Scales

62-70

Scale Type

cycloid

Fillet Characteristics

Vertebrae

80-90

Color

yellowish

Larval Myotomes

not found

Fish Myotomes

59-60

Fillet Myotomes

53-58

Bones in Fillet

No

Species

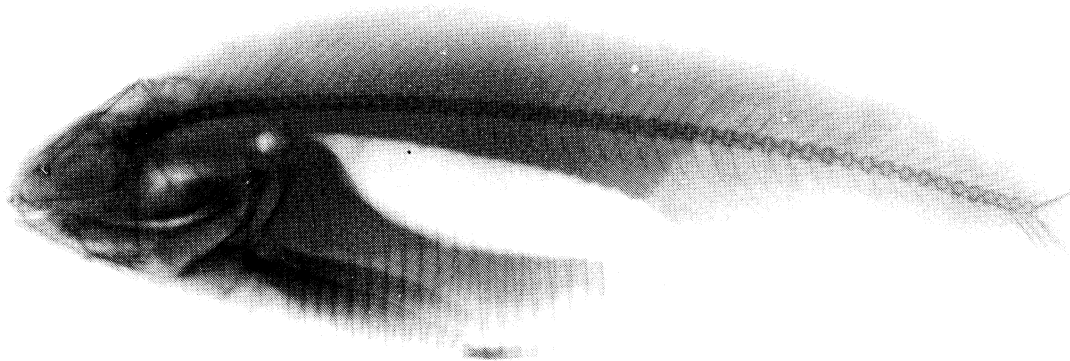
Bowfin

Herring Family — *Clupeidae*

The herring family are smallish, thin fishes with silvery scales and large eyes. They may have spots on the side of their bodies; their scales are sharply pointed and have a very prominent sawtooth edge on the midline of the belly. They feed on small animal life, but some feed on plankton and crustacea. Although their flesh is edible, most of this species are forage fish for larger predators. Some of these species may experience heavy mortality when long periods of ice cover cause winter die-offs.

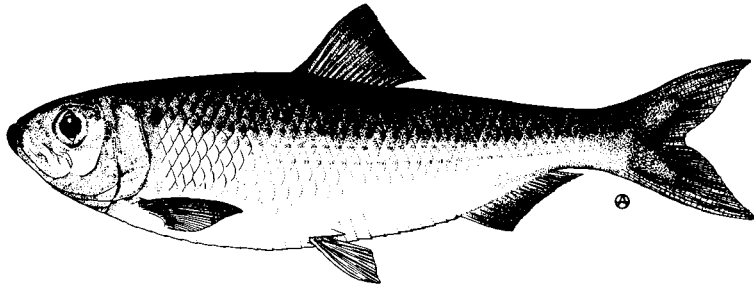
Several species of *menhaden* occasionally enter into the mouths of streams bordering oceans. They are similar to the American shad but have fluted scales. They are not covered in this manual.

Species in this family are: **Alabama shad**, *Alosa alabamae*; **alewife**, *Alosa pseudoharengus*; **American shad**, *Alosa sapidissima*; **blueback herring**, *Alosa aestivalis*; **gizzard shad**, *Dorosoma cepedianum*; **hickory shad**, *Alosa mediocris*; **skipjack herring**, *Alosa chrysochloris*; and **threadfin shad**, *Dorosoma petenense*.



Gizzard shad

Description: Small fish • Fish narrow bodied, can be smoked • Normally a forage fish, seldom eaten by humans • Lateral line straight and not visible on fillet because of midline • Inability to adapt to fluctuating water temperatures causes die-offs of alewife, American shad and gizzard shad • See gizzard shad for example of herring family scales.



Fillet similar to gizzard shad

Common Names: Mulhaden, golden or green shad, gray, blear-eyed, spring, branch, wall-eyed, big-eyed, glut herring, seth, skipjack, bang, racer kyak, kiack, ellwife, sawbelly or grayback

Alewife

Alosa pseudoharengus

External Characteristics

Record Weight

Typical Lengths (in.)
10-14

No. of Ribs
~< 30

Lateral Line Scales
42-52

Scale Type
cycloid

Fillet Characteristics

Vertebrae
46-50

Color
whitish, red outside

Larval Myotomes
Pre 33-42 Post 9-14

Fish Myotomes
44-49

Fillet Myotomes

Bones in Fillet
Yes

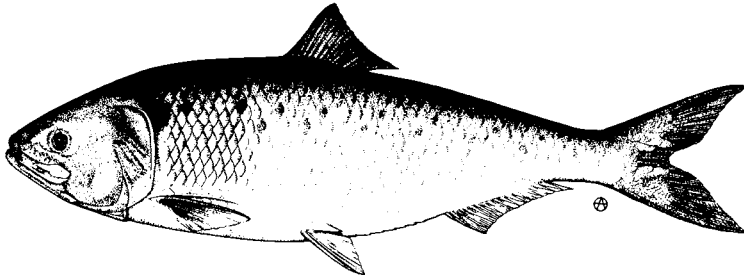
Species
Alewife

American Shad

Alosa sapidissima

Common Names: Common, Atlantic, North River, Potomac, Connecticut, Delaware, Susquehanna or white shad, shad and alose

Description: Small fish • Fish narrow bodied, can be smoked • Normally a forage fish, seldom eaten by humans • Lateral line straight and not visible on fillet because of midline • Inability to adapt to fluctuating water temperatures causes die-offs of alewife, American shad and gizzard shad • May be caught for roe.



**Fillet similar to
gizzard shad**

External Characteristics

Record Weight

11 lbs. 4 oz.

Typical Lengths (in.)

12-18

No. of Ribs

~< 30

Lateral Line Scales

50-55

Scale Type

cycloid

Fillet Characteristics

Vertebrae

51-60

Color

whitish, red outside

Larval Myotomes

not found

Fish Myotomes

55-57

Fillet Myotomes

Bones in Fillet

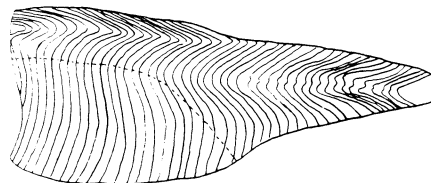
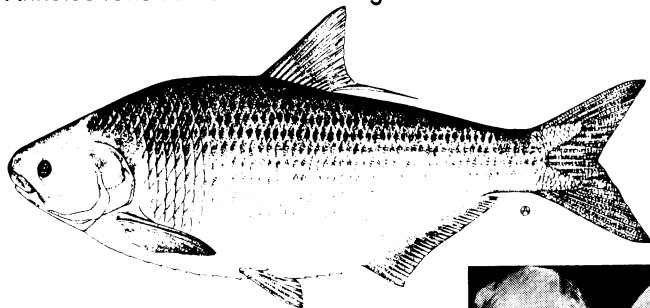
Yes

Species

American Shad

Description: Small fish • Fish narrow bodied, can be smoked • Normally a forage fish, seldom eaten by humans • Lateral line straight and not visible on fillet because of midline • Inability to adapt to fluctuating water temperatures causes die-offs of alewife, American shad and gizzard shad.

Scales: Average to large • Roundish • Focus definitely posterior • No radii • Circuli only in anterior field • Annulus runs vertical • Poster edge ~1/4 of scale.



Magnification 2-3X for 25 cm (10") fish.

5A

Common Names: Hickory, nanny shad, hairyback, golden eyes, slicks, silver crappie, slime-ball, skipjack, jackshad, mud, lake, eastern gizzard or stink shad, shad, sawbelly or flatfish

Gizzard Shad

Dorosoma cepedianum

External Characteristics

Record Weight

4 lbs. 5 oz.

Typical Lengths (In.)

8-12

No. of Ribs

< 25

Lateral Line Scales

52-70

Scale Type

cycloid

Fillet Characteristics

Vertebrae

47-51

Color

whitish, red outside

Larval Myotomes

not found

Fish Myotomes

45-51

Fillet Myotomes

47-49

Bones in Fillet

Yes

Species

Gizzard Shad

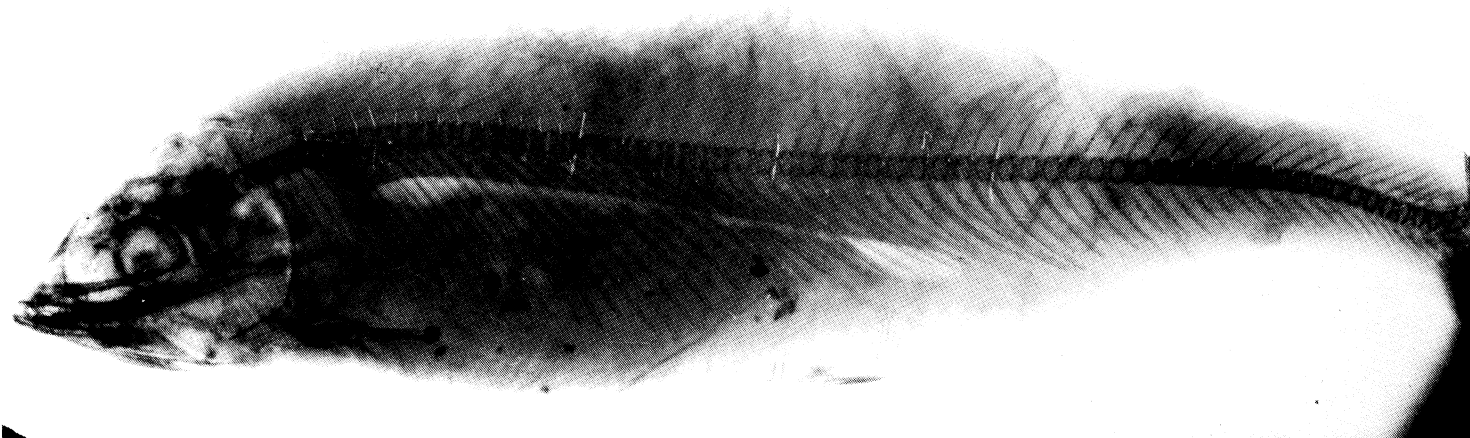
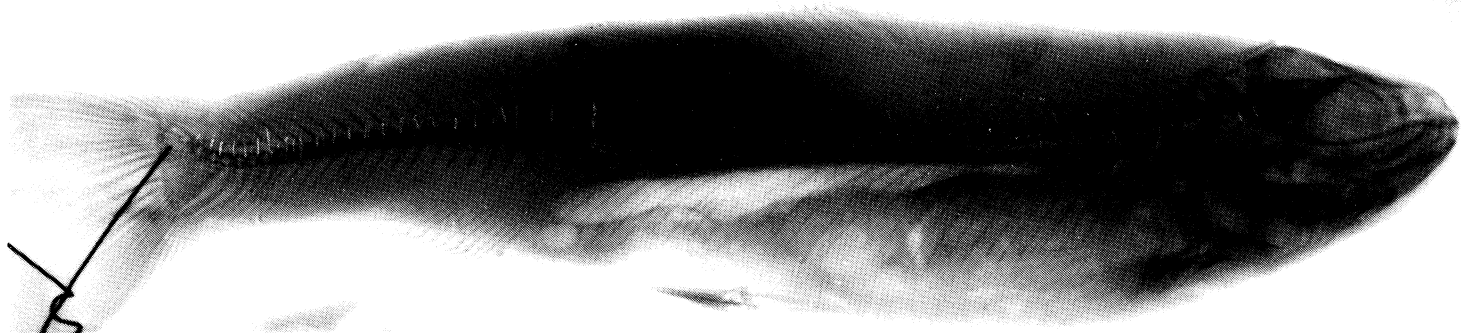
Salmon Family — *Salmonidae*

The salmon family includes salmon, trout, char and whitefish. Some species may be marine or freshwater, and several are being stocked in freshwater sites (not all covered on map). The salmon, trout and char members of this family possess more than 100 scales in the lateral line, and the mouth is strong, large and well-toothed. Whitefish and grayling possess less than 100 scales in the lateral line, and their mouth is weak and has few or no teeth. All salmonids have an adipose fin and an axillary process at the base of each pelvic fin. They require cold, well-oxygenated water. They are primarily insect eaters but are also fish eaters, especially the larger fish.

They are considered by many to be excellent eating fish. The salmon and trout frequently have an orangish or pinkish colored flesh.

Species found in North America are **broad whitefish**, *Coregonus nasus*; **lake whitefish**, *Coregonus clupeaformis*; **Alaska whitefish**, *Coregonus nelsoni*; **humpback whitefish**, *Coregonus pidschian*; **Atlantic whitefish**, *Coregonus huntsmani*; **clisco or lake herring**, *Coregonus artedii*; **least clisco**, *Coregonus sardinella*; **Arctic clisco**, *Coregonus autumnalis*; **shortjaw clisco**, *Coregonus zenithicus*; **blackfin clisco**, *Coregonus nigripinnis*; **klyl**, *Coregonus kiyi*; **bloater**, *Coregonus hoyi*; **Inconnu**, *Stenodus leucichthys*; **Bonneville clisco**, *Prosopium gemmiferum*; **pygmy whitefish**, *Prosopium coulteri*; **Bear Lake whitefish**, *Prosopium abyssicola*; **Bonneville whitefish**, *Prosopium spilonotus*; **mountain whitefish**, *Prosopium williamsoni*; **round whitefish**, *Prosopium cylindraceum*; **Arctic grayling**, *Thymallus arcticus*; **lake trout**, *Salvelinus namaycush*; **brook trout**, *Salvelinus fontinalis*; **Arctic char**, *Salvelinus alpinus*; **Dolly Varden**, *Salvelinus malma*; **bull trout**, *Salvelinus confluentus*; **Angayukaksurak char**, *Salvelinus anaktuvukensis*; **Atlantic salmon**, *Salmo salar*; **brown trout**, *Salmo trutta*; **sockeye or red salmon**, *Oncorhynchus nerka*; **chum salmon**, *Oncorhynchus keta*; **chinook or king salmon**, *Oncorhynchus tshawytscha*; **coho or silver salmon**, *Oncorhynchus kisutch*; **pink salmon**, *Oncorhynchus gorbuscha*; **cutthroat trout**, *Oncorhynchus clarki*; **gila trout**, *Oncorhynchus gilae*; **Apache trout**, *Oncorhynchus apache*; **rainbow trout or steelhead**, *Oncorhynchus mykiss*; **golden trout**, *Oncorhynchus aguabonita*. *Prosopium williamsoni*; **round whitefish**, *Prosopium cylindraceum*; **Arctic grayling**, *Thymallus arcticus*; **lake trout**, *Salvelinus namaycush*; **brook trout**, *Salvelinus fontinalis*; **Arctic char**, *Salvelinus alpinus*; **Dolly Varden**, *Salvelinus malma*; **bull trout**, *Salvelinus confluentus*; **Angayukaksurak char**, *Salvelinus anaktuvukensis*; **Atlantic salmon**, *Salmo salar*; **brown trout**, *Salmo trutta*; **sockeye or red salmon**, *Oncorhynchus nerka*; **chum salmon**, *Oncorhynchus keta*; **chinook or king salmon**, *Oncorhynchus tshawytscha*; **coho or silver salmon**, *Oncorhynchus kisutch*; **pink salmon**, *Oncorhynchus gorbuscha*; **cutthroat trout**, *Oncorhynchus clarki*; **gila trout**, *Oncorhynchus gilae*; **Apache trout**, *Oncorhynchus apache*; **rainbow trout or steelhead**, *Oncorhynchus mykiss*; **golden trout**, *Oncorhynchus aguabonita*.





Rainbow trout

Sockeye salmon

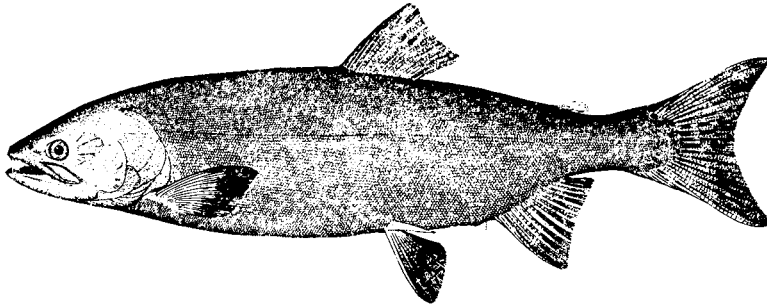
Pink Salmon

Oncorhynchus gorbuscha

Common Names: Fall, humpback salmon or pink humpback

Description: Color of trout and salmon diet-related — normally pinkish-orange, but can be whitish to orange-red • Some fish may be kept whole (scales attached without gills and intestines) • Larger fish can be steaked, cut for smoking • Lateral line straight and not visible on fillet because of midline • See sockeye salmon for example of salmon scales.

Scales: Small • Longer than wide • Small central focus • No radii.



Fillet similar
to trout

External Characteristics

Record Weight
12 lbs. 9 oz.

Typical Lengths (in.)
16-22

No. of Ribs
< 30

Lateral Line Scales
147-205

Scale Type
cycloid

Fillet Characteristics

Vertebrae
63-72

Color
pink-orange

Larval Myotomes
not found

Fish Myotomes

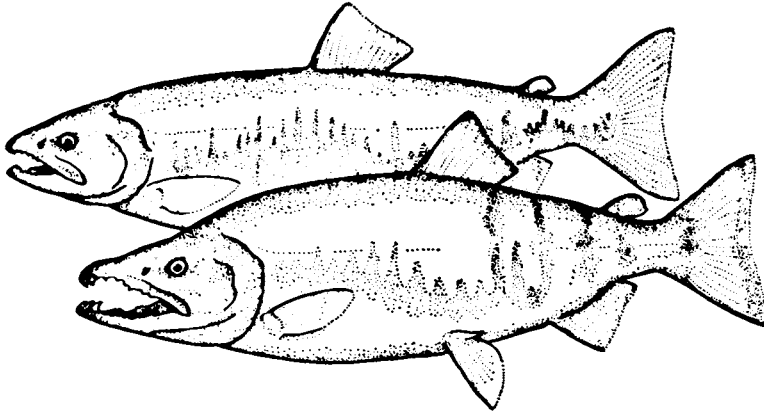
Fillet Myotomes

Bones in Fillet
Yes

Species
Pink Salmon

Description: Fillets of salmon and trout can be different colors due to diet • Skin sometimes left on fish • Large fish may be steaked or smoked • Lateral line straight and not visible on fillet because of midline • Bilton et al., 1964, identified salmon scales to species. See sockeye salmon for example of salmon scales.

Scales: Small • Longer than wide • Small central focus • No radii.



Fillet similar
to trout

Common Names: Fall, autumn or dog salmon, chum or keta

Chum Salmon *Oncorhynchus keta*

External Characteristics

Record Weight:
24 lbs. 4 oz.

Typical Lengths (In.)
18-24

No. of Ribs
~< 30

Lateral Line Scales
124-153

Scale Type
cycloid

Fillet Characteristics

Vertebrae
59-71

Color
pink-orange

Larval Myotomes
not found

Fish Myotomes

Fillet Myotomes

Bones In Fillet
Yes

Species
Chum Salmon

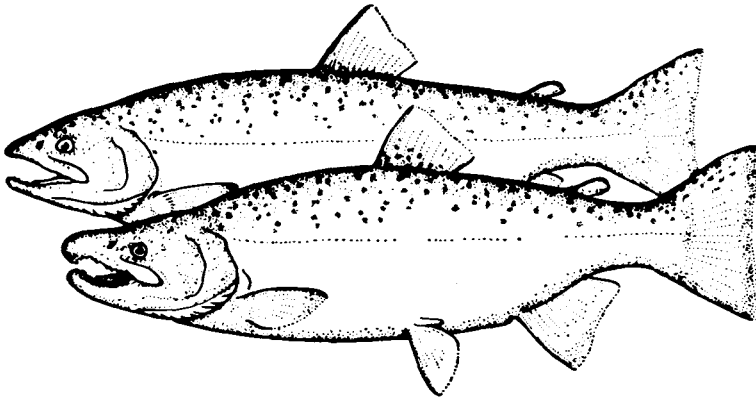
Coho Salmon

Oncorhynchus kisutch

Common Names: Medium red or silver salmon, coho, blueback, sea trout, hooknose or silver sides

Description: Fillets of salmon and trout can be different colors due to diet • Skin sometimes left on fish • Large fish may be steaked or smoked • Lateral line straight and not visible on fillet because of midline • Bilton et al., 1964, identified salmon scales to species • See sockeye salmon for example of salmon scales.

Scales: Small • Longer than wide • Small central focus • No radii.



Fillet similar
to trout

External Characteristics

Record Weight
33 lbs. 4 oz.

Typical Lengths (in.)
18-24

No. of Ribs
< 30

Lateral Line Scales
121-148

Scale Type
cycloid

Fillet Characteristics

Vertebrae
61-69

Color
pink-orange

Larval Myotomes
not found

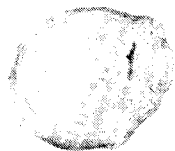
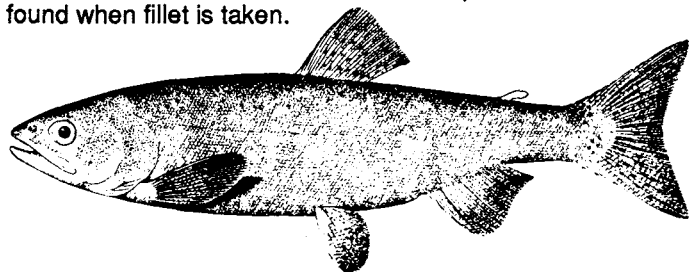
Fish Myotomes

Fillet Myotomes

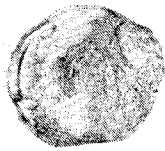
Bones In Fillet
Yes

Species
Coho Salmon

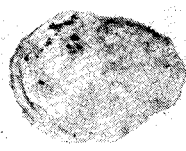
Description: Fillets of salmon and trout can be different colors due to diet • Skin sometimes left on fish • Large fish may be steaked or smoked • Lateral line straight and not visible on fillet because of midline • Bilton et al., 1964, identified salmon scales to species • Scales: five scales depicted which could represent those found when fillet is taken.



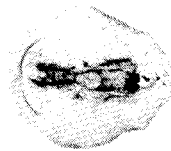
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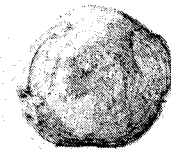
2



3



4



5A

Length 201mm • Royal Ontario Museum (ROM) #24989 • Magnification 10-16X

Common Names: Kickininee, little redfish, silver trout, yank, land-locked sockeye, Kennerly's salmon or trout, red or blueback salmon

Kokanee or Sockeye Salmon *Oncorhynchus nerka*

External Characteristics

Record Weight

9 lbs. 6 oz.

Typical Lengths (In.)

16-22

No. of Ribs

~ 35

Lateral Line Scales

120-150

Scale Type

cycloid

Fillet Characteristics

Vertebrae

56-67

Color

pink-orange

Larval Myotomes

not found

Fish Myotomes

Fillet Myotomes

Bones in Fillet

Yes

Species

**Kokanee or
Sockeye Salmon**

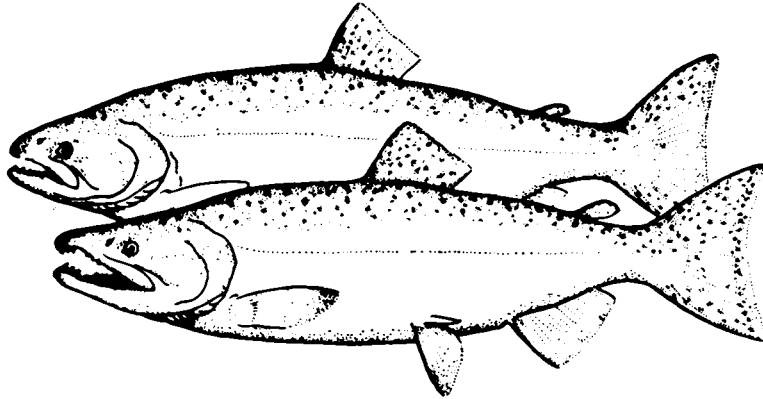
Chinook Salmon

Oncorhynchus tshawytscha

Common Names: Spring or king salmon, tyee, spring chinook, king quinnat or blackmouth

Description: Fillets of salmon and trout can be different colors due to diet • Skin sometimes left on fish • Large fish may be steaked or smoked • Lateral line straight and not visible on fillet because of midline • Bilton et al., 1964, identified salmon scales to species • See sockeye salmon for example of salmon scales.

Scales: Small • Longer than wide • Small central focus • No radii.



**Fillet similar
to trout**

External Characteristics

Record Weight

44 lbs. 9 oz.

Typical Lengths (in.)

20-30

No. of Ribs

~< 39

Lateral Line Scales

130-165

Scale Type

cycloid

Fillet Characteristics

Vertebrae

67-75

Color

pink-orange

Larval Myotomes

not found

Fish Myotomes

63-69

Fillet Myotomes

Bones in Fillet

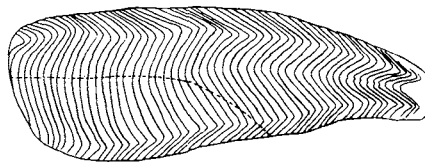
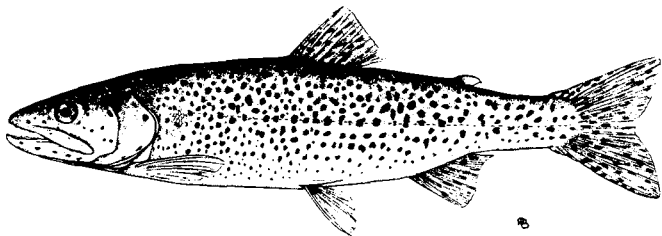
Yes

Species

Chinook Salmon

Description: Trout, char and salmon fillets differ in color based on diet • Small fish frequently kept whole (gills and viscera may be removed, skin may be left on fish) • Larger fish may have skin removed, cut in pieces • Trout filleted with only tail section kept, remainder discarded because of bones • Lateral line straight and not visible on fillet because of midline • See rainbow trout for example of trout scales.

Scales: Small • Longer than wide • Central small focus • No radii • Circuli normally unbroken concentric circles.



Common Names: Red-throated, Clarks Lake, sea, short-tailed, blackspotted, native mountain, lake, brook or harvest trout, coastal Yellowstone, Snake River, Lakotan, Rio Grande, Colorado, Utah or Piute cutthroat

Cutthroat Trout

Oncorhynchus clarki

External Characteristics

Record Weight

41 lbs.

Typical Lengths (In.)

12-15

No. of Ribs

~ < 30

Lateral Line Scales

120-180

Scale Type

cycloid

Fillet Characteristics

Vertebrae

60-64

Color

pink-orange

Larval Myotomes

Pre ~ 40 Post ~ 20

Fish Myotomes

55-58

Fillet Myotomes

Bones in Fillet

Yes

Species

Cutthroat Trout

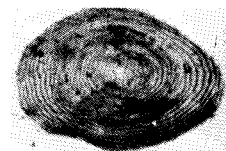
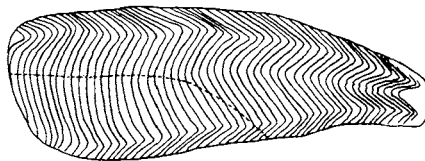
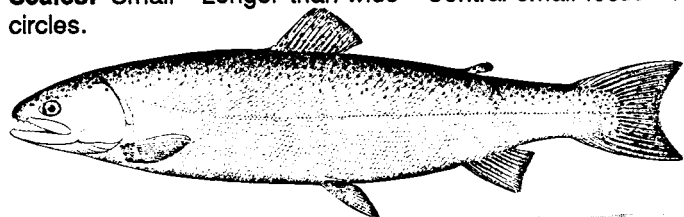
Rainbow or Kamloops Trout Steelhead Trout

Oncorhynchus mykiss

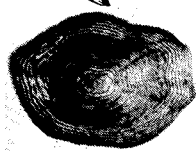
Common Names: Shasta, Kern River, Nelson, Whitney, Eagle Lake, San Gorgonio silver or salmon trout, steelhead, redbside, California trout, coastal rainbow and hardhead or redband

Description: Trout, char and salmon fillets differ in color based upon diet • Small fish frequently kept whole (gills and viscera may be removed, skin may be left on fish) • Larger fish may have skin removed, cut in pieces • Trout filleted with only tail section kept, remainder discarded because of bones • Lateral line straight and not visible on fillet because of midline:

Scales: Small • Longer than wide • Central small focus • No radii • Circuli normally unbroken concentric circles.



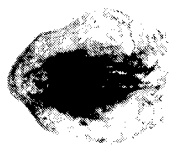
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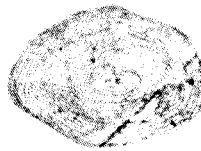
2



3



4



5A

Length 215mm • ROM #03561 • Magnification 12-24X

External Characteristics

Record Weight
42 lbs. 3 oz.

Typical Lengths (In.)
12-18

No. of Ribs
< 32

Lateral Line Scales
100-160

Scale Type
cycloid

Fillet Characteristics

Vertebrae
60-66

Color
pink-orange

Larval Myotomes
Pre 38-40 Post 18-20

Fish Myotomes
59-63

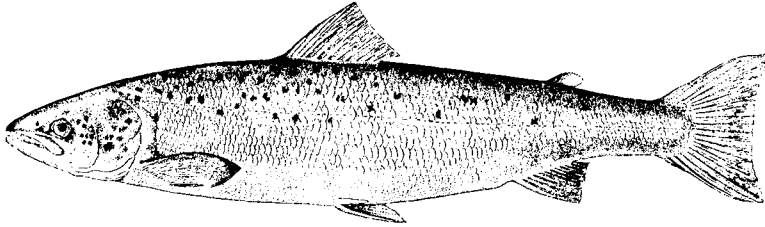
Fillet Myotomes
56-60

Bones in Fillet
Yes

Species
Rainbow or
Kamloops Trout

Description: Fillets of salmon and trout can differ in color due to diet • Skin sometimes left on fish • Large fish may be steaked or smoked • Lateral line straight and not visible on fillet because of midline • See sockeye salmon for example of salmon scales.

Scales: Small • Longer than wide • Small central focus • No radii.



**Fillet similar
to trout**

Common Names: Lake Atlantic, Kennebec, landlocked, Sebago, black salmon Sebago, grilse, kelt, grayling, slink, gilt, fiddler, smolt, pan, saumon or bratan

Atlantic Salmon *Salmo salar*

External Characteristics

Record Weight

22 lbs. 11 oz.

Typical Lengths (In.)

16-24

No. of Ribs

~ 32

Lateral Line Scales

109-121

Scale Type

cycloid

Fillet Characteristics

Vertebrae

58-61

Color

pink-orange

Larval Myotomes

not found

Fish Myotomes

59-60

Fillet Myotomes

58-59

Bones in Fillet

Yes

Species

Atlantic Salmon

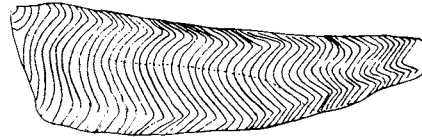
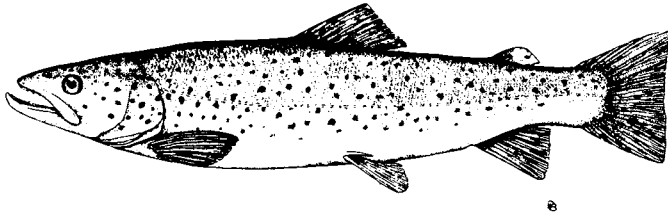
Brown Trout

Salmo trutta

Common Names: German, English sea, lake, brook, river, bull Von Behr, Lochleven, Loch Leven, European brown or liberty trout, brownie or gealag

Description: Trout, char and salmon fillets differ in color based on diet • Small fish frequently kept whole (gill and viscera may be removed, skin may be left on fish) • Larger fish may have skin removed, cut in pieces • Trout filleted with only tail section kept, remainder discarded because of bones • Lateral line straight and not visible on fillet because of midline • See rainbow trout for example of trout scales.

Scales: Small • Longer than wide • Small central focus • No radii • Circuli normally unbroken concentric circles.



External Characteristics

Record Weight
38 lbs. 9 oz.

Typical Lengths (in.)
12-22

No. of Ribs
~ 30

Lateral Line Scales
115-150

Scale Type
cycloid

Fillet Characteristics

Vertebrae
56-61

Color
pink-orange

Larval Myotomes
Pre 35-37 Post 17-19

Fish Myotomes
52-59

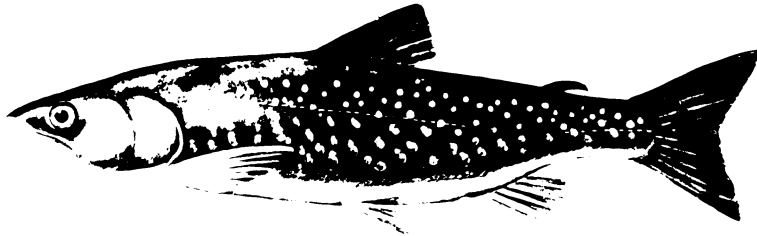
Fillet Myotomes
53-57

Bones in Fillet
Yes

Species
Brown Trout

Description: Trout, char and salmon fillets differ in color based on diet • Small fish frequently kept whole (gill and viscera may be removed, skin may be left on fish) • Larger fish may have skin removed, cut in pieces • Trout filleted with only tail section kept, remainder discarded because of bones • Lateral line straight and not visible on fillet because of midline • See rainbow trout for example of trout scales.

Scales: Small • Longer than wide • Small central focus • No radii.



Fillet similar
to trout

Common Names: Blueback, alpine, European or Greenland char, Hearne's, Hudson Bay or Copper-mine River salmon, sea, Sunapee, golden or Québec Red trout

Arctic Char *Salvelinus alpinus*

External Characteristics

Record Weight
32 lbs. 9 oz.

Typical Lengths (in.)
15-18

No. of Ribs
~ 30

Lateral Line Scales
123-152

Scale Type
cycloid

Fillet Characteristics

Vertebrae
60-71

Color
pink-orange

Larval Myotomes
not found

Fish Myotomes

Fillet Myotomes

Bones in Fillet
Yes

Species
Arctic Char

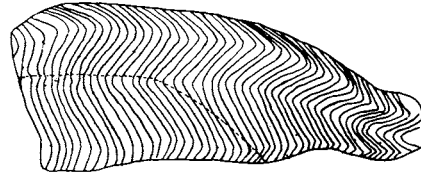
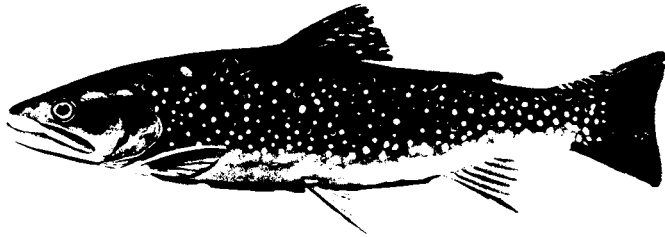
Brook Trout

Salvelinus fontinalis

Common Names: Eastern brook, spotted, speckled, aurora, sea, common brook, mud, eastern speckled, native, mountain or squaretailed trout, square-tail or speckled char, coaster, breac, whitefin, brookie or salter

Description: Trout, char and salmon fillets differ in color based upon diet • Small fish frequently kept whole (gill and viscera may be removed, skin may be left on fish) • Larger fish may have skin removed, cut in pieces • Trout filleted with only tail section kept, remainder discarded because of bones • Lateral line straight and not visible on fillet because of midline • See rainbow trout for example of trout scales.

Scales: Small • Longer than wide • Small central focus • No radii • Circuli normally unbroken concentric circles.



External Characteristics

Record Weight
14 lbs. 8 oz.

Typical Lengths (in.)
10-14

No. of Ribs
~ 34

Lateral Line Scales
110-130

Scale Type
cycloid

Fillet Characteristics

Vertebrae
55-62

Color
pink-orange

Larval Myotomes
Pre 33-35 Post 19-20

Fish Myotomes
50-56

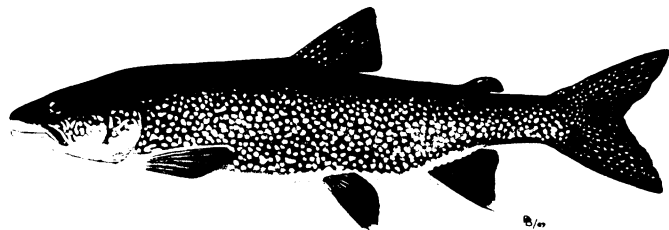
Fillet Myotomes
55-57

Bones in Fillet
Yes

Species
Brook Trout

Description: Trout, char and salmon fillets differ in color based upon diet • Small fish frequently kept whole (gill and viscera may be removed, skin may be left on fish) • Larger fish may have skin removed, cut in pieces • Trout filleted with only tail section kept, remainder discarded because of bones • Lateral line straight and not visible on fillet because of midline • See rainbow trout for example of trout scales.

Scales Small • Longer than wide • • Small central focus • No radii • Circuli normally unbroken concentric circles.



Fillet similar
to trout

Common Names: Great Lakes, lean, fat, bank, mackinaw, salmon, grey, great grey or mountain trout, laker, namaycush, nasamacush, toque, taque, landlocked salmon, Great Lakes char, tongue, paperbelly, siscowet or humper

Lake Trout

Salvelinus namaycush

External Characteristics

Record Weight
65 lbs.

Typical Lengths (in.)
15-20

No. of Ribs
< 30

Lateral Line Scales
116-138

Scale Type
cycloid

Fillet Characteristics

Vertebrae
61-69

Color
pink-orange

Larval Myotomes
Pre 37-40 Post 17-20

Fish Myotomes
63-65

Fillet Myotomes
59-61

Bones in Fillet
Yes

Species
Lake Trout

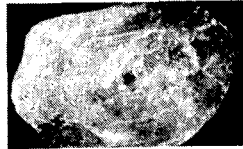
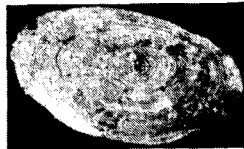
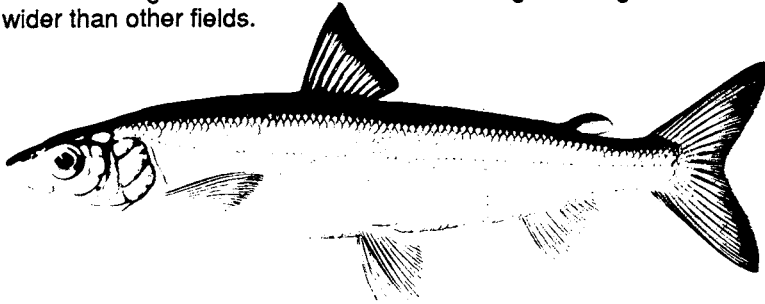
Cisco Lake Herring

Coregonus artedii

Common Names: Freshwater, Bear Lake or sand herring, tullibee, grayback, blueback, shallowwater or common cisco, herring-salmon or cisco

Description: Smaller fish • May be kept whole, used for smoking • Fish retained for smoking may be scaled • Lateral line straight and not visible on fillet because of midline • Typical scale used for aging fish shown for herring.

Scales: Longer than wide • Rounded with irregular margin • Central focus • No radii • Circuli in posterior field wider than other fields.



Magnification 5-6X for 35 cm (14") fish

External Characteristics

Record Weight

7 lbs. 4 oz.

Typical Lengths (In.)

8-12

No. of Ribs

~ 36

Lateral Line Scales

63-105

Scale Type

cycloid

Fillet Characteristics

Vertebrae

50-63

Color

white

red midline

Larval Myotomes

Pre 33-44 Post 9-13

Fish Myotomes

46-56

Fillet Myotomes

50-53

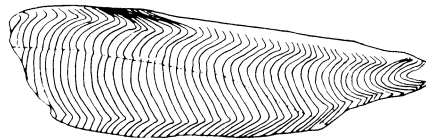
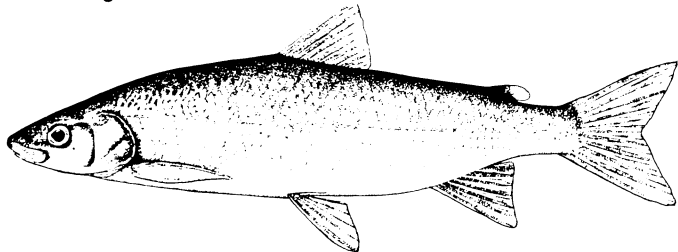
Bones in Fillet

Yes

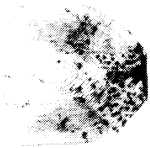
Species

Cisco Lake Herring

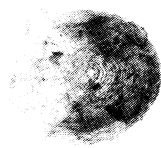
Description: Color of fish, number of myotomes should help to identify • Myotomes for larval fish inconsistent with adult fillets • We found from 53-59 myotomes per fillet • We guess that whitefish should possess <55 myotomes • Color, size and scales located should eliminate trout, salmon, goldeye, gar and sturgeon • Lateral line straight and not visible on fillet because of midline.



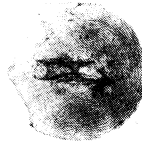
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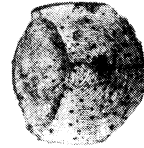
2



3



4



5A

Length 165mm • ROM #04276 • Magnification 6-8X

Common Names: Common, Sault, humpback, high back, bow back, buffalo back, eastern Great Lakes or inland whitefish or gizzard fish

Lake Whitefish

Coregonus clupeaformis

External Characteristics

Record Weight

14 lbs. 6 oz.

Typical Lengths (in.)

12-18

No. of Ribs

~ 38

Lateral Line Scales

70-97

Scale Type

cycloid

Fillet Characteristics

Vertebrae

55-64

Color

yellowish-white

red midline

Larval Myotomes

Pre ~ 39 Post ~ 13

Fish Myotomes

52

Fillet Myotomes

57-59

Bones in Fillet

Yes

Species

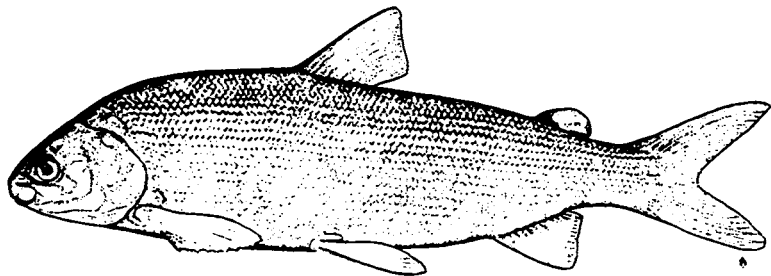
Lake Whitefish

Broad Whitefish

Coregonus nasus

Common Names: Atlantic, Sault, round-nosed or sheep-nosed whitefish

Description: Color of fish, number of myotomes should help to identify • Myotomes for larval fish inconsistent with adult fillets • We found from 53-59 myotomes per fillet • We guess that whitefish should possess <55 myotomes • Color, size and scales located should eliminate trout, salmon, goldeye, gar and sturgeon • Lateral line straight and not visible on fillet because of midline • Example of whitefish scales shown with the lake whitefish.



**Fillet similar to
lake whitefish**

External Characteristics

Record Weight

Typical Lengths (In.)
8-12

No. of Ribs
~ 35

Lateral Line Scales
84-102

Scale Type
cycloid

Fillet Characteristics

Vertebrae
60-63

Color
yellowish-white
red midline

Larval Myotomes
not found

Fish Myotomes
52-53

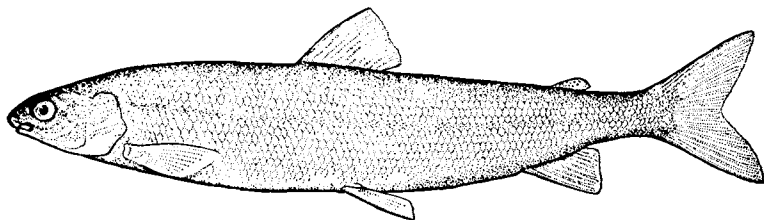
Fillet Myotomes

Bones In Fillet
Yes

Species
Broad Whitefish

Description: Color of fish, number of myotomes should help to identify • Myotomes given for larval fish inconsistent with adult fillets • We found from 53-59 myotomes per fillet • We guess that whitefish should possess <55 myotomes • Color, size and scales located should eliminate trout, salmon, goldeye, gar and sturgeon • Lateral line straight and not visible on fillet because of midline • See lake whitefish for example of whitefish scales.

Scales: Average • Longer than wide • Anterior corners sharply squared • Central focus • Radii in posterior field • Circuli very wavy and widest in posterior fields • Circuli not continuous.



**Fillet similar to
lake whitefish**

Common Names: Menominee whitefish, pilot, frost or round fish

Round Whitefish *Prosopium cylindraceum*

External Characteristics

Record Weight
3 lbs. 12 oz.

Typical Lengths (In.)
8-14

No. of Ribs
~ 36

Lateral Line Scales
74-108

Scale Type
cycloid

Fillet Characteristics

Vertebrae
58-65

Color
yellowish-white
red midline

Larval Myotomes
not found

Fish Myotomes
47-51

Fillet Myotomes

Bones in Fillet
Yes

Species
Round Whitefish

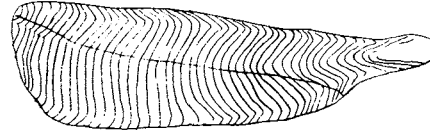
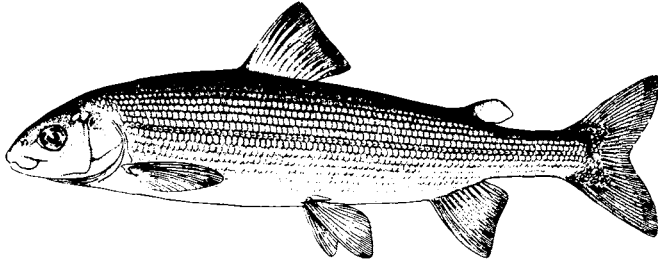
Mountain Whitefish

Prosopium williamsoni

Common Names: Rocky Mountain or Williamson's whitefish, grayling or grayback

Description: Color of fish, number of myotomes should help to identify • Myotomes given for larval fish inconsistent with adult fillets • We found from 53-59 myotomes in a fish fillet • We guess that whitefish should possess <55 myotomes • Color, size and scales located should eliminate trout, salmon, goldeye, gar and sturgeon • Lateral line straight and not visible on fillet because of midline • See lake whitefish for example of whitefish scales.

Scales: Average • Wider than long • Central focus • ~15 indistinct posterior radii • Circuli not continuous, widest and rippled in posterior field • Bumps on posterior edge almost resembles ctenii.



External Characteristics

Record Weight

5 lbs. 4 oz.

Typical Lengths (in.)

8-12

No. of Ribs

~ 35

Lateral Line Scales

74-90

Scale Type

cycloid

Fillet Characteristics

Vertebrae

53-61

Color

yellowish-white

red midline

Larval Myotomes

not found

Fish Myotomes

53-57

Fillet Myotomes

47-50

Bones in Fillet

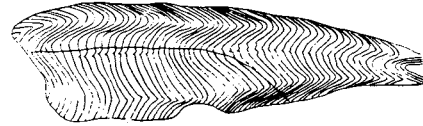
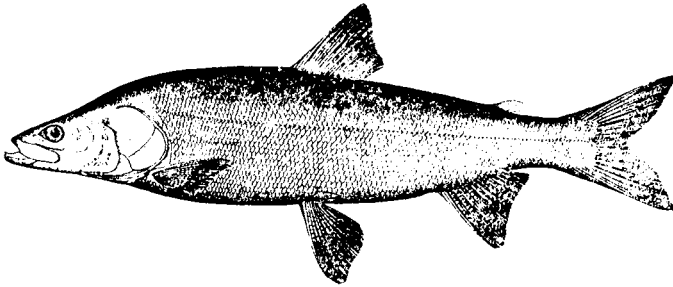
Yes

Species

Mountain Whitefish

Description: Color of fish, number of myotomes should help to identify • Myotomes given for larval fish inconsistent with adult fillets • We found from 53-59 myotomes per fillet • We guess that whitefish should possess <55 myotomes • Color, size and scales located should eliminate trout, salmon, goldeye, gar and sturgeon • Lateral line straight and not visible on fillet because of midline • Normally found only in Alaska and Northwest Territories of Canada • Large whitefish frequently smoked.

Scales: Average • Wider than long • Roundish • Central focus • 8-20 typical of radii in posterior field • Circuli continuous, unbroken circles • Small dips in circuli in posterior field.



Common Names: Sheefish, connie or conny

Inconnu
Stenodus leucichthys

External Characteristics

Record Weight
53 lbs.

Typical Lengths (In.)
18-30

No. of Ribs
~ 40

Lateral Line Scales
90-110

Scale Type
cycloid

Fillet Characteristics

Vertebrae
64-69

Color
yellowish

Larval Myotomes
not found

Fish Myotomes
60-63

Fillet Myotomes
62-63

Bones in Fillet
Yes

Species
Inconnu

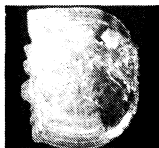
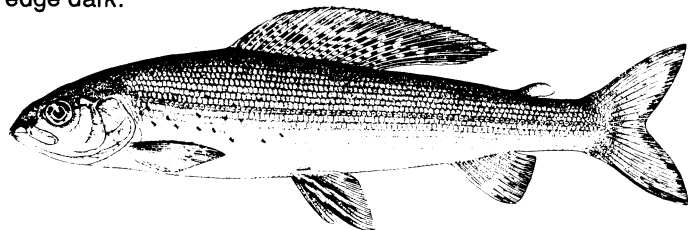
Arctic Grayling

Thymallus arcticus

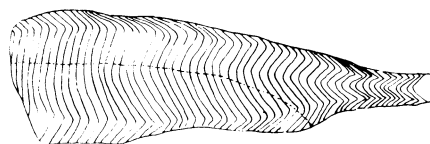
Common Names: American, Back's, sailfin, grayling, bluefish, arctic trout or tillimeg

Description: Trout, char and salmon fillets differ in color based upon diet • Small fish frequently kept whole (gills and viscera may be removed, skin may be left on fish) • Found in Alaska and northwestern Canada • Can be used for food like trout and whitefish • Typical scales used for aging fish shown below • Scales more typical for whitefish than trout.

Scales: Average • Wider or less wide than long • Wavy anterior margin • Central focus • Appears to be 8-25 secondary posterior radii • Circuli in anterior field • Posterior edge almost looks like weak blunt ctenii • Posterior edge dark.



5A



External Characteristics

Record Weight
5 lbs. 15 oz.

Typical Lengths (In.)
12-15

No. of Ribs
~ 34

Lateral Line Scales
77-98

Scale Type
cycloid

Fillet Characteristics

Vertebrae
58-62

Color
pink-orange

Larval Myotomes
not found

Fish Myotomes
54-58

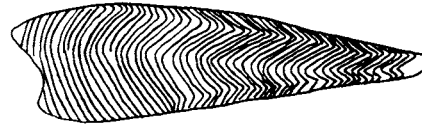
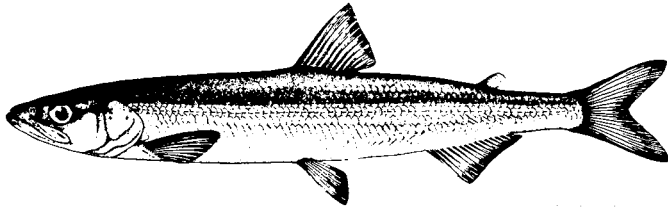
Fillet Myotomes
54-58

Bones in Fillet
Yes

Species
Arctic Grayling

Description: Not in salmon family but smelt family, *Osmeridae* • Small fish • Often cooked whole • Usually kept with scales attached, head and viscera removed • Lateral line straight and not visible on fillet because of midline • Typical scale used for aging fish shown below.

Scales: Small • Wider than long • Focus large, centered near posterior edge • No radii • Anterior field is small and circuli are compressed.



5A

Magnification 6-7X for 15 cm (6") fish

Common Names: American or freshwater smelt, leefish, frost fish or icefish

Rainbow Smelt *Osmerus mordax*

External Characteristics

Record Weight

Typical Lengths (In.)

7-8

No. of Ribs

~ 40

Lateral Line Scales

62-72

Scale Type

cycloid

Fillet Characteristics

Vertebrae

58-70

Color

whitish yellow

Larval Myotomes

Pre 43-48 Post 14-17

Fish Myotomes

52-60

Fillet Myotomes

48-62

Bones in Fillet

Yes

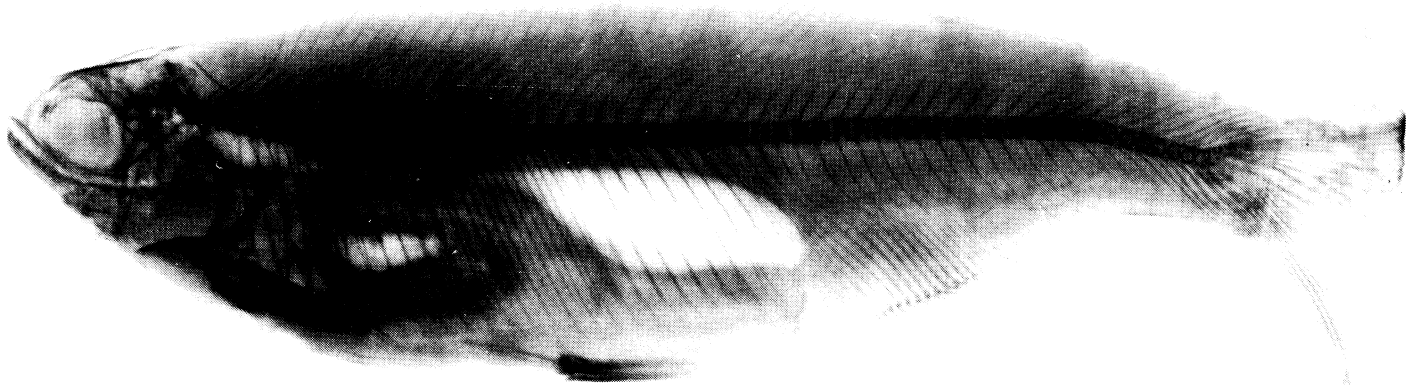
Species

Rainbow Smelt

Mooneye Family — *Hiodontidae*

The mooneye family are strictly a North American species with thin silvery bodies, small heads and large shiny eyes. They can be shaped like a herring but don't possess the sawtooth or keel edge on the stomach. They also have well-developed teeth on the roof of the mouth, tongue and both jaws (sometimes called toothed herring). They feed on insects, invertebrates and minnows. Many people consider them inedible because of the many bones present. In northern states and Canada, they are considered excellent for smoking.

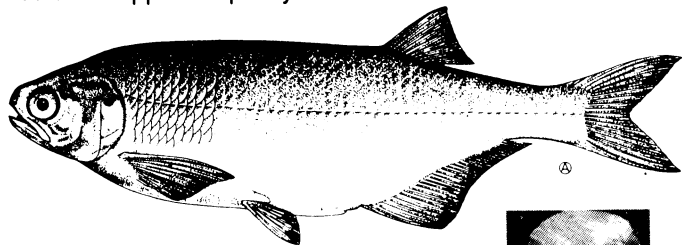
There are two species in this family, the **goldeye** *Hiodon alosoides* and **mooneye** *Hiodon tergisus*



Mooneye

Description: Small, narrow fish • Can be smoked, canned or pickled • Scales may be attached on smoked fish • For bone removal, meat can be scored (1/4"-3/8" vertical cuts) • Lateral line straight and not visible on fillet because of midline • Typical scale for aging fish shown below.

Scales: Average to large • Same or longer than wide • Focus slightly posterior • 10 to 30 radii in both anterior and posterior • Circuli circular around focus except at posterior edge, they are absent or move to scale margin • Anterior appears split by 1 or 2 central radii.



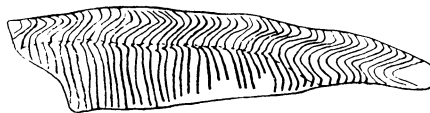
5A

Magnification 1.5-2.0X for 33 cm (13") fish

Common Names: Yellow, toothed or freshwater herring, shad, shad mooneye, slicker, golden mooneye, webechee, northern goldeye, Winnipeg goldeye, western goldeye or mooneye

Goldeye

Hiodon alosoides



External Characteristics

Record Weight

3 lbs. 13 oz.

Typical Lengths (in.)

12-16

No. of Ribs

~ 30

Lateral Line Scales

57-62

Scale Type

cycloid

Fillet Characteristics

Vertebrae

58-61

Color

whitish-yellow

red outside

Larval Myotomes

Pre < 24 Post > 16

Fish Myotomes

53-59

Fillet Myotomes

54-56

Bones in Fillet

Yes

Species

Goldeye

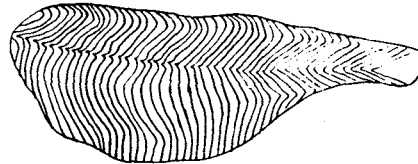
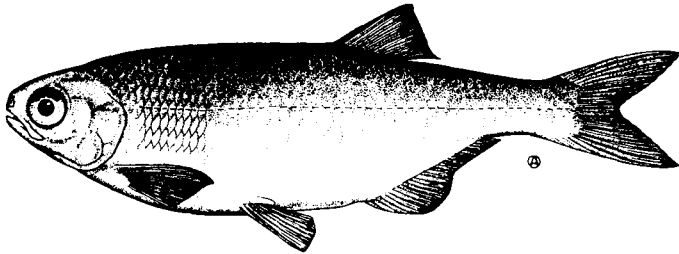
Mooneye

Hiodon tergisus

Common Names: Toothed or freshwater herring, river whitefish, slicker, cisco, white shad or notch-finned Hiodon

Description: Small, narrow fish • Can be smoked, canned, pickled • Scales may be attached on smoked fish • For bone removal, meat can be scored (1/4"-3/8" vertical cuts) • Lateral line straight and not visible on fillet because of midline • Scales typical to those found on goldeye

Scales: Average to larger • Anterior corners rounded • Same, wider than long • Focus posterior • 5-40 radii in both anterior and posterior field • Circular circuli around focus • Weak circuli on posterior margin.



External Characteristics

Record Weight
1 lb. 7 oz.

Typical Lengths (In.)
9-12

No. of Ribs
~ 28

Lateral Line Scales
52-57

Scale Type
cycloid

Fillet Characteristics

Vertebrae
53-57

Color
white
red outside

Larval Myotomes
Pre 34-36 Post 17-20

Fish Myotomes
52-56

Fillet Myotomes
48-50

Bones in Fillet
Yes

Species
Mooneye

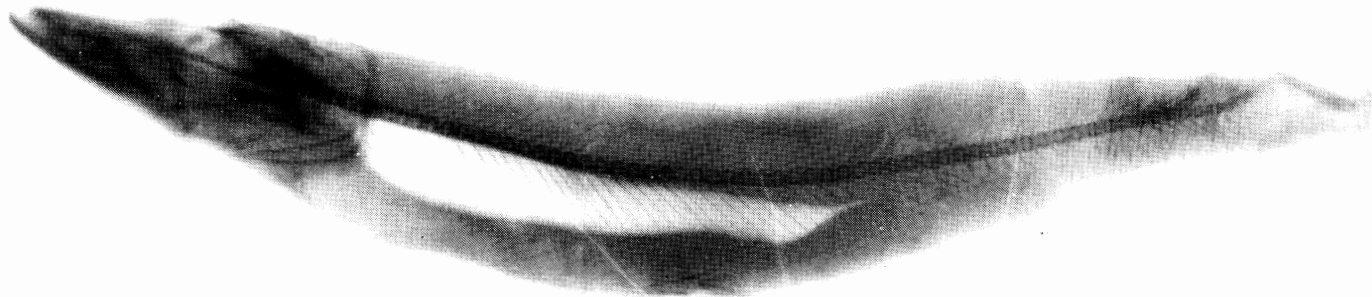
Pike Family — *Esocidae*

Their body shape is cylindrical with a large duckbill-like snout. The body is covered with many small cycloid scales with the dorsal and anal fins (dorsal just above anal fin) located far back near the tail. The mouth contains numerous needle-like teeth. The members of this family are voracious predators.

They prefer shallow water that is cool and clean in lakes or slowly flowing streams. These fish hide and wait for their meals which consist of fish, frogs, mice and small ducks.

They are fighters. Their flesh is tasty but bony.

Species found in North America are **grass or redfin pickerel**, *Esox americanus*; **chain pickerel**, *Esox niger*, **northern pike**, *Esox lucius*; **muskellunge**, *Esox masquinongy*, **tiger-muskie hybrid of northern pike**, *Esox lucius* and **muskellunge**, *Esox masquinongy*.



Grass pickerel

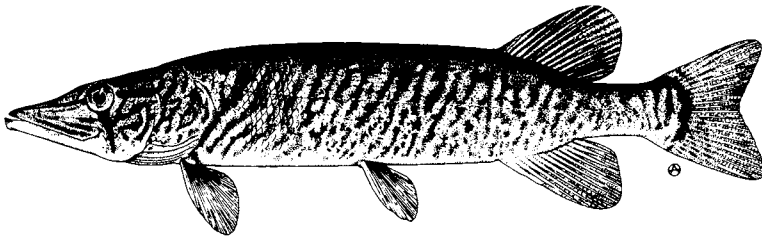
Grass Pickerel

Esox americanus

Common Names: Western grass, mud, little, central redfin, brook, barred, slough, banded or trout pickerel, grass, pond or mud pike

Description: Small fish, usually less than one foot long • Y-bones in fillet can be removed (may change fillet structure, or have 2 sections per fillet) • Lateral line straight and not visible on fillet because of midline • Scales for the pike family unique; see northern pike scales.

Scales: Average • Longer than wide • Focus slightly posterior • No radii • 1 to 4 overlapping anterior lobes • Circuli closely spaced • Posterior margin may have small bump or can be indented.



Fillet similar to
chain pickerel

External Characteristics

Record Weight
2 lbs. 10 oz.

Typical Lengths (in.)
8-10

No. of Ribs
~ < 25

Lateral Line Scales
93-118

Scale Type
cycloid

Fillet Characteristics

Vertebrae
42-51

Color

white to yellow

Larval Myotomes
Pre ~31 Post ~ 15

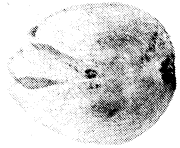
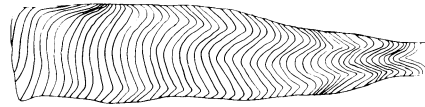
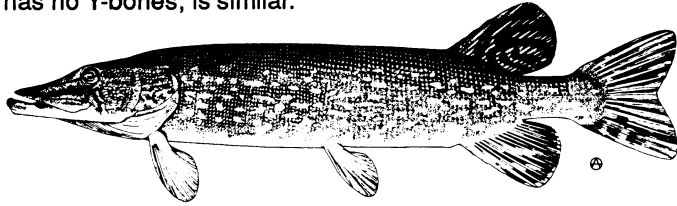
Fish Myotomes
45-47

Fillet Myotomes
47-49

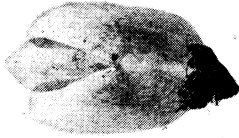
Bones in Fillet
Yes

Species
Grass Pickerel

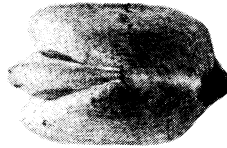
Description: Larger fish, may have size limits • Y-bones in fillet can be removed (may change fillet structure, or have 2 sections of flesh per fillet) • Fillet may be pieced for frying • Lateral line straight and not visible on fillet because of midline • Fillet can be cross-sectioned • Section near head unique for pike; only gar, which has no Y-bones, is similar.



1



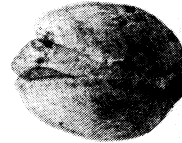
2



3



4



5A

Length 253mm • ROM #60361 • Magnification 8-12X • Scales unique for the pike family, enclosed portion being lobed • Pike can be differentiated from muskellunge, see pages 138-139

Common Names: Great northern, common or American pike or pickerel, Northern jack, jack, jackfish, pickerel, pike, wolf or snake

Northern Pike

Esox lucius

External Characteristics

Record Weight
55 lbs. 15 oz.

Typical Lengths (in.)
18-24

No. of Ribs
~ 35

Lateral Line Scales
105-148

Scale Type
cycloid

Fillet Characteristics

Vertebrae
57-65

Color
yellowish
red midline

Larval Myotomes
Pre 40-44 Post 17-19

Fish Myotomes
57-68

Fillet Myotomes
55-58

Bones in Fillet
Yes

Species
Northern Pike

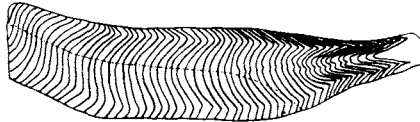
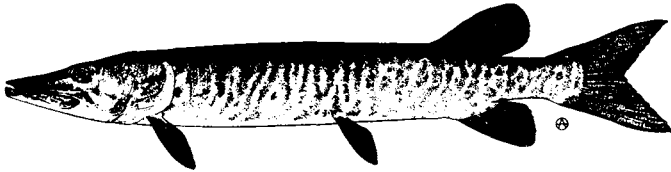
Muskellunge

Esox masquinongy

Common Names: Maskinonge, musky, lunge, purebred musky, tiger muskellunge, mascalonge, masquinouge, Great Lakes, Ohio, Wisconsin or great pike, silver or tiger muskie, white pickerel, white, blue, great or Allegheny River pike or jack

Description: Larger fish, may have size limits • Y-bones in fillet can be removed (may change fillet structure, or have 2 sections of flesh per fillet) • Fillet may be pieced for frying • Lateral line straight and not visible on fillet because of midline • See northern pike for fillet cross-section and scales • Muskellunge can be differentiated from northern pike, pages 138-139.

Scales: Average • Longer than wide • Focus slightly posterior • No radii • 1 to 4 overlapping anterior lobes • Circuli closely spaced • Posterior margin has small bump



External Characteristics

Record Weight
69 lbs. 15 oz.

Typical Lengths (In.)
24-36

No. of Ribs
~ 40

Lateral Line Scales
132-167

Scale Type
cycloid

Fillet Characteristics

Vertebrae
64-66

Color
yellowish
red midline

Larval Myotomes
Pre 44-47 Post 17-20

Fish Myotomes
61-68

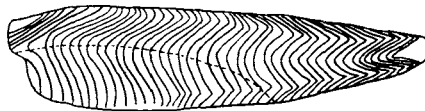
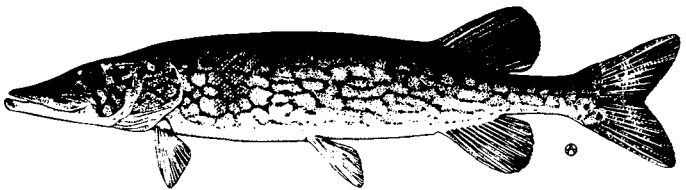
Fillet Myotomes
55-65

Bones in Fillet
Yes

Species
Muskellunge

Description: Smaller than northern pike and muskellunge • Fillet similar except fewer myotomes • Y-bones in fillet can be removed (may change fillet structure, or have 2 sections of flesh per fillet) • Lateral line straight and not visible on fillet because of midline • Cross-sectioned fillets and scales similar to northern pike.

Scales: Average • Longer than wide • Focus slightly posterior • 1 to 4 overlapping anterior lobes • Circuli closely spaced • Posterior margin may have a small bump or indentation (notch)



Common Names: Eastern, mud, grass, black, lake, reticulated or federation pickerel, pike, green, chain or duck-billed pike, chainsides, jack or snake

Chain Pickerel

Esox niger

External Characteristics

Record Weight

9 lbs. 6 oz.

Typical Lengths (In.)

15-20

No. of Ribs

< 30

Lateral Line Scales

112-135

Scale Type

cycloid

Fillet Characteristics

Vertebrae

49-54

Color

yellowish

red midline

Larval Myotomes

Pre 30-34 Post 20-23

Fish Myotomes

53-54

Fillet Myotomes

45-49

Bones in Fillet

Yes

Species

Chain Pickerel

Minnow Family — *Cyprinidae*

Most minnows are small fish normally taken by predators. Fish examined vary since the fins contain spines where they are non-existent in the other minnows. The introduced species are common carp, goldfish and grass carp. They normally stir up the bottom mud and feed on insects and plant material. Feeding on aquatic vegetation was the reason for introduction of the grass carp. The fish can be good fighters and the meat is considered good by some people.

The introduced species examined in North America are **common carp**, *Cyprinus carpio*; **grass carp**, *Ctenopharyngodon idella* and **goldfish**, *Carassius auratus*.

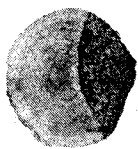
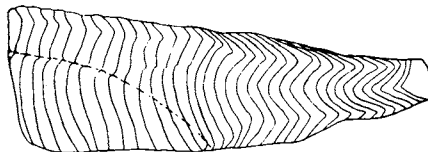
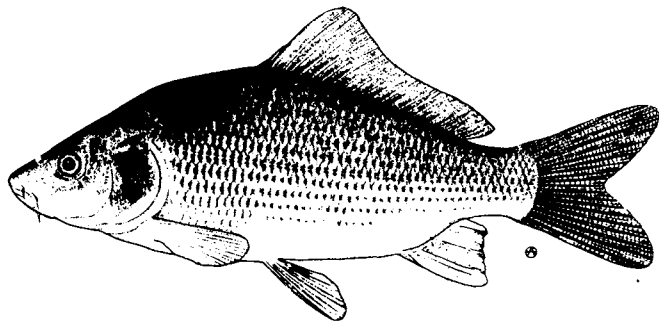


Common carp

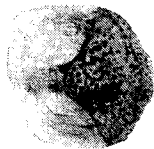


Description: Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline • Myotomes wide at head, narrow by tail.

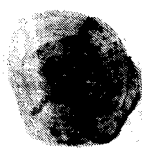
Scales: Large • Rounded • Small central focus • 4-6 radii in both anterior and posterior fields • Circuli wider apart, wavy and broken looking in posterior field



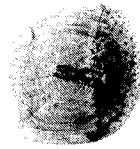
1



2



3



4



5A

Length 113mm • ROM #37322 • Magnification 3-4X

Common Names: German, European, Israeli, scaled, king, mirror or leather carp, buglemouth bass, carp or German bass

Common Carp *Cyprinus carpio*

External Characteristics

Record Weight

74 lbs.

Typical Lengths (In.)

15-18

No. of Ribs

~ 16

Lateral Line Scales

32-41

Scale Type

cycloid

Fillet Characteristics

Vertebrae

32-40

Color

yellowish-pink
red outside

Larval Myotomes

Pre ~ 25 Post ~ 13

Fish Myotomes

32-38

Fillet Myotomes

34-40

Bones In Fillet

Yes

Species

Common Carp

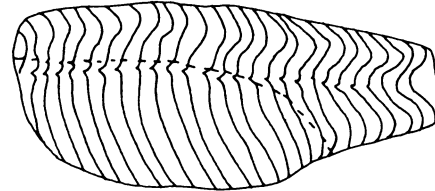
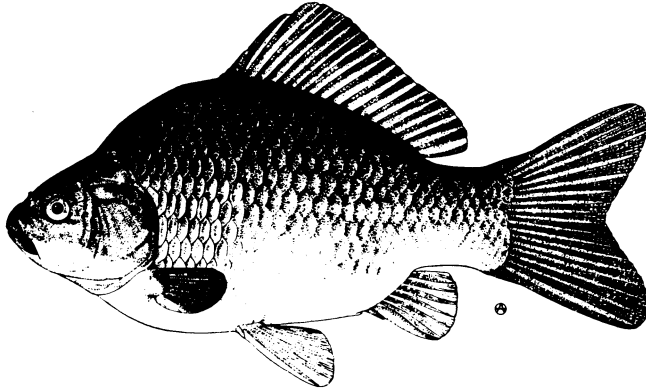
Goldfish

Carassius auratus

Common Names: Crucian, silver, fancy crucian or golden carp, carp or bubble-eye

Description: Small fish • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline • Myotomes wide at head, narrow near tail • Orange color on scales.

Scales: Average to large • Focus central • 5-20 radii in both posterior and anterior fields • Some lateral radii • Circuli much wider and less on posterior edge • Goldish-colored scales.



External Characteristics

Record Weight

Typical Lengths (In.)
10-16

No. of Ribs
~ 15

Lateral Line Scales
27-32

Scale Type
cycloid

Fillet Characteristics

Vertebrae
28-32

Color
yellowish-pink
red outside

Larval Myotomes
Pre ~ 22 Post ~ 12

Fish Myotomes
26-34

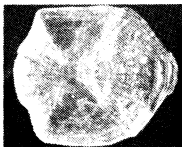
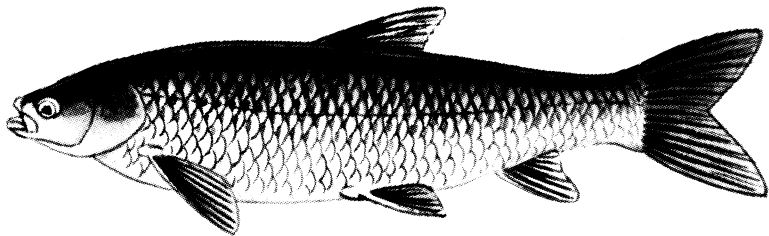
Fillet Myotomes

Bones In Fillet
Yes

Species
Goldfish

Description: Large, torpedo-shaped fish • Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline • Typical scale used for aging shown below.

Scales: Large • Roundish • Central focus • 10-20 radii in both posterior and anterior fields • Circuli in posterior field bowed toward scale margin • Circuli not continuous



5A

Magnification 1.3-1.7X for 50 cm (20") fish

Common Names: White amur

Grass Carp

Ctenopharyngodon idella

Fillet similar to carp,
but more myotomes

External Characteristics

Record Weight
58 lbs.

Typical Lengths (In.)
16-24

No. of Ribs

Lateral Line Scales
42-50

Scale Type
cycloid

Fillet Characteristics

Vertebrae
42-43

Color
yellowish-pink
red outside

Larval Myotomes
not found

Fish Myotomes
41-44

Fillet Myotomes
43-44

Bones in Fillet
Yes

Species
Grass Carp

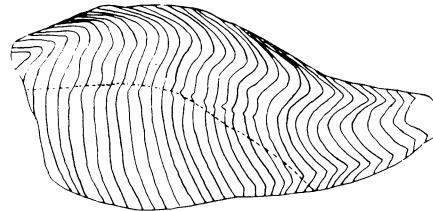
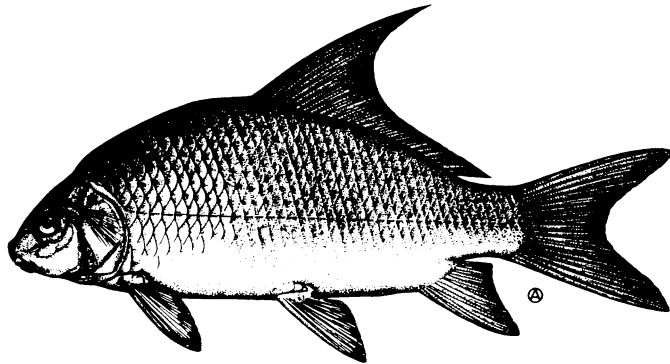
Quillback

Carpiodes cyprinus

Common Names: Lake quillback, eastern or plains carpsucker, carpsucker, quillback or long-finned sucker, broad mullet, mullet, carp, drum lake carp, white carp or silver carp

Description: Not a large fish • Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline.

Scales: Large • Anterior corners rounded • Posterior edge rounded • Focus slightly posterior • Normally more radii anterior (10-50) than posterior (10-20) • Circular circuli • Broken circuli lines, heavier, wider spaced in posterior field.



External Characteristics

Record Weight

Typical Lengths (In.)

10-15

No. of Ribs

~ 17

Lateral Line Scales

33-42

Scale Type

cycloid

Fillet Characteristics

Vertebrae

38-40

Color

whitish-pink

red midline

Larval Myotomes

Pre 26-27 Post 6-8

Fish Myotomes

33-38

Fillet Myotomes

36-38

Bones in Fillet

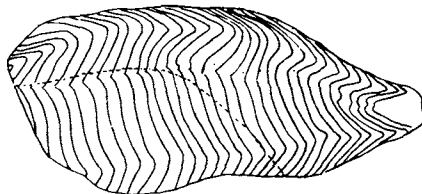
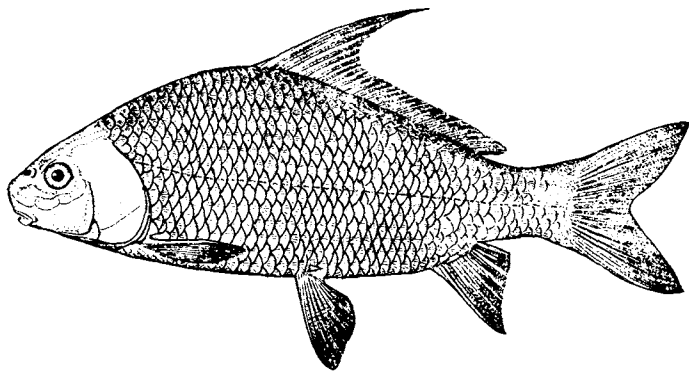
Yes

Species

Quillback

Description: Not a large fish • Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline.

Scales: Average to large • Variable shape • Central focus • Variable posterior and anterior radii • Normally more anterior than posterior radii • Edges of scale scalloped • Broken circuli lines, heavier and wider spaced in posterior field.



Common Names: White, common river or silver carp

River Carpsucker *Carpionodes carpio*

External Characteristics

Record Weight
6 lbs. 14 oz.

Typical Lengths (In.)
14-20

No. of Ribs
~ 17

Lateral Line Scales
34-36

Scale Type
cycloid

Fillet Characteristics

Vertebrae
36-37
Color
whitish
red outside

Larval Myotomes
Pre 28-31 Post 5-9

Fish Myotomes
34-42

Fillet Myotomes
36-38

Bones in Fillet
Yes

Species
River Carpsucker

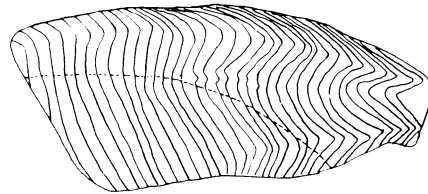
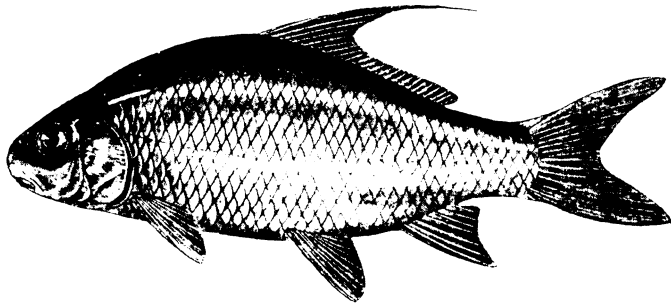
Highfin Carpsucker

Carpiodes velifer

Common Names: Skimback, spearfish, sailor, sailing sucker, humpbacked or bluntnose river carp

Description: Not a large fish • Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline.

Scales: Large • Anterior corners rounded • Posterior edge rounded • Focus central • More radii anterior (5-50) than posterior (5-20) • Circular circuli • Broken circuli lines • Heavier, wider spaced in posterior field.



External Characteristics

Record Weight

Typical Lengths (In.)
10-16

No. of Ribs
~ 20

Lateral Line Scales
33-35

Scale Type
cycloid

Fillet Characteristics

Vertebrae
36-38

Color
whitish-pink
red midline

Larval Myotomes
Pre 26-29 Post 6-10

Fish Myotomes
35-38

Fillet Myotomes
35-38

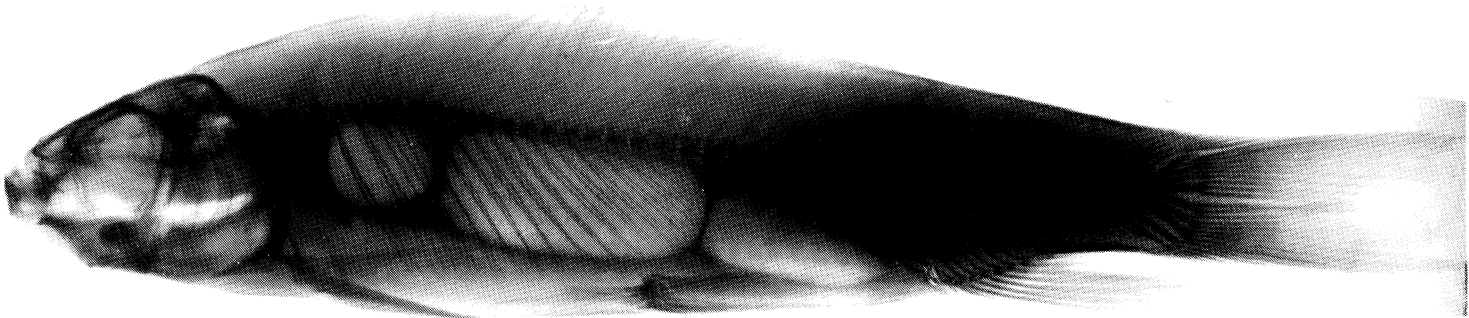
Bones in Fillet
Yes

Species
Highfin
Carpsucker

Sucker Family — *Catostomidae*

Suckers are a large family that have large, thick lips. The suckers have no jaw teeth but numerous molar-like teeth in a single row on each pharyngeal arch. They have soft rays in their fins with cycloid scales on the body and no scales on the head. Their mouth and lips are used to “vacuum” and ingest invertebrates from stream and lake beds. They are extremely bony as the ribs plus a set of accessory bones are distributed from the head all the way to the tail. For some, the flesh is considered quite edible.

Species found in North America are **bigmouth buffalo**, *Ictiobus cyprinellus*; **smallmouth buffalo**, *Ictiobus bubalus*; **black buffalo**, *Ictiobus niger*, **quillback**, *Carpiodes cyprinus*; **river carpsucker**, *Carpiodes carpio*; **highfin carpsucker**, *Carpiodes velifer*; **blue sucker**, *Cycleptus elongatus*; **June sucker**, *Chasmistes liorus*; **Cui-UI**, *Chasmistes cujus*; **shortnose sucker**, *Chasmistes brevirostris*; **white sucker**, *Catostomus commersoni*; **largescale sucker**, *Catostomus macrocheilus*; **flannelmouth sucker**, *Catostomus latipinnis*; **longnose sucker**, *Catostomus catostomus*; **razorback sucker**, *Xyrauchen texanus*; **spotted sucker**, *Minytrema melanops*; **creek chubsucker**, *Erimyzon oblongus*; **lake chubsucker**, *Erimyzon sucetta*; **northern hog sucker**, *Hypentelium nigricans*; **greater redhorse**, *Moxostoma valenciennesi*; **copper redhorse**, *Moxostoma hubbsi*; **river redhorse**, *Moxostoma carinatum*; **shorthead redhorse**, *Moxostoma macrolepidotum*; **black redhorse**, *Moxostoma duquesnei*; **golden redhorse**, *Moxostoma erythrurum*; **silver redhorse**, *Moxostoma anisurum*; **suckermouth redhorse**, *Moxostoma pappilosum*; **gray redhorse**, *Moxostoma congestum*.



Shorthead redhorse

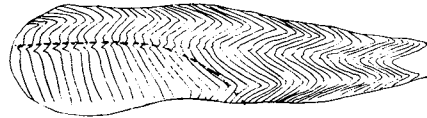
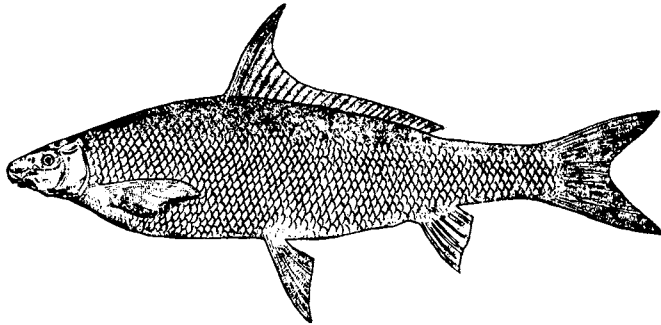
Blue Sucker

Cycleptus elongatus

Common Names: Missouri, gourdseed, sweet or slenderhead sucker, suckerel, bluefish, blackhorse, schooner or long buffalo

Description: Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline • Example of sucker scales shown with white sucker.

Scales: Average to large • Longer than wide • Small central focus • 20-30 radii in anterior and posterior fields • Circuli frequently sharply curved between radii in posterior field • Circuli fine, broken, heavier posterior.



External Characteristics

Record Weight
14 lbs. 3 oz.

Typical Lengths (In.)
14-20

No. of Ribs
~ 15

Lateral Line Scales
49-57

Scale Type
cycloid

Fillet Characteristics

Vertebrae
49-50

Color
yellowish
red outside

Larval Myotomes
not found

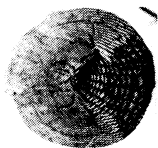
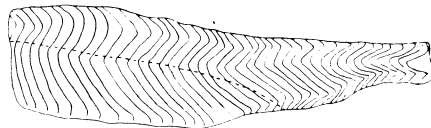
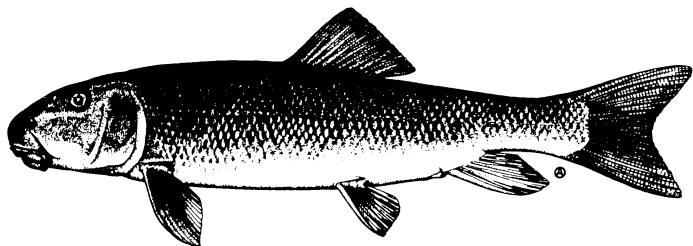
Fish Myotomes
45-53

Fillet Myotomes
47-49

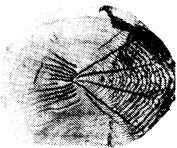
Bones in Fillet
Yes

Species
Blue Sucker

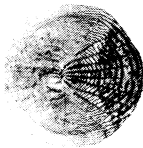
Description: Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline.



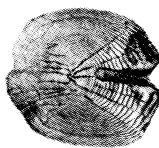
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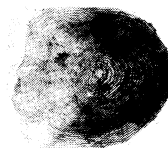
2



3



4



5A

Length 197mm • ROM #25120 • Magnification 3-4X

Common Names: Common, common white, coarse scaled, fine scaled, slender, eastern, brook, mud, June, grey or black sucker carp, sucker or black mullet

White Sucker *Catostomus commersoni*

External Characteristics

Record Weight

7 lbs. 4 oz.

Typical Lengths (in.)

10-20

No. of Ribs

~ 22

Lateral Line Scales

53-85

Scale Type

cycloid

Fillet Characteristics

Vertebrae

44-48

Color

whitish

red midline

Larval Myotomes

Pre 35-39 Post 7-10

Fish Myotomes

41-52

Fillet Myotomes

42-46

Bones in Fillet

Yes

Species

White Sucker

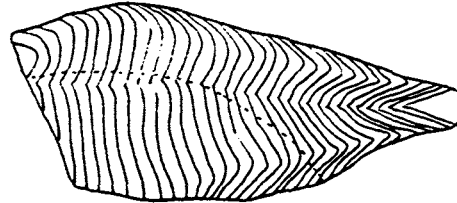
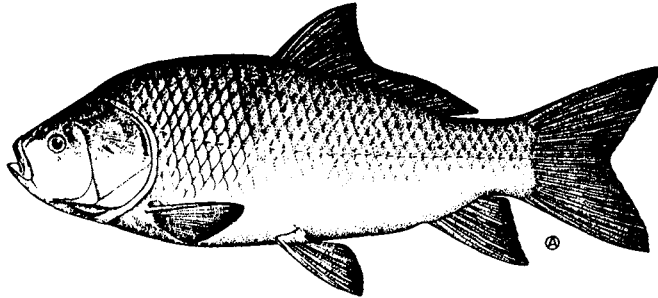
Bigmouth Buffalo

Ictiobus cyprinellus

Common Names: Redmouth, blue, bullnosed, chubnosed, brown, pugnosed, common, mud, lake, slough, stubnose or gourdhead buffalo, buffalo, buffalofish or carp

Description: Not a large fish • Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline.

Scales: Large • Roundish • Small central focus • 40+ radii in anterior and 12+ in posterior field • Circuli in posterior field wider than anterior field • Circuli with breaks, not continuous • Circuli frequently sharply bent between radii in posterior field.



External Characteristics

Record Weight

70 lbs. 5 oz.

Typical Lengths (in.)

16-24

No. of Ribs

~ 15

Lateral Line Scales

39-41

Scale Type

cycloid

Fillet Characteristics

Vertebrae

36-37

Color

whitish

red outside

Larval Myotomes

Pre 28-31 Post 5-9

Fish Myotomes

34-39

Fillet Myotomes

35-38

Bones in Fillet

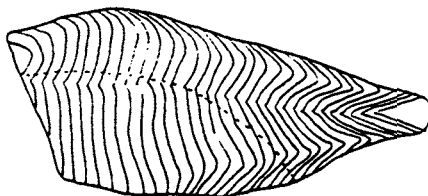
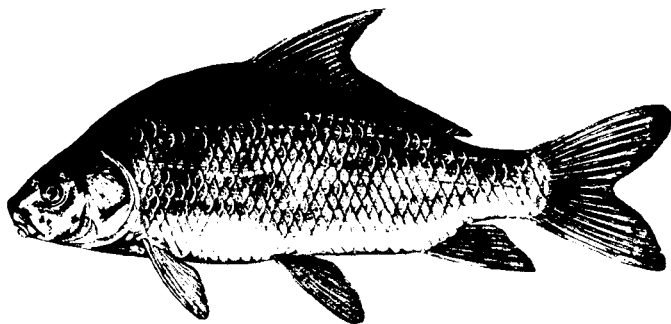
Yes

Species

Bigmouth Buffalo

Description: Not a large fish • Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline.

Scales: Large • Roundish • Central focus • 30+ radii in anterior and 10-15 in posterior field • Radii much closer spaced anterior than posterior.



Common Names: Brown, thicklipped, suckermouth, razorback, quillback, round, channel, baitnet or humpbacked buffalo, blue pancake, rooter, razorbill, white carp, highback, carp, liner or roachback

Smallmouth Buffalo *Ictiobus bubalus*

External Characteristics

Record Weight
79 lbs. 8 oz.

Typical Lengths (In.)
16-24

No. of Ribs
~ 18

Lateral Line Scales
36-38

Scale Type
cycloid

Fillet Characteristics

Vertebrae
35-39

Color
whitish
red midline

Larval Myotomes
Pre 28-31 Post 5-9

Fish Myotomes
33-39

Fillet Myotomes

Bones in Fillet
Yes

Species
Smallmouth Buffalo

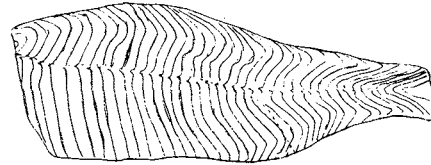
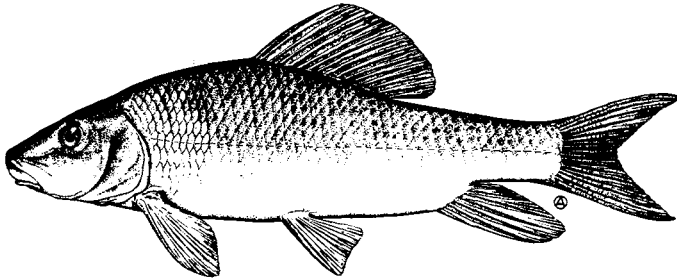
Silver Redhorse

Moxostoma anisurum

Common Names: Whitenose redhorse, silver or white nosed, bay, redfin mullet or white nosed, longtailed sucker

Description: Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline • Example of redhorse scales shown with shorthead redhorse.

Scales: Large • Anterior edge curved • Posterior edge roundish • Central focus • 10 to 25 anterior and posterior radii • Circuli continuous through radii • Circuli circular around focus • Broken line around annulus • Heavier lines on posterior margin



External Characteristics

Record Weight
11 lbs. 7 oz.

Typical Lengths (in.)
12-16

No. of Ribs
~ 19

Lateral Line Scales
38-48

Scale Type
cycloid

Fillet Characteristics

Vertebrae
40-44

Color
whitish
red outside

Larval Myotomes
not found

Fish Myotomes
42-43

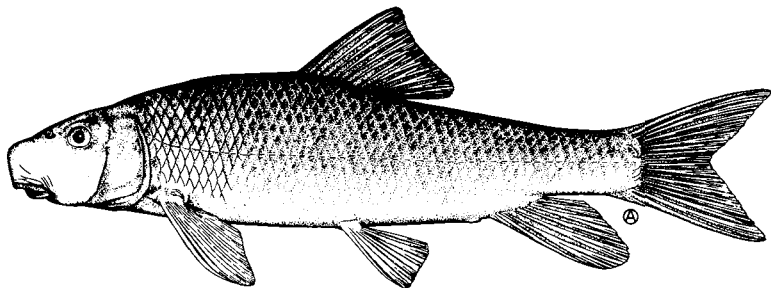
Fillet Myotomes
41-43

Bones In Fillet
Yes

Species
Silver Redhorse

Description: Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline • Example of redhorse scales shown with shorthead redhorse.

Scales: Large • Round anterior corners • Raised anterior surface after corners • Roundish posterior • Focus posterior • More anterior radii (10-40) than posterior (10-20) • Circuli broken at radii • Heavier circuli on posterior margin



**Fillet similar to
short redhorse**

Common Names: Common redhorse and golden or smallheaded, golden mullet or golden sucker

Golden Redhorse *Moxostoma erythrurum*

External Characteristics

Record Weight
2 lbs.

Typical Lengths (in.)
11-15

No. of Ribs
~ 20

Lateral Line Scales
37-45

Scale Type
cycloid

Fillet Characteristics

Vertebrae
39-43
Color
whitish
red midline

Larval Myotomes
Pre 33-35 Post 7-8

Fish Myotomes
40-42

Fillet Myotomes
39-41

Bones in Fillet
Yes

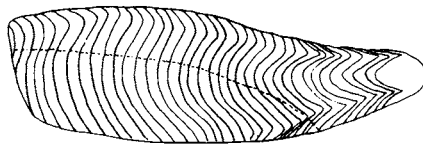
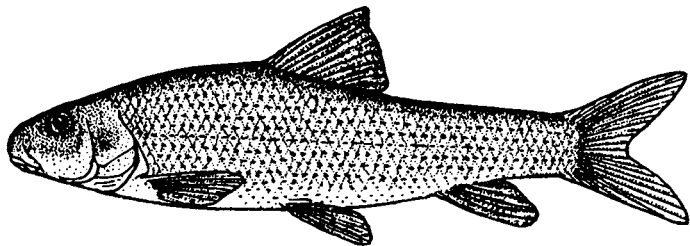
Species
Golden Redhorse

Spotted Sucker

Minytrema melanops

Common Names: Striped, speckled, sand, winter, black or corn cob sucker or spotted redhorse

Description: Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline • Example of redhorse scales shown with shorthead redhorse • Scales black marked.



External Characteristics

Record Weight

Typical Lengths (In.)

10-15

No. of Ribs

~ 19

Lateral Line Scales

44-47

Scale Type

cycloid

Fillet Characteristics

Vertebrae

43-44

Color

whitish

red outside

Larval Myotomes

Pre 31-33 Post 6-9

Fish Myotomes

35-42

Fillet Myotomes

36-38

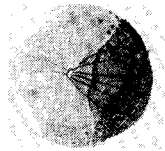
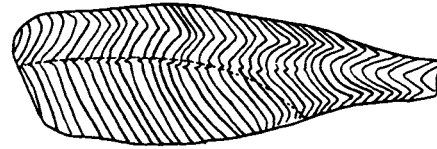
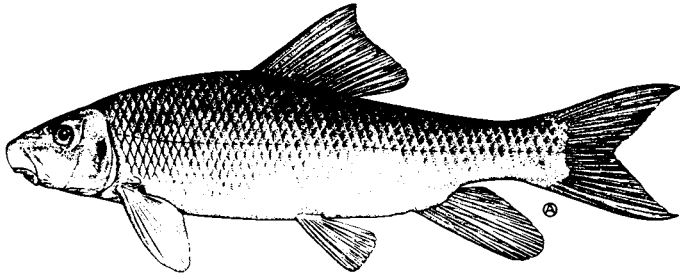
Bones in Fillet

Yes

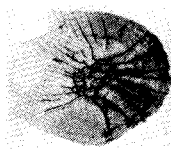
Species

Spotted Sucker

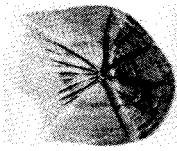
Description: Can be smoked • Scored (1/4" - 3/8") vertically • Bones removed by canning or pickling • Lateral line straight and not visible on fillet because of midline • Scales.



1



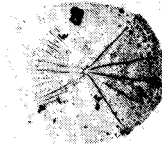
2



3



4



5A

Length 173mm • ROM #35228 • Magnification 3-8X

Common Names: Northern shorthead or common redhorse, short headed, red, eastern, brook or common mullet, redfin, river sucker, Des Moines plunger, redfin, red or bigscale sucker

Shorthead Redhorse

Moxostoma macrolepidotum

External Characteristics

Record Weight

Typical Lengths (in.)

14-18

No. of Ribs

~ 24

Lateral Line Scales

39-48

Scale Type

cycloid

Fillet Characteristics

Vertebrae

41-44

Color

yellowish
red midline

Larval Myotomes

Pre 30-35 Post 6-8

Fish Myotomes

38-45

Fillet Myotomes

39-44

Bones in Fillet

Yes

Species

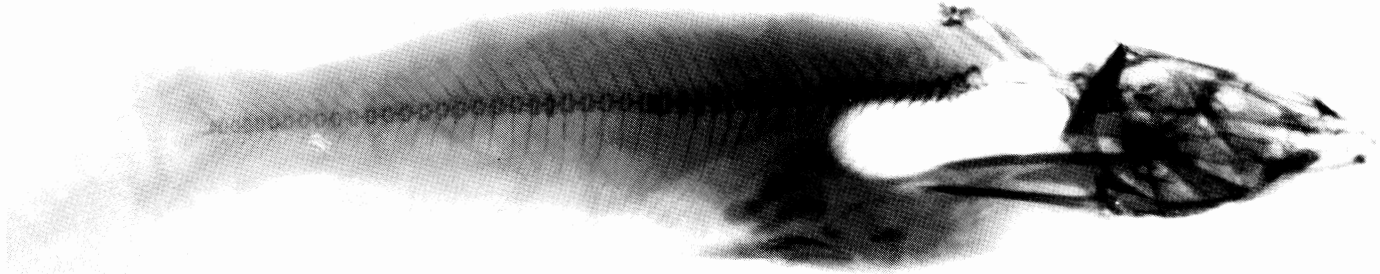
Shorthead Redhorse

Catfish Family — *Ictaluridae*

All catfish are bottom-dwellers that consume worms, insects, fish, frogs and occasionally plant material. This family is easily identified because of the scaleless bodies. Their heads are broad and flat and have long barbels about the mouth. They possess numerous bands of bristle-like teeth in their jaws. They are mostly nocturnal — using their barbels to locate food. Three serrated spines are present: 1 dorsal and 2 pectoral — a prick from these spines may cause discomfort because of a venom that may be introduced.

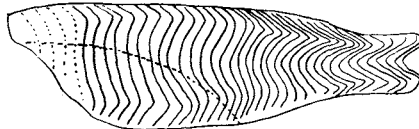
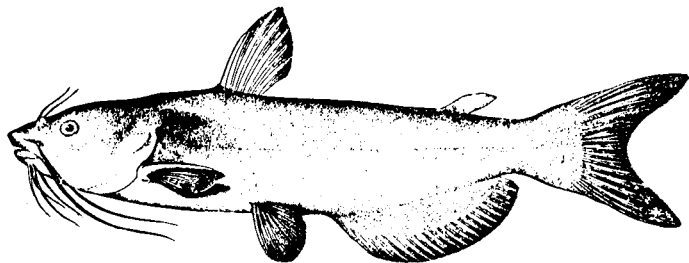
This family includes large catfish, bullheads and madtoms (omitted). The meat of several species in this family is considered excellent. In stores, fins are left on channel catfish fillets.

Species found in North America are **channel catfish**, *Ictalurus punctatus*; **headwater catfish**, *Ictalurus lupus*; **Yaqui catfish**, *Ictalurus pricei*; **blue catfish**, *Ictalurus furcatus*; **flathead catfish**, *Pylodictis olivaris*; **white catfish**, *Ameiurus catus*; **yellow bullhead**, *Ameiurus natalis*; **black bullhead**, *Ameiurus melas*; **brown bullhead**, *Ameiurus nebulosus*; **spotted bullhead**, *Ameiurus serracanthus*; **snail bullhead**, *Ameiurus brunneus*; **flat bullhead**, *Ameiurus platycephalus*; **stonecat**, *Noturus flavus*.



Channel catfish

Description: Small fish • Fish usually skinned • May not be filleted, fins may be left attached • Easy to see if dorsal spine cut or pulled • Adipose fin or anal fin removal may be obvious • No ribs before dorsal spine • On large fish may have yellow (fat) by dorsal and a adipose fin • No scales • If spines left attached, can be identified to species • Difficult to see myotomes ahead of dorsal fin • Lateral line straight and not visible on fillet because of midline • Muscle texture not as firm as channel catfish.



Common Name: Potomac Cat or White Cat of the Potomac

White Catfish *Ameiurus catus*

External Characteristics

Record Weight

Typical Lengths (In.)

9-12

No. of Ribs

~ 9

Lateral Line Scales

Scaleless

Scale Type

none

Fillet Characteristics

Vertebrae

37-38

Color

yellowish

Larval Myotomes

Pre 17-19 Post 25-28

Fish Myotomes

Fillet Myotomes

37-40

Bones in Fillet

No

Species

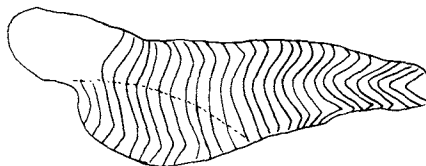
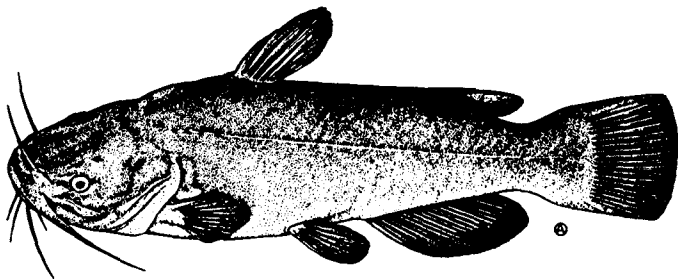
White Catfish

Black Bullhead

Ameiurus melas

Common Names: Black catfish, small, brown, yellow belly, common bullhead, mudcat, slick, polliwog, stinger, chucklehead, horned-pout catfish, or river snapper

Description: Small fish • Fish usually skinned • May not be filleted, fins may be left attached • Easy to see if dorsal spine cut or pulled • Adipose fin or anal fin removal may be obvious • No ribs before dorsal spine • No scales • If spines left attached, can be identified to species • Difficult to see myotomes ahead of dorsal fin • Lateral line straight and not visible on fillet because of midline • Muscle texture not as firm as channel catfish.



External Characteristics

Record Weight
8 lbs. 15 oz.

Typical Lengths (in.)
7-12

No. of Ribs
~ 9

Lateral Line Scales
scaleless

Scale Type
none

Fillet Characteristics

Vertebrae
38-39

Color
yellowish

Larval Myotomes
Pre 15-17 Post 23-27

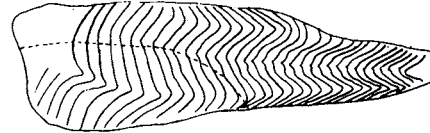
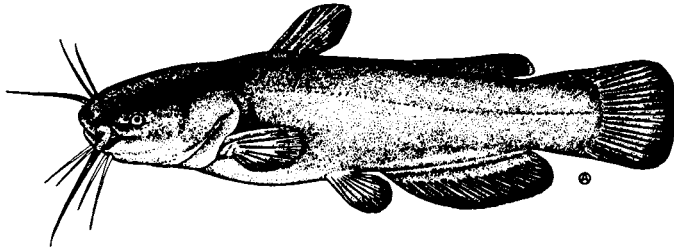
Fish Myotomes

Fillet Myotomes
33-37

Bones In Fillet
No

Species
Black Bullhead

Description: Small fish • Fish usually skinned • May not be filleted, fins may be left attached • Easy to see if dorsal spine cut or pulled • Adipose fin or anal fin removal may be obvious • No ribs before dorsal spine • No scales • If spines left attached, can be identified to species • Difficult to see myotomes ahead of dorsal fin • Lateral line straight and not visible on fillet because of midline • Muscle texture not as firm as it would be on a channel catfish.



Common Names: Bullhead, yellowbelly, brown, Mississippi, white-whiskered, slick bullhead, yellow catfish or cat, butterball, buttercat, polliwog, greaser, paper skin

Yellow Bullhead *Ameiurus natalis*

External Characteristics

Record Weight

5 lbs. 13 oz.

Typical Lengths (In.)

7-12

No. of Ribs

~ 9

Lateral Line Scales

scaleless

Scale Type

none

Fillet Characteristics

Vertebrae

42

Color

yellowish-pink

Larval Myotomes

Pre ~ 15-17 Post ~ 23-27

Fish Myotomes

Fillet Myotomes

37-41

Bones in Fillet

No

Species

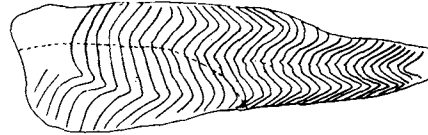
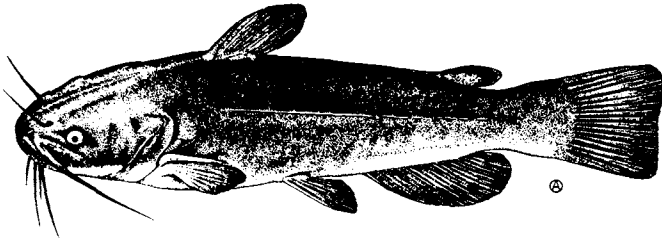
Yellow Bullhead

Brown Bullhead

Ameiurus nebulosus

Common Names: Marbled, speckled or common bullhead, brown, or common catfish, catfish, mudcat, horn-pout, horned, common or bull pout, minister, Schuylkill, wooly, red or Sacramento cat

Description: Small fish • Fish usually skinned • May not be filleted, fins may be left attached • Easy to see if dorsal spine cut or pulled • Adipose fin or anal fin removal may be obvious • No ribs before dorsal spine • No scales • If spines left attached, can be identified to species • Difficult to see myotomes ahead of dorsal fin • Lateral line straight and not visible on fillet because of midline • Muscle texture not as firm as channel catfish.



External Characteristics

Record Weight

7 lbs. 1 oz.

Typical Lengths (In.)

8-14

No. of Ribs

~ 9

Lateral Line Scales

scaleless

Scale Type

none

Fillet Characteristics

Vertebrae

38-43

Color

yellowish-pink

Larval Myotomes

Pre ~ 15-17 Post ~ 23-27

Fish Myotomes

38-44

Fillet Myotomes

36-37

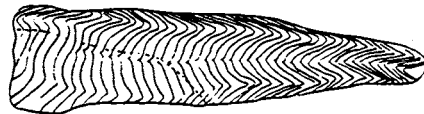
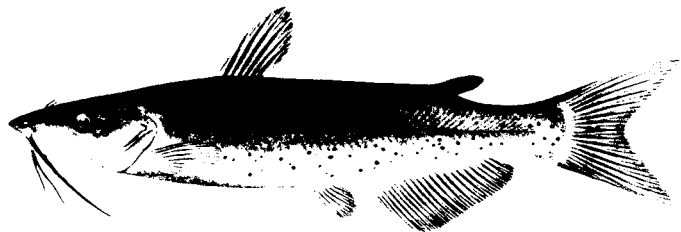
Bones in Fillet

No

Species

Brown Bullhead

Description: Fish usually skinned • May not be filleted, fins may be left attached • Easy to see if dorsal spine cut or pulled • Adipose fin or anal fin removal may be obvious • No ribs prior to dorsal spine • No scales • Difficult to see myotomes ahead of dorsal fin • Lateral line straight and not visible on fillet because of midline • Higher amounts of fat pre-dorsal and near adipose fin • Sometimes meat above eyes collected • Larger fish, may be steaked.



Common Names: Spotted, blue, sand eel, white, river, silver, speckled, government, forked tail, lake, Great Lakes or willow catfish or cat, fiddler, sharpies, blue fulton, squealer or chucklehead.

Channel Catfish

Ictalurus punctatus

External Characteristics

Record Weight
58 lbs.

Typical Lengths (in.)
12-20

No. of Ribs
~ 9

Lateral Line Scales
scaleless

Scale Type
none

Fillet Characteristics

Vertebrae
46-48

Color
yellowish

Larval Myotomes
Pre 19-23 Post 26-31

Fish Myotomes
45-49

Fillet Myotomes
45-48

Bones in Fillet
No

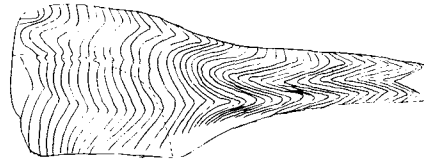
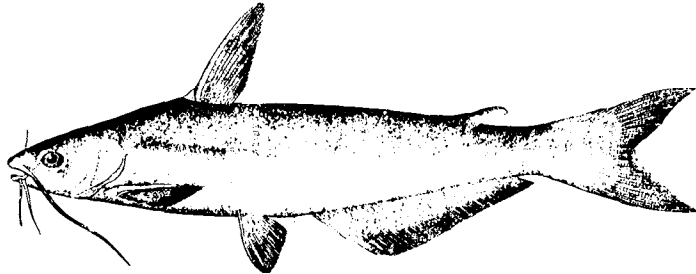
Species
Channel Catfish

Blue Catfish

Ictalurus furcatus

Common Names: Catfish, bluecat, white or blue fulton, fulton, great blue, Mississippi, white, blue channel or forktail cat, chucklehead, humpback, highfin blue, Arkansas cat, boarder or mad tom

Description: Fish usually skinned • May not be filleted, fins may be left attached • Easy to see if dorsal spine cut or pulled • Adipose fin or anal fin removal may be obvious • No ribs before dorsal spine • No scales • Difficult to see myotomes ahead of dorsal fin • Lateral line straight and not visible on fillet because of midline • High amount of fat pre-dorsal and near adipose fin • Sometimes meat above eyes collected • Larger fish may be steaked.



External Characteristics

Record Weight
100 lbs. 8 oz.

Typical Lengths (in.)
12-20

No. of Ribs
~ 9

Lateral Line Scales
scaleless

Scale Type
none

Fillet Characteristics

Vertebrae
51-53

Color
yellowish

Larval Myotomes
Pre 19-21 Post 31-34

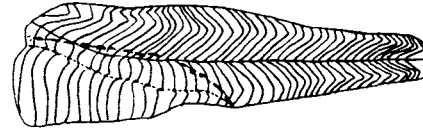
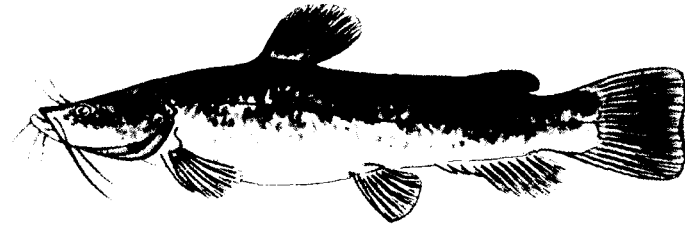
Fish Myotomes
50-55

Fillet Myotomes
48-52

Bones in Fillet
No

Species
Blue Catfish

Description: Can be a large fish • Fish usually skinned • May not be filleted, fins may be left attached • Easy to see if dorsal spine cut or pulled • Adipose fin or anal fin removal may be obvious • No ribs prior to dorsal spine • No scales • Difficult to see myotomes ahead of dorsal fin • Lateral line straight and not visible on fillet because of midline • Higher amounts of fat pre-dorsal and near adipose fin • Sometimes meat above eyes collected • Larger fish may be steaked • Has a very large stomach muscle which may be collected separately.



Common Names: Yellow, mud, shovelhead, morgan, appaloosa, Mississippi, Russian, granny or pieded catfish or cat, flatbelly, bean eye, tabby, goujon or bashaw

Flathead Catfish *Pylodictis olivaris*

External Characteristics

Record Weight

98 lbs

Typical Lengths (In.)

16-24

No. of Ribs

Lateral Line Scales

scaleless

Scale Type

none

Fillet Characteristics

Vertebrae

50-51

Color

yellowish

Larval Myotomes

Pre 22-24 Post 27-30

Fish Myotomes

49-54

Fillet Myotomes

43-46

Bones in Fillet

No

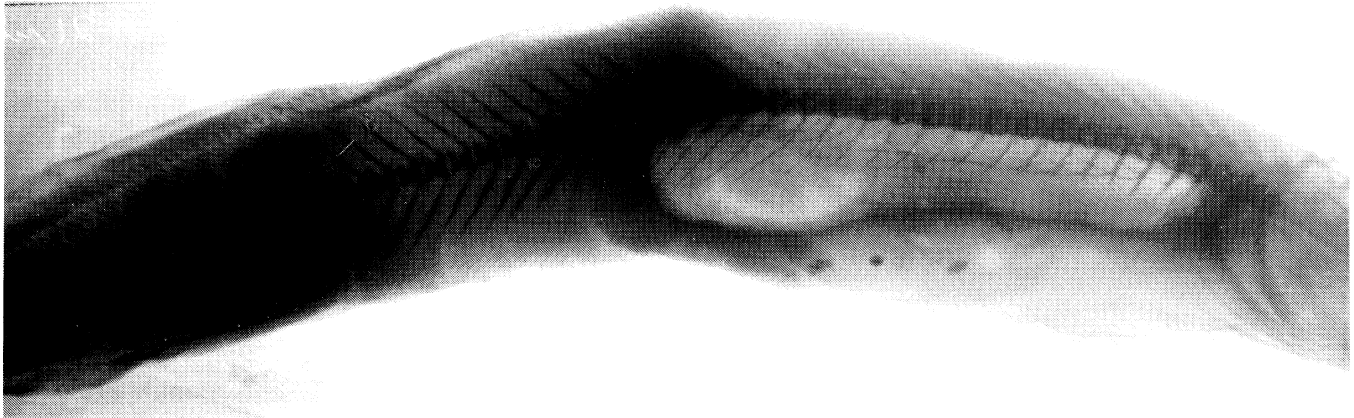
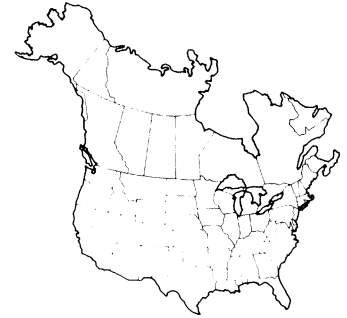
Species

Flathead Catfish

Codfish Family — *Gadidae*

Most members of this fish family are ocean-dwellers. One species lives in the freshwaters of North America. They have an elongate body with cycloid scales. Their head is very large characterized by a single, long barbel at the tip of the chin. The dorsal fin is long and soft and may be divided into two or three parts. The cods are important food fishes. Their jaws and vomer are equipped with numerous small teeth in wide bands. The cods are bottom-dwelling fish which like cover and feed on small fish and insects.

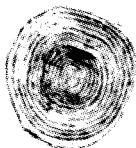
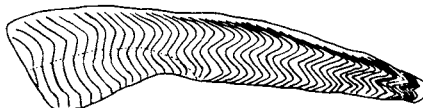
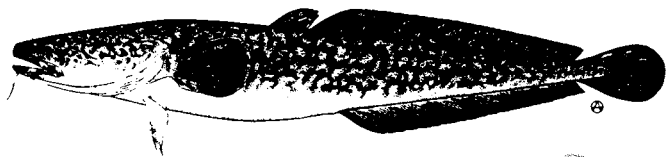
Species found in North America is **burbot**, *Lota lota* and **Atlantic tomcod**, *Microgadus tomcod*.



Burbot

Description: Long fish • Lateral line straight and not visible on fillet because of midline • Found in northern United States and Canada • Fin placement may be obvious on fillet • Scales differ only in size and all are represented by the scale shown below.

Scales: Small • Circular • Central focus • No radii • Concentric circuli in concentric circles • Only fish covered whose scales don't overlap • May think fish not scaled • Lateral line scales smaller than other scales, opening not found in scale.



5A

Length 179mm • ROM #30631 • Magnification 40X

Common Names: Ling, eelpout, loche, freshwater cod, maria, methy, lush, lawyer, dogfish, cusk, spineless cat, mother eel or sand ling

Burbot *Lota lota*

External Characteristics

Record Weight
18 lbs. 4 oz.

Typical Lengths (In.)
12-18

No. of Ribs
~ 21

Lateral Line Scales
none

Scale Type
cycloid

Fillet Characteristics

Vertebrae
50-66

Color
whitish

Larval Myotomes
not found

Fish Myotomes
51-62

Fillet Myotomes
48-54

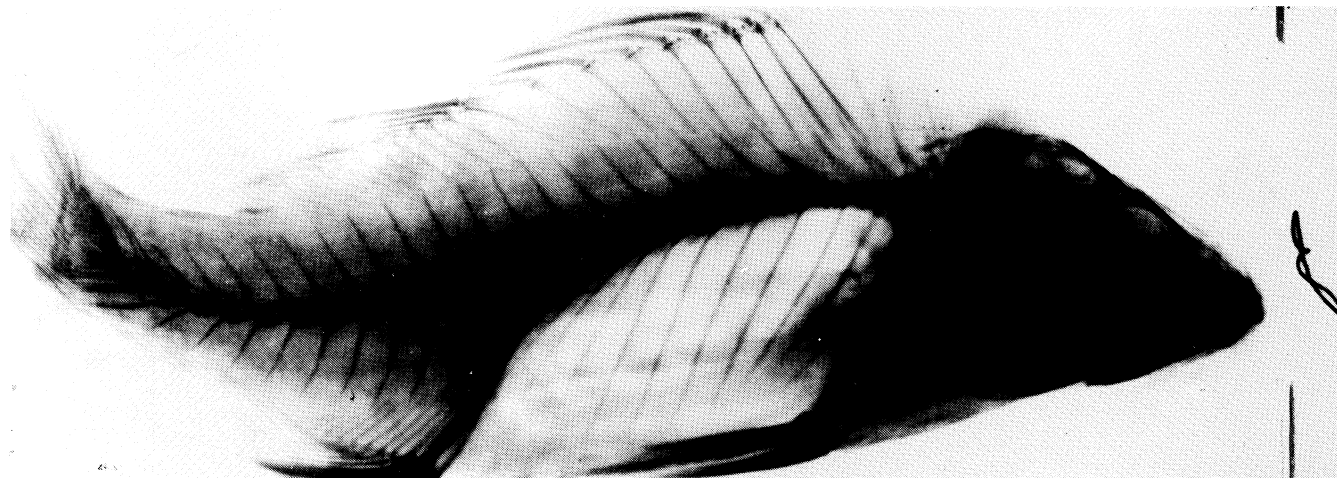
Bones in Fillet
No

Species
Burbot

Temperate Bass Family — *Percichthyidae*

This family has two dorsal fins with stout spines, a complete lateral line, ctenoid scales (some cycloid) and well-developed jaws containing numerous teeth. They feed mostly in the top layer of water on small fishes and insects. They have a small number of myotomes (24), lower than all species except the freshwater drum. The meat is well liked, and fish such as stripers can reach a large size. The number of fish over a certain size may be restricted, as may undersized fish.

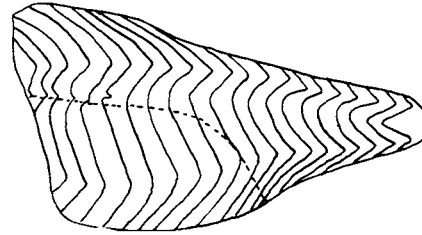
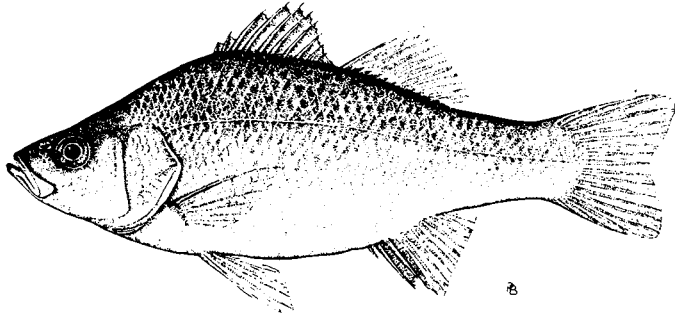
Species found in North America are **striped bass**, *Morone saxatilis*; **white bass**, *Morone chrysops*; **yellow bass**, *Morone mississippiensis*; **white perch**, *Morone americana*.



Yellow bass

Description: Small fish • May be scaled and not filleted • Myotomes few and evenly spaced • Lateral line straight and not visible on fillet because of midline.

Scales: Average • Anterior corners sharply squared • Lateral edge flattened • Posterior edge curved • Focus posterior • Radii (8-20) anterior field • Long and pointed ctenii at posterior edge • Circuli heavier on lateral edges, not as heavy as for white bass • Anterior margin fairly straight • Example of scales shown for white bass.



Common Names: Silver, gray, blue-nose or sea perch, bass, narrow-mouthed bass, perch, gatte or stiffback

White Perch *Morone americana*

External Characteristics

Record Weight

4 lbs. 12 oz.

Typical Lengths (In.)

6-8

No. of Ribs

~ 9

Lateral Line Scales

46-51

Scale Type

ctenoid

Fillet Characteristics

Vertebrae

24-25

Color

pinkish-white

red midline

Larval Myotomes

Pre 12-13 Post 12-13

Fish Myotomes

23-25

Fillet Myotomes

23-25

Bones in Fillet

No

Species

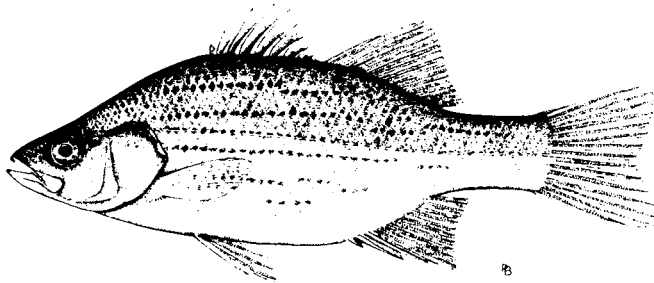
White Perch

White Bass

Morone chrysops

Common Names: Silver, sand, striped, gray, striped lake or black-striped bass, streaker, linesides or barfish

Description: Small fish • May be scaled and not filleted • Myotomes few and evenly spaced • Lateral line straight and not visible on fillet because of midline.



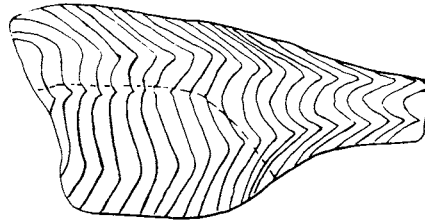
1



2



3



4



5B

Length 106mm • ROM #24483 • Magnification 8-20X

External Characteristics

Record Weight
5 lbs. 14 oz.

Typical Lengths (In.)
10-12

No. of Ribs
~ 9

Lateral Line Scales
52-60

Scale Type
ctenoid

Fillet Characteristics

Vertebrae
24-25

Color
pinkish-white
red midline

Larval Myotomes
Pre 11-13 Post 7-9

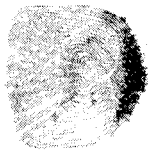
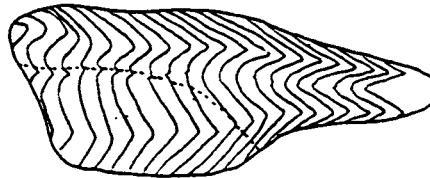
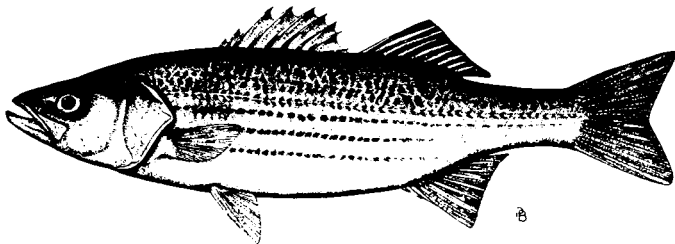
Fish Myotomes
20-26

Fillet Myotomes
22-26

Bones in Fillet
No

Species
White Bass

Description: Can be large fish • Lateral line straight and not visible on fillet because of midline • Myotomes few and evenly spaced • Length and height not as great as white bass • No other large freshwater fish has so few myotomes.



1



2



3



4



5B

Length 112mm • ROM #21670 • Magnification 8-16X • Cteni lines can be used to differentiate striped bass and white bass • Page 137

Common Names: Striper bass, linesider, roller, rockfish, rock, greenhead or squid hound

Striped Bass

Morone saxatilis

External Characteristics

Record Weight
66 lbs.

Typical Lengths (in.)
16-20

No. of Ribs
~ 9

Lateral Line Scales
50-72

Scale Type
ctenoid

Fillet Characteristics

Vertebrae
24-25

Color
pinkish-white
red midline

Larval Myotomes
not found

Fish Myotomes
24-25

Fillet Myotomes
24-25

Bones in Fillet
No

Species
Striped Bass

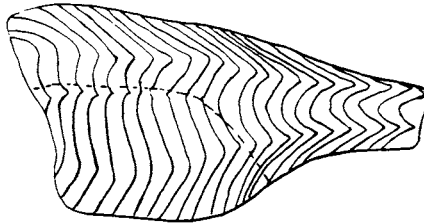
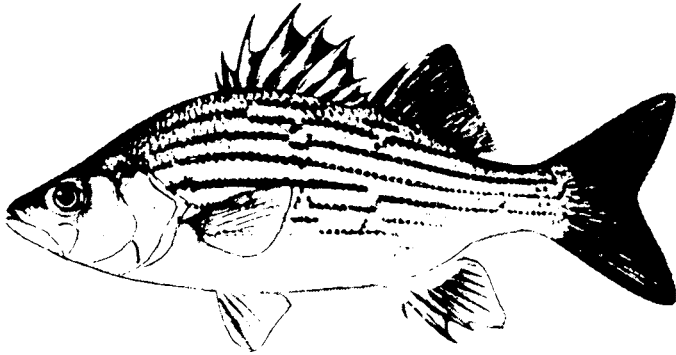
Yellow Bass

Morone mississippiensis

Common Names: Gold, sand or brassy bass, barfish, yellow perch, striped jack, streaker, stripe or rock fish

Description: Small fish • May be scaled and not filleted • Myotomes few and evenly spaced • Lateral line straight and not visible on fillet because of midline.

Scales: Average • Anterior corners squared • Lateral edge flattened • Posterior edge curved • Posterior focus
• Radii (5-12) in anterior field • Long pointed ctenii at posterior edge • Circuli heavier on lateral margins • Anterior margins fairly straight • Example of scales shown for white bass.



External Characteristics

Record Weight
2 lbs. 2 oz.

Typical Lengths (in.)
7-10

No. of Ribs
~ 9

Lateral Line Scales
49-52

Scale Type
ctenoid

Fillet Characteristics

Vertebrae
24-25

Color
pinkish-white

Larval Myotomes
Pre 11-13 Post 7-9

Fish Myotomes
23-24

Fillet Myotomes
24-25

Bones in Fillet
No

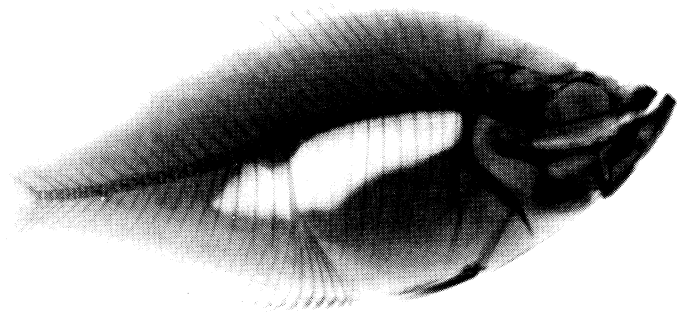
Species
Yellow Bass

Sunfish Family — *Centrarchidae*

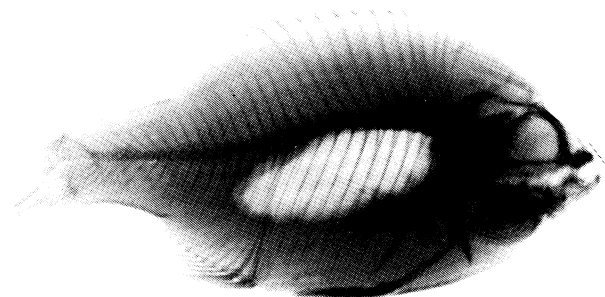
The sunfish occur naturally only in the freshwaters of North America. This family prefers warmer waters. Their mouths contain bands of villiform teeth on the jaws, vomer, palatines and tongue in most species. The dorsal fins of this family consist of a spinous portion and a soft-rayed portion, to a varying degree jointed as one fin. The family has ctenoid scales; some cycloid scales from fillet cuts are found. All species are predators that like to remain near submerged objects. This family tends to feed in the upper layers of water. The sunfish family also includes black basses and crappies. Bag limits on large/smallmouth bass are lower than limits on crappie, and bass size may also be restricted. Some anglers fillet extra bass or undersize bass and say they are crappie. These fillets can be differentiated.



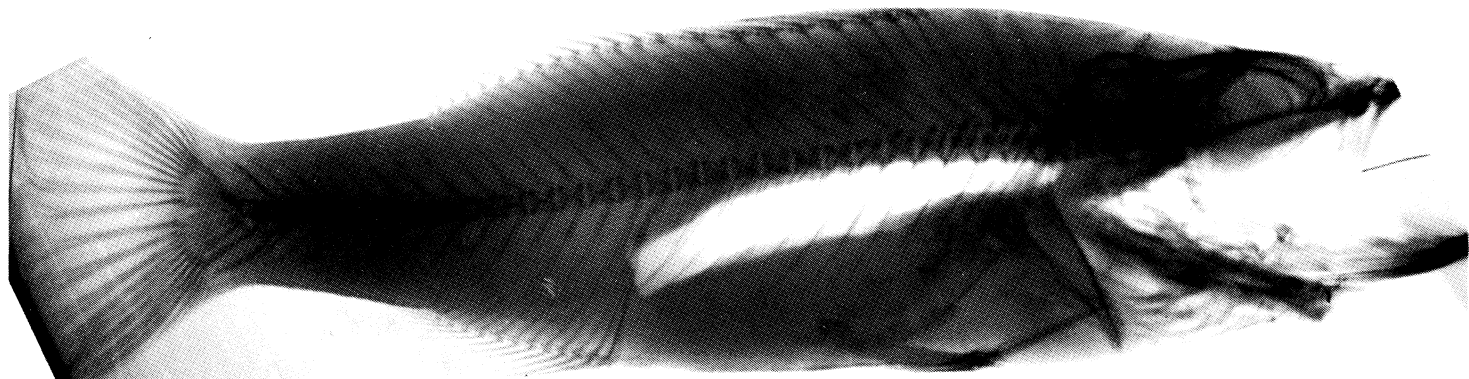
Species found in North America are **Sacramento perch**, *Archoplites interruptus*; **fler**, *Centrarchus macropterus*; **black crappie**, *Pomoxis nigromaculatus*; **white crappie**, *Pomoxis annularis*; **Roanoke bass**, *Ambloplites rupestris*; **Ozark bass**, *Ambloplites constellatus*; **shadow bass**, *Ambloplites ariommus*; **mud sunfish**, *Acantharchus pomotis*; **banded sunfish**, *Enneacanthus obesus*; **bluespotted sunfish**, *Enneacanthus gloriosus*; **blackbanded sunfish**, *Enneacanthus chaetodon*; **largemouth bass**, *Micropterus salmoides*; **Suwannee bass**, *Micropterus notius*; **spotted bass**, *Micropterus punctulatus*; **Guadalupe bass**, *Micropterus treculi*; **redeye bass**, *Micropterus coosae*; **smallmouth bass**, *Micropterus dolomieu*; **warmouth**, *Lepomis gulosus*; **green sunfish**, *Lepomis cyanellus*; **bantam sunfish**, *Lepomis symmetricus*; **spotted sunfish**, *Lepomis punctatus*; **bluegill**, *Lepomis macrochirus*; **redear sunfish**, *Lepomis microlophus*; **pumpkinseed**, *Lepomis gibbosus*; **longear sunfish**, *Lepomis megalotis*; **dollar sunfish**, *Lepomis marginatus*; **redbreast sunfish**, *Lepomis auritus*; **orangespotted sunfish**, *Lepomis humilis*.



White crappie

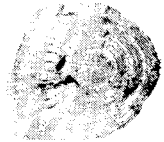
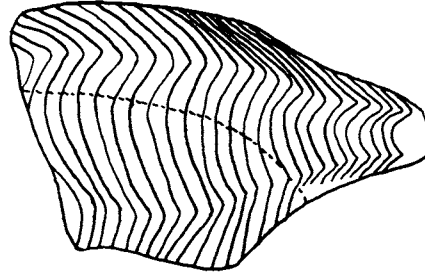
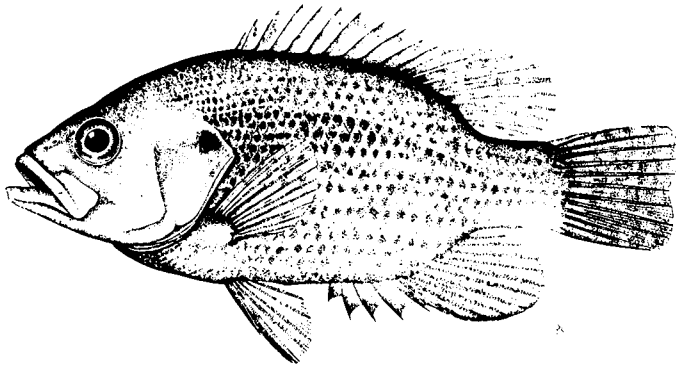


Pumpkinseed



Largemouth bass

Description: Smaller fish, may get over 2 pounds • May be skinned and not filleted • Lateral line arched and may be visible on fillet • Height versus length very important for identifying sunfish.



1



2



3



4



5B

Length 199mm • ROM #61752 • Magnification 5-12

Common Names: Redeye bass, redeye, goggle eye or garguncle

Rock Bass *Ambloplites rupestris*

External Characteristics

Record Weight
3 lbs.

Typical Lengths (In.)
6-10

No. of Ribs
~ 12

Lateral Line Scales
37-51

Scale Type
ctenoid

Fillet Characteristics

Vertebrae
29-30

Color
yellowish

Larval Myotomes
Pre 12-13 Post 16-18

Fish Myotomes
28-32

Fillet Myotomes
29-31

Bones in Fillet
No

Species
Rock Bass

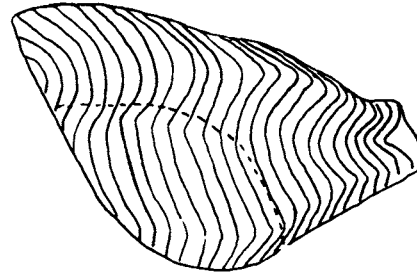
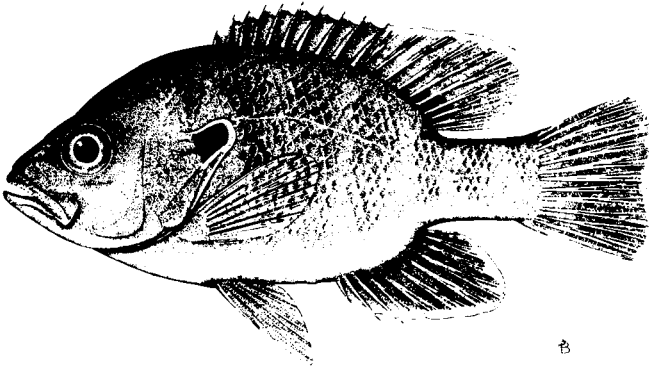
Green Sunfish

Lepomis cyanellus

Common Names: Blue, buffalo, bluespotted sunfish, black, branch, pond, shade and green perch, perch, sand, rock or blue bass, redeye, slicks, goggle-eye, ricefield slick, rubbertail, sunperch or sunfish

Description: Small fish • May be skinned and not filleted • Lateral line arched and may be visible on fillet • Height versus length very important for identifying sunfish.

Scales: Average • Rounded anterior corners • Anterior edge fairly straight • Focus slightly posterior • 5-15 anterior radii • Circuli much heavier on posterior field • Anterior field very fine circuli • Most scales without ctenii • Ctenii found, not deep • Example of scales shown for bluegill.



External Characteristics

Record Weight

2 lbs. 7 oz.

Typical Lengths (In.)

4-6

No. of Ribs

~ 12

Lateral Line Scales

40-50

Scale Type

ctenoid

Fillet Characteristics

Vertebrae

28-30

Color

whitish

Larval Myotomes

Pre 11-13 Post 15-17

Fish Myotomes

27-28

Fillet Myotomes

26-28

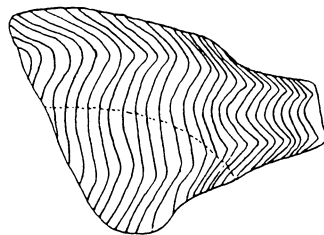
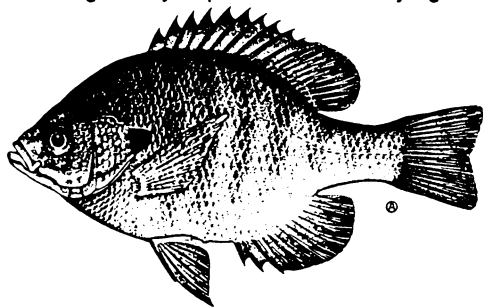
Bones in Fillet

No

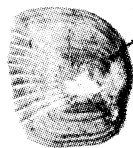
Species

Green Sunfish

Description: Small fish • May be skinned and not filleted • Lateral line arched and may be visible on fillet • Height versus length very important for identifying sunfish.



1



2



3



4



5B

Length 126mm • ROM #30791 • Magnification 3-8X • If the ribs are left in the fish, it can be seen that the air bladder and stomach are the same length; in crappie, the air bladder is longer than the stomach.

Common Names: Blue or redbreasted sunfish, common bluegill, sunfish, bream bluegill or coppernose bream, roach, pond, blue, gold, pond or sun perch, copperbelly, copperhead, dollardee, yellowbelly, pumpkinseed, plumb granny, blue joe, chainside or baldface

Bluegill

Lepomis macrochirus

External Characteristics

Record Weight

4 lbs. 12 oz.

Typical Lengths (In.)

7-9

No. of Ribs

~ 12

Lateral Line Scales

40-44

Scale Type

ctenoid

Fillet Characteristics

Vertebrae

28-30

Color

whitish

Larval Myotomes

Pre 12-15 Post 15-17

Fish Myotomes

28-35

Fillet Myotomes

21-28

Bones In Fillet

No

Species

Bluegill

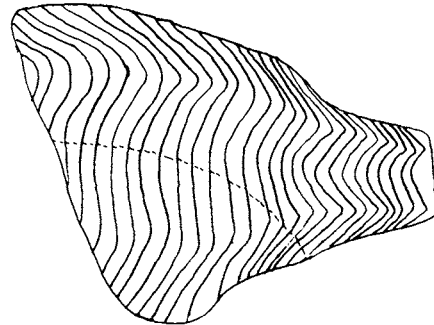
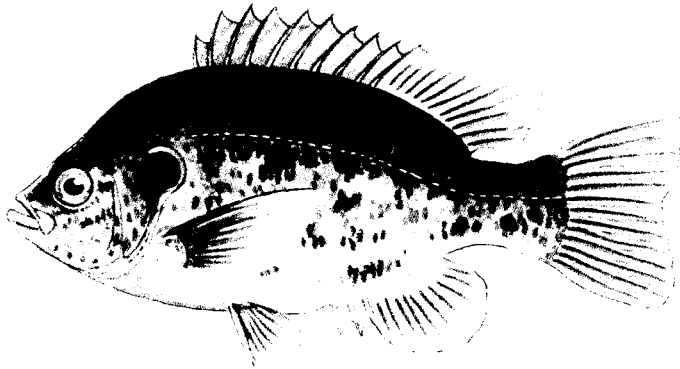
Redear Sunfish

Lepomis microlophus

Common Names: Fire cracker, shellcracker, stump-knocker, strawberry, G.I., tupelo, Texas-improved or yellow bream

Description: Small fish • May be skinned and not filleted • Lateral line arched and may be visible on fillet • Height versus length very important for identifying sunfish • If the ribs are left in the fish, it can be seen that the air bladder and stomach are the same length; in crappie, the air bladder is longer than the stomach.

Scales: Average • Anterior corners rounded • Anterior edge fairly straight • Focus posterior • 5-8 anterior radii • Short ctenii in narrow band • Wider circuli in posterior field • Circuli end at narrow band of ctenii • Example of scales shown for bluegill.



External Characteristics

Record Weight
4 lbs. 13 oz.

Typical Lengths (In.)
7-9

No. of Ribs
~ 12

Lateral Line Scales
39-44

Scale Type
ctenoid

Fillet Characteristics

Vertebrae
30

Color
whitish-yellow

Larval Myotomes
Pre 11-13 Post 15-17

Fish Myotomes
29-30

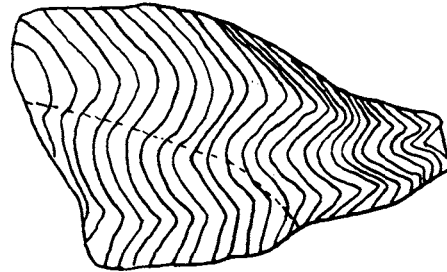
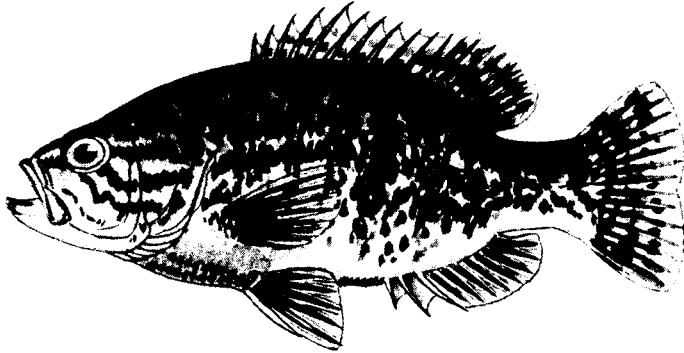
Fillet Myotomes
28

Bones in Fillet
No

Species
Redear Sunfish

Description: Small fish • May be skinned and not filleted • Lateral line arched and may be visible on fillet • Height versus length very important for identifying sunfish.

Scales: Average • Anterior corners rounded • Anterior edge fairly straight • Focus posterior • 6-12 anterior radii • Short ctenii in narrow band • Posterior curved • Heavy posterior circuli • Circuli end at ctenii • Example of scales shown for bluegill.



Common Names: Wood, rock, weed or mud bass, goggle-eye, stump-knocker, bigmouth, black warmouth, perchmouth bream, strawberry or yawnmouth perch, jugmouth, mud chub, Indian fish, redeye, red-eyed bream, mudgapper, mo-mouth, morgan, molly or open mouth

Warmouth *Lepomis gulosus*

External Characteristics

Record Weight
2 lbs. 7 oz.

Typical Lengths (in.)
6-8

No. of Ribs
~ 11

Lateral Line Scales
35-46

Scale Type
ctenoid

Fillet Characteristics

Vertebrae
28-30
Color
whitish

Larval Myotomes
Pre 10-11 Post 19

Fish Myotomes
29-30

Fillet Myotomes
25-28

Bones in Fillet
No

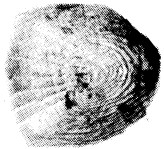
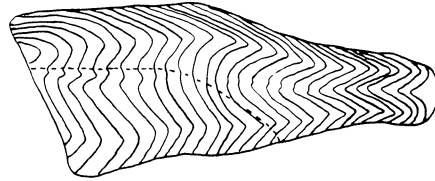
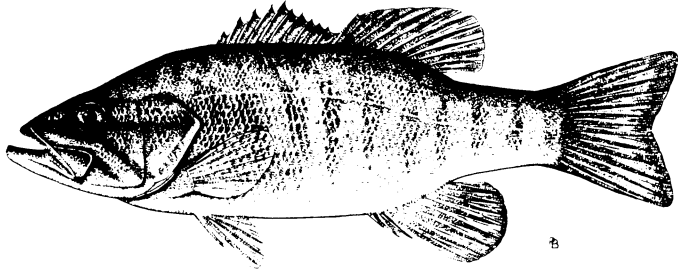
Species
Warmouth

Smallmouth Bass

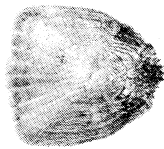
Micropterus dolomieu

Common Names: Oswego, small-mouthed black, black, brown, swago, streaked-cheek, river, gold, trout or green bass, green, white, brown or mountain trout, jumper, bronzeback or smallie

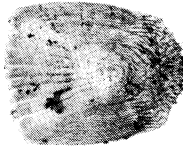
Description: May be skinned or scaled and not filleted • Arched lateral line may be visible on fillet • Difference in myotomes at top of fish compared to crappie • Height of bass fillet not as great as crappie of same length.



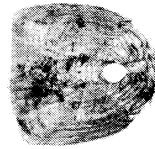
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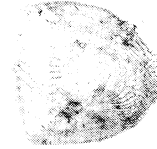
2



3



4



5B

Length 145mm • ROM #38021 • Magnification 7-12X

External Characteristics

Record Weight
11 lbs. 15 oz.

Typical Lengths (In.)
8-15

No. of Ribs
~ 12

Lateral Line Scales
68-78

Scale Type
ctenoid

Fillet Characteristics

Vertebrae
31-33

Color
whitish-gray

Larval Myotomes
Pre 13-16 Post 16-18

Fish Myotomes
29-33

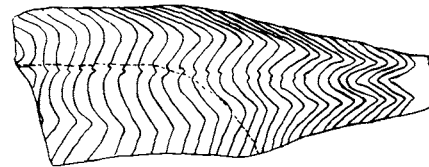
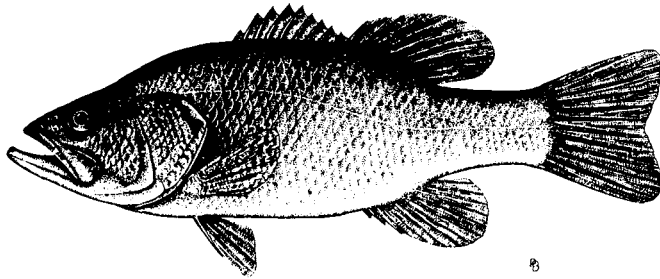
Fillet Myotomes
29-30

Bones in Fillet
No

Species
Smallmouth Bass

Description: May be skinned or scaled and not filleted • Arched lateral line may be visible on fillet • Difference in myotomes at top of fish compared to crappie • Height of bass fillet not as great as crappie of same length • Fillet can be cross-sectioned so difference between largemouth bass and crappie can be determined.

Scales: Average • Anterior corners rounded • Fairly flat anterior margin • Focus posterior • 6-12 anterior radii • Circuli not continuous • Heavier circuli in posterior field • Posterior radii end at ctenii • Ctenii, when present, close together, short tines • See smallmouth for example of scales.



Common Names: Largemouth black, bigmouth, bucketmouth, open-mouth, Welshman, straw, slough, Florida, Oswego, mud, cow, river, lake or green bass, bass, mossback, chub jumper, hog, hawg, speckled hin or green trout

Largemouth Bass

Micropterus salmoides

External Characteristics

Record Weight

22 lbs. 4 oz.

Typical Lengths (In.)

8-18

No. of Ribs

~ 12

Lateral Line Scales

60-68

Scale Type

ctenoid

Fillet Characteristics

Vertebrae

30-33

Color

whitish-gray

Larval Myotomes

Pre 13-16 Post 16-18

Fish Myotomes

29-30

Fillet Myotomes

27-32

Bones in Fillet

No

Species

Largemouth Bass

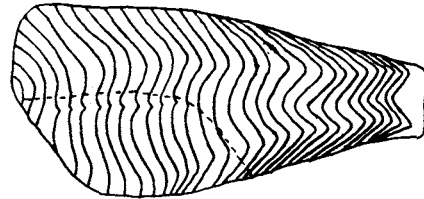
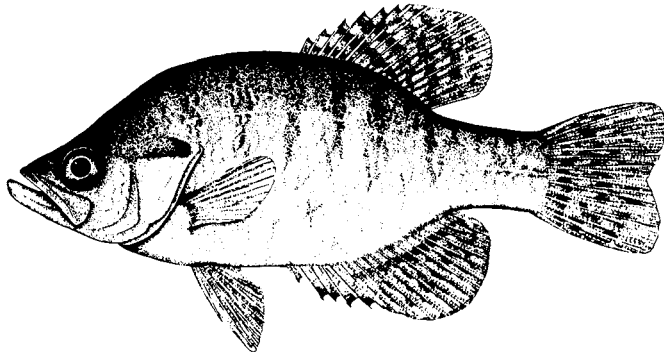
White Crappie

Pomoxis annularis

Common Names: Timber crappie, crappie, crawpie, strawberry, silver, white or calico bass, silver, white, speckled or bridge perch, papermouth, sac-a-lait, barfish, bachelor, newlight, campbellite, John Demon, goldring, goggle eye or shad

Description: May be skinned or scaled on smaller fish • Lateral line arched and may be visible on fillet • Whiter meat than on bass • Difference in myotomes on top of fish compared to bass • Crappie are greater in height than bass of the same length • Fillet can be cross-sectioned so difference between crappie and bass can be determined • Example of scales shown for black crappie • White crappie and black crappie scales used for aging fish are different at the focus. Page 135 • If the ribs are left in the fish, it can be seen that the air supply bladder is longer than the stomach; it is the same length for bluegill.

Scales: Average • Anterior corners rounded • Fairly flat anterior margin • Focus posterior • 8-18 anterior radii • Posterior field, weak ctenii from focus to margin at 60° to 120° angles • Crappie can be differentiated from largemouth bass from their scales • See black crappie for example of scales.



External Characteristics

Record Weight
5 lbs. 3 oz.

Typical Lengths (In.)
8-10

No. of Ribs
~ 12

Lateral Line Scales
34-44

Scale Type
ctenoid

Fillet Characteristics

Vertebrae
30-32
Color
white

Larval Myotomes
Pre 11-13 Post 17-20

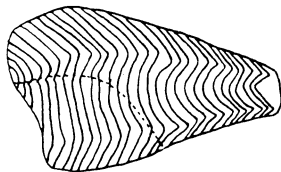
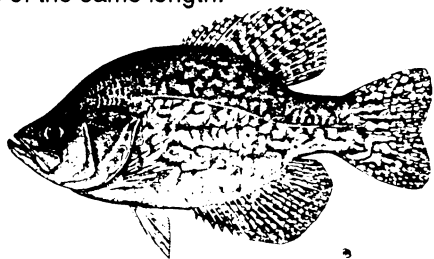
Fish Myotomes
29-33

Fillet Myotomes
28-31

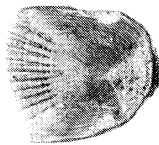
Bones in Fillet
No

Species
White Crappie

Description: May be skinned or scaled on smaller fish • Lateral line arched and may be visible on fillet • Whiter meat than on bass • Difference in myotomes on top of fish compared to bass • Crappie are greater in height than bass of the same length.



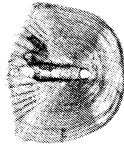
1



2



3



4



5B

Length 143mm • ROM #43014 • Magnification 4-6X • White crappie and black crappie scales used for aging fish are different at the focus • Page 135

Common Names: Crappie, crawpie, back-lick, straw, calico, strawberry, speckled, Oswego, or grass bass, shiner, moonfish, white or Mason perch, specks, slab, tinmouth, bachelor, sac-a-lait, bitterhead, bream and lamplighter

Black Crappie

Pomoxis nigromaculatus

External Characteristics

Record Weight

6 lbs.

Typical Lengths (in.)

7-10

No. of Ribs

~ 12

Lateral Line Scales

36-41

Scale Type

ctenoid

Fillet Characteristics

Vertebrae

31-33

Color

white

Larval Myotomes

Pre 11-13 Post 19-21

Fish Myotomes

29-35

Fillet Myotomes

29-31

Bones In Fillet

No

Species

Black Crappie

Perch Family — *Percidae*

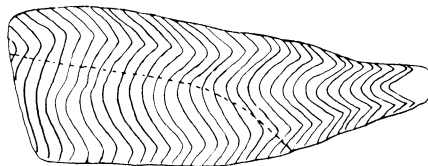
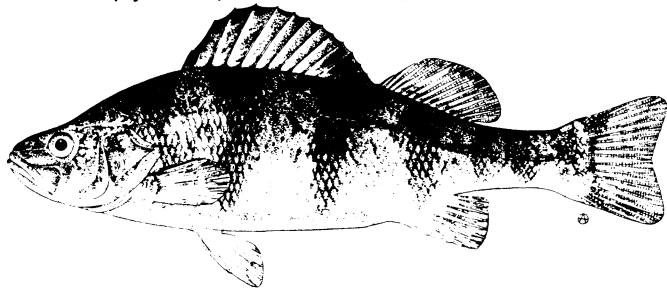
Three groups compose the *Percidae*, five perches, pike perches and darters (omitted). The perches are characterized by a dorsal fin divided into separate spiny and soft-rayed portions. The anal fin bears one or two spines. All species are predaceous and have elongated bodies, have a fat spine on the gill cover, and sharp teeth rimming the mouth. The perch family are primarily deepwater fish that come into shallower water to feed on minnows and other fish. They are considered among the best eating of freshwater fish. One problem that may exist with this family is number and size restrictions for walleye and not for yellow perch. A small walleye can be filleted and “called” a yellow perch. Walleye and sauger can be differentiated from yellow perch.

Species found in North America are **sauger**, *Stizostedion canadense*; **walleye**, *Stizostedion vitreum*; **yellow perch**, *Perca flavescens*.



Yellow perch

Description: Small fish • Arched lateral line may be visible on fillet • Fewer myotomes than walleye or sauger (>40) • If ribs are present, are twice as heavy for perch than for walleye or sauger of same length • Scales more deeply scalloped than for sauger and walleye.



1



2



3



4



5B

Length 163mm • ROM #41732 • Magnification 4-8X

Common Names: Lake, American, ring, redfin, raccoon, coon, Eisenhower, red, ring-tail, ringed, river sand, green, jack or striped perch, perch, convict, coontail, yellow ned, bandit fish or redfin trout

Yellow Perch

Perca flavescens

External Characteristics

Record Weight
4 lbs. 3 oz.

Typical Lengths (In.)
4-10

No. of Ribs
~ 19

Lateral Line Scales
51-61

Scale Type
ctenoid

Fillet Characteristics

Vertebrae
38-41

Color
whitish

Larval Myotomes
Pre 18-21 Post 16-20

Fish Myotomes
34-43

Fillet Myotomes
35-37

Bones in Fillet
No

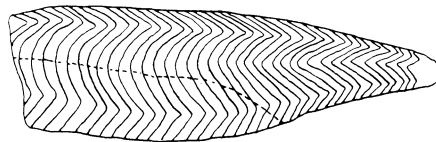
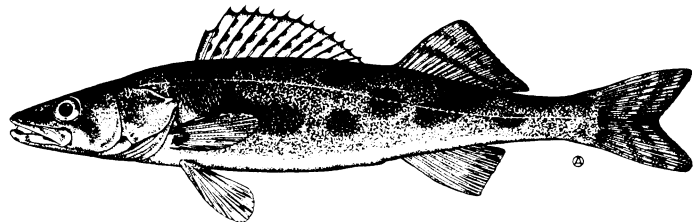
Species
Yellow Perch

Sauger

Stizostedion canadense

Common Names: Sand, blue or grey pickerel, blue or grey perch, sand, blue or grey pike perch, gray, river, spotfin or rattlesnake pike, jack, jack salmon, horsefish, pickering or spotted trout

Description: Arched lateral line may be visible on fillet • More myotomes than yellow perch • If ribs are present, are half as heavy as for yellow perch of same size • Scales not as deeply lobed as yellow perch (<40).



1



2



3



4



5B

Length 210mm • ROM #22433 • Magnification 6-12X • Sauger and walleye scales used for aging fish can be differentiated at the focus • Page 136

External Characteristics

Record Weight

8 lbs. 12 oz.

Typical Lengths (In.)

10-16

No. of Ribs

~ 20

Lateral Line Scales

83-100

Scale Type

ctenoid

Fillet Characteristics

Vertebrae

43-45

Color

whitish-yellow

bright red outside

Larval Myotomes

Pre 19-22 Post 21-24

Fish Myotomes

37-47

Fillet Myotomes

42-44

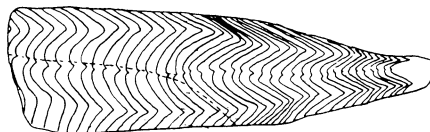
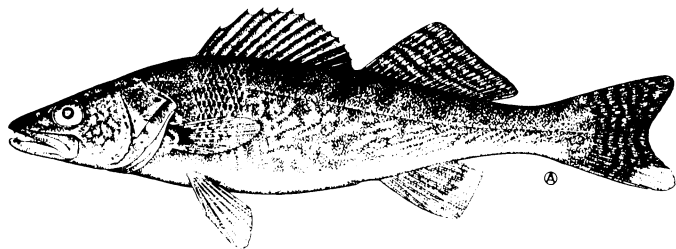
Bones in Fillet

No

Species

Sauger

Description: Arched lateral line may be visible on fillet • More myotomes than yellow perch • If ribs are present, are half as heavy as for yellow perch of same size • Scales not as deeply lobed as yellow perch.



1



2



3



4



5B

Length 150mm • ROM #35176 • Magnification 8-16X • Walleye and sauger scales used for aging fish can be differentiated at the focus • Page 136

Common Names: Yellow walleye, pickerel, pike-perch, yellow, blue, gray or green pike or pike-perch, wall-eyed pike or pickerel, jack salmon, jackfish, dory, glass eye, white eye, marble eye or yellow pickerel

Walleye

Stizostedion vitreum

External Characteristics

Record Weight

25 lbs.

Typical Lengths (in.)

13-20

No. of Ribs

~ 20

Lateral Line Scales

80-108

Scale Type

ctenoid

Fillet Characteristics

Vertebrae

44-48

Color

whitish-yellow
light red outside

Larval Myotomes

Pre 16-21 Post 22-29

Fish Myotomes

38-53

Fillet Myotomes

42-47

Bones in Fillet

No

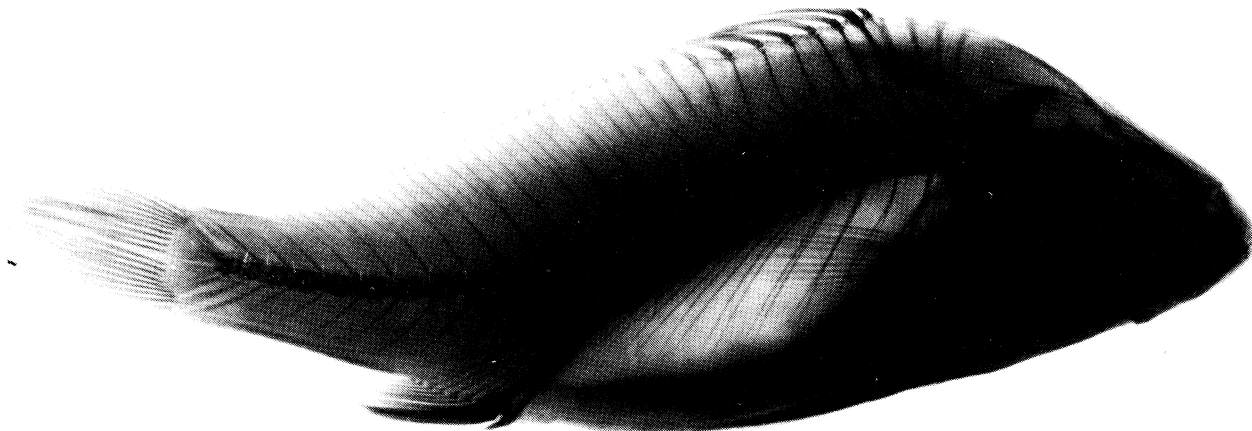
Species

Walleye

Drum Family — *Sciaenidae*

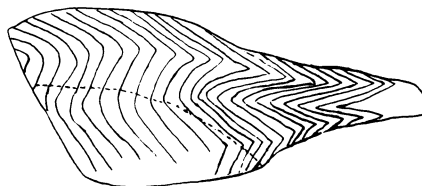
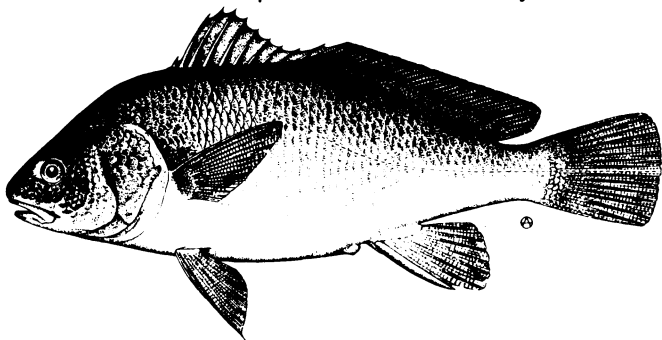
The drum family is primarily marine but occupies coastal areas and sometimes brackish or freshwater where a river enters the sea. The drum is a silvery fish with a highly arched back, and an extension of the lateral line onto the tail. The dorsal fin has a deep notch between the spiny and soft portions. The drum is a bottom feeder grinding its food (snails, crayfish, insects, clams) with a powerful set of flat pharyngeal teeth. The drum possess large ivory-like ear bones within its skull which are unlike those of other freshwater fish. The drum can produce a loud sound by vibrating the walls of its air bladder. Drums have ctenoid scales on head and body.

One species is restricted to the freshwaters of North America, the **freshwater drum**, *Aplodinotus grunniens*.



Freshwater drum

Description: Small number of myotomes for a fish that can be large • Arched lateral line may be visible on fillet • Differs from temperate bass because myotomes narrow greatly near tail.



1



2



3



4



5B

Length 212mm • ROM #55489 • Magnification 4-6X

Common Names: Freshwater river, sheepshead or lake drum, sunfish, silver or gray bass, grunter, white or gray perch, croaker, goo, crocus, thunderpumper, grunt, campbellite, jewel-head, bubbler or grinder

Freshwater Drum *Aplodinotus grunniens*

External Characteristics

Record Weight

54 lbs. 8 oz.

Typical Lengths (in.)

14-20

No. of Ribs

~ 9

Lateral Line Scales

48-53

Scale Type

clenoid

Fillet Characteristics

Vertebrae

24

Color

whitish

red midline

Larval Myotomes

Pre 10-14 Post 9-11

Fish Myotomes

25

Fillet Myotomes

23-25

Bones in Fillet

No

Species

Freshwater Drum

SOLVING POTENTIAL PROBLEMS FACED IN WILDLIFE FORENSICS

With the facilities available for fish production and the illegal overharvesting of wild species, violators are selling wild fish as domestically raised fish. Can wild fish be differentiated from domestic fish? Fish diets are the key to this problem and are used to separate these fish. Fatty acid comparisons of muscle segments using gas chromatography can answer this important question (Suzuki et. al. 1986, Jahncke et. al. 1988 and Villarreal 1992).

Many families of fish can be identified by their fillets; to identify them to a species, other characteristics should be examined. Fish fillets pick up scales like mammal meats pick up hair and avian meats pick up feathers. If you identify a fillet, and the scale differs from the fillet, this is possible because of fish-cleaning benches. If the scale matches the fillet, great. Several species of fish scales were examined with a scanning electron microscope to see if species can be differentiated using the scales used for aging fish.

Species examined were northern pike and muskellunge, walleye, sauger and saugeye, white bass, striped bass and their hybrid the wiper, white crappie and black crappie. We examined a scale to find differences, then five additional fish were viewed to see if this feature was consistent. Scales were taken from Nebraska fish so they may vary from fish taken in other locations. These are the differences found in Nebraska.

For northern pike and muskellunge, works by Crossman and Casselman, 1969, and Casselman et. al, 1986, were useful in separating these species.

Key features for segregation of scales for muskellunge, white crappie and black crappie, walleye and sauger are based upon the focal point of the scale, **Figures 6 and 7**. White bass and striped bass rely upon the cteni fragments for separation, **Figure 8**.

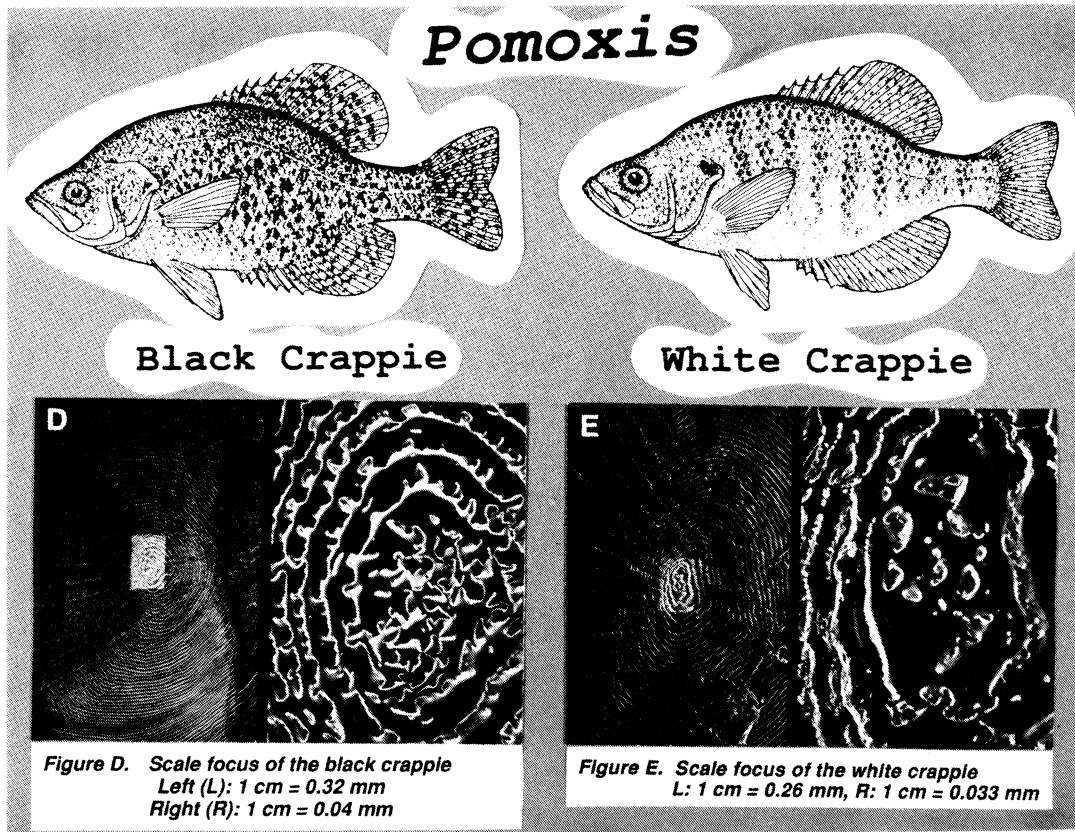


Figure 6. The focus of the scale separates black crappie and white crappie.

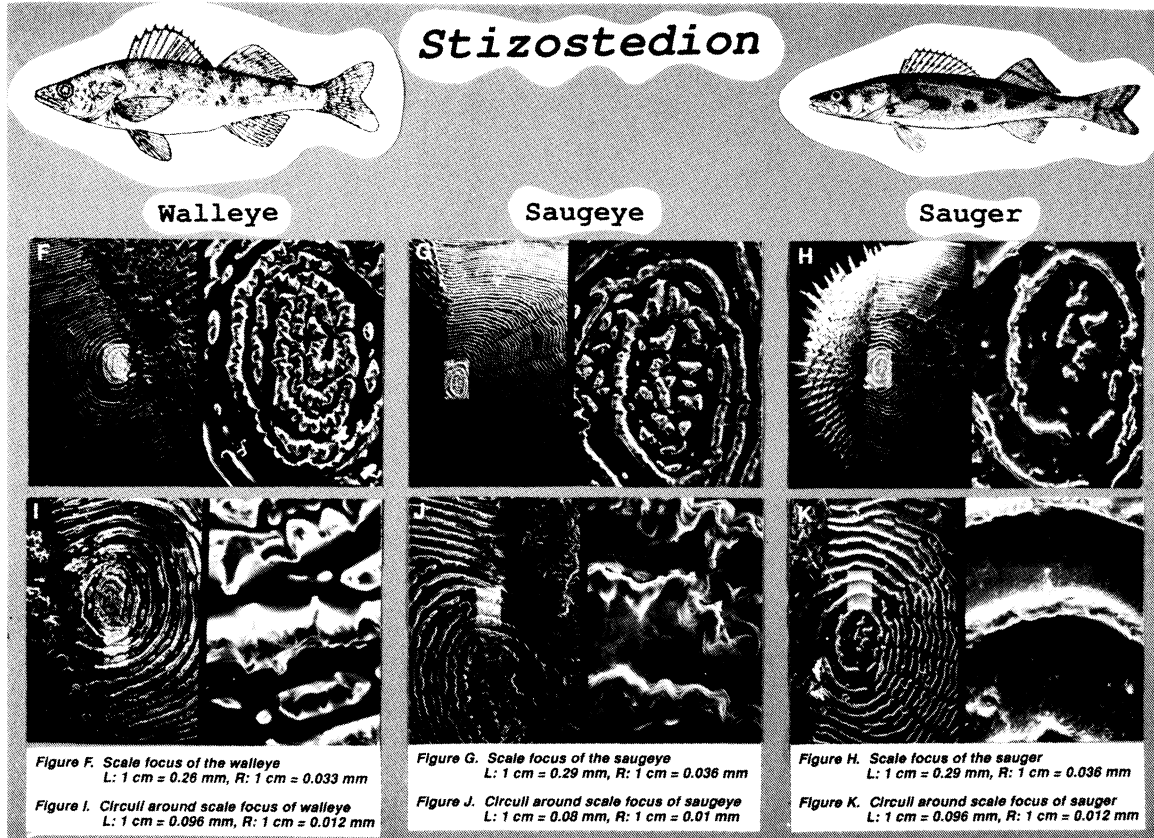


Figure 7. The focus of the scale and the circuli around the focus separates walleye and sauger.

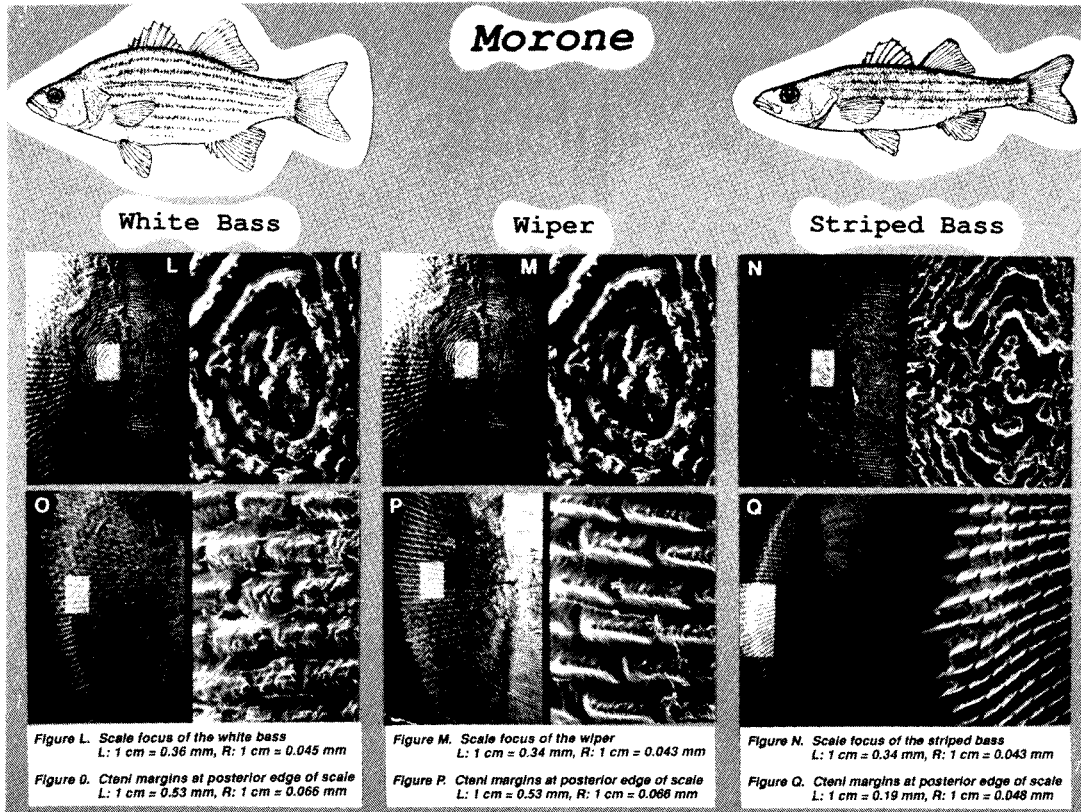


Figure 8. The focus of the scale is similar, the difference is the length of the cteni margins on the posterior edge of the scale. White bass can be different from a wiper and striped bass, but wipers not from striped bass.

Northern Pike and Muskellunge

Identification of *Esocides* to species is difficult, yet frequently possible. Muskellunge can be distinguished from northern pike if the dorsal aorta or Y-bones are examined. In addition, scales can be used if they are present. In a skinned fish with the head removed, identification can be made by examining the dorsal aorta lying against the vertebra just anterior to the pelvic fins. In northern pike, the aorta is straight and in the muskellunge it is curved (**Figure 9**).

If the fish is filleted, examine the fillet for Y-bones. (Caution! Y-bones have variation from head towards tail, use Y-bones near head for true results.) The length of the dorsal rami is about as long as the ventral rami in muskellunge, but the ventral rami is longer in the northern pike (**Figure 10**). When comparing fillets whose dimensions suggest the host fishes from which they came were about the same size, the shape of the Y-bones also can be used to distinguish the two species. The Y-bones of northern pike are finer and noticeably curved (**Figure 10**).

When scales are present, the focus of the scale when viewed under a microscope, also can assist in identification (**Figure 11**). The muskellunge scale's focus is visibly more open than the northern pike's.

As additional identification, muskellunge scales have a more uniform width to height shape while northern pike

scales are noticeably taller than wide (**Figure 11**). Length versus width ranges from 1.77-1.98 in northern pike and 1.41-1.49 in muskellunge.

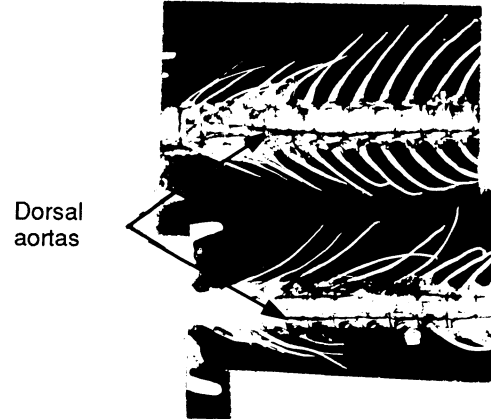
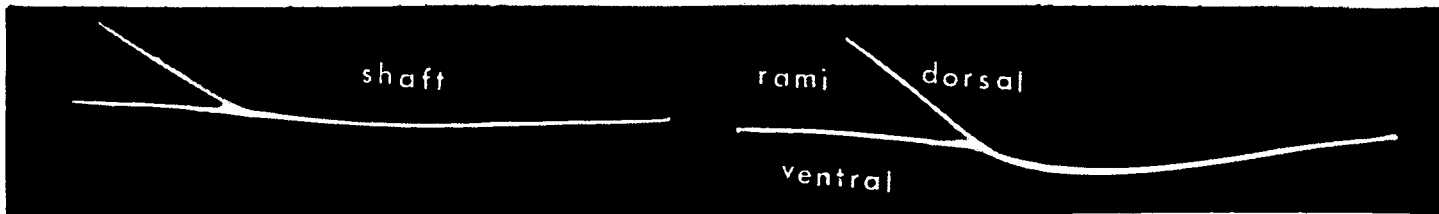


Figure 9. Ventral view of the anterior portion of the axial skeleton of muskellunge (top) showing curved path of groove for dorsal aorta. Ventral view of the anterior portion of the axial skeleton of northern pike (bottom) showing straight path of groove for dorsal aorta. (Permission from E. Crossman from 1969 article from J. Fish. Res. Bd. Canada 26 Page 176 for the above and the next two figures).



Caution! Y-bones have variation from head towards tail, only use Y-bones near head for best results.

Figure 10. Y-bones from muskellunge (left) and northern pike (right).

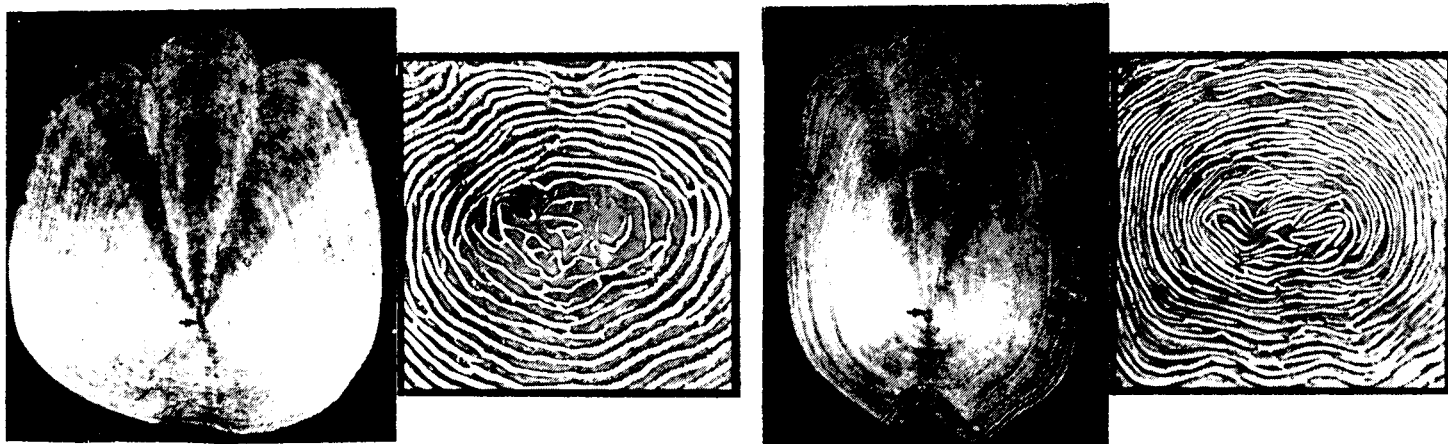


Figure 11. Scale from mid-lateral region of muskellunge (left) and northern pike (right).

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APPENDIX I

Identification Of Fish Fillets By Use Of Cross-Sections

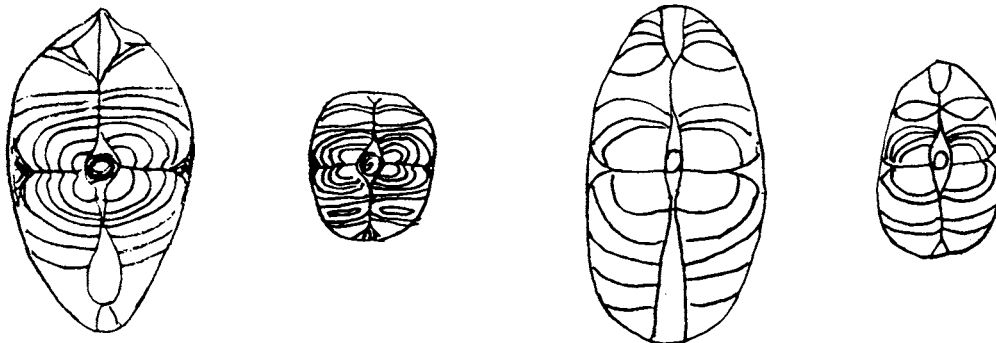
In identifying a fish fillet, the process of elimination can be very important. Fillet color, fillet shape, myotomes, bone placement and scales are all useful. Cross-sectioning can also be a helpful tool for examination of fillets or pieced fillets for identifying species.

The speed and endurance of a fish is different from species to species and is reflected in the muscle structure. The fillet shows external myotomes (myomeres) which will vary among fish families. A cross-section will reveal the internal myotomes which don't resemble the external myotomes. These structures can also be a distinct aid in species identification.

Blin et. al. 1953, sampled cross-sectioned fillets just behind head, at the anus and midway between the anus and the tail to separate several saltwater species. Freshwater fish can also be identified through application of this technique. In cycloid fish (trout, salmon and pike), the section prior to the anus contains bones (intermuscular) in the fillet

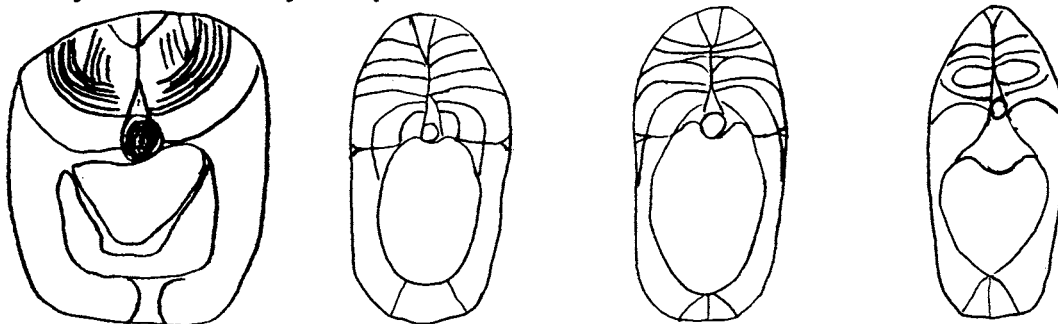
other than the ribs. The tail section behind the anus does not have these bones. All ctenoid fish studied have no bones other than ribs and vertebrae. Note that some ctenoid fish may possess cycloid scales, especially toward the head, but a cycloid scale doesn't necessarily mean a cycloid fish.

Problems in forensics can involve closely related species or similar species when there is a distinction between bag limits and legal size restrictions. Walleye may have size restrictions and the daily bag is much less between them and yellow perch. When yellow perch are suspected of being walleye, the cross-sections may be used to aid in identification. This difference can be compared at the anus and between anus and tail for walleye and yellow perch (**Figure 12**). For pike (*Esox*) and gar (*Lepisosteidae*), the section near the head is obviously different from the other species examined. This difference is shown (**Figure 13**) where a northern pike, yellow perch, largemouth bass and white bass are presented.



[A meat slicer (1/8" slice) and a frozen fish provides the best samples.]

Figure 12. Walleye fillet versus a yellow perch fillet cross-sectioned at the anus and between anus and tail.



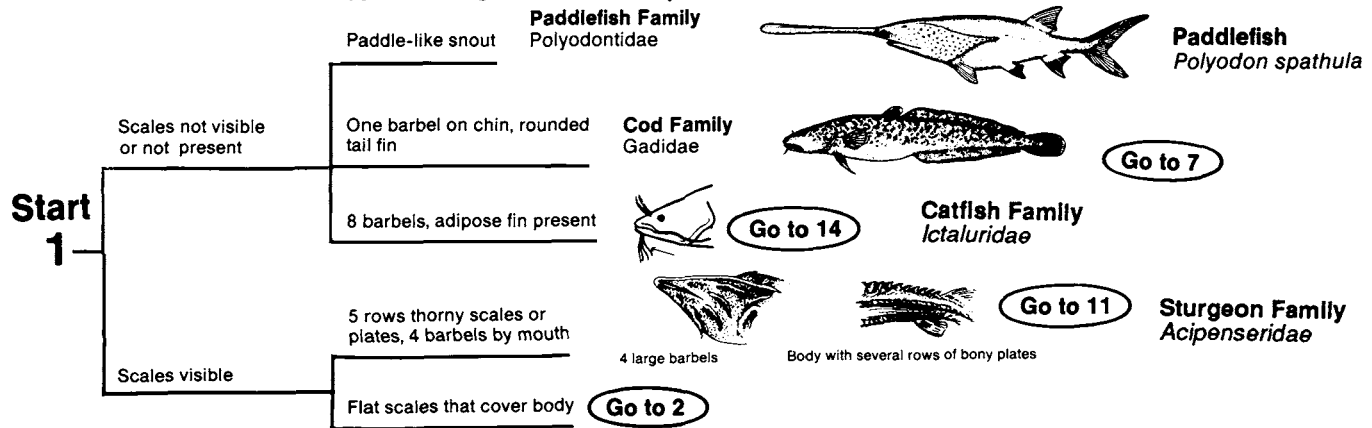
[A meat slicer (1/8" slice) and a frozen fish provides the best samples.]

Figure 13. Northern pike, yellow perch, largemouth bass and white bass cross-sectioned just behind head.

APPENDIX II

Fish Identification Key

This key may help you identify many fish caught by commercial or sport fishing. Start at 1, noting that two alternatives are presented. Always start at the top of any series of such alternatives. If the statement is true of the fish in question, proceed along the line across the page. If the statement is false, follow the line down the page to the next alternative. Continue this until you find the one that best describes the fish, then move across the page. Moving across may lead to a very quick identification, or it may lead to several other alternatives. It may also direct you to another part of the key, for example, "go to 15". Drawings of fish anatomy are found at the end of this key. This key might not work in all cases, because of hybridization, because of complex identification characteristics, or because they may not have been included. In case of difficulty, consult with a more complete scientific key. "How to Know Freshwater Fishes" by Eddy and Underhill is available for \$15.00. They supplied most pictures in this key.



2

Tail fin more or less rounded



Tail fin rounded

Hard plate-like scales, bony snout with sharp teeth

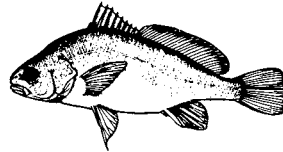
Gar Family
Lepisosteidae



Go to 20

Soft dorsal fin much longer than spinous dorsal fin (23 to 32 rays)

Drum Family
Sciaenidae



Freshwater Drum
Aplodinotus grunniens

No spinous dorsal fin, 45 or more soft dorsal fin rays

Bowfin Family
Amiidae



Bowfin
Amia calva

Adipose fin present



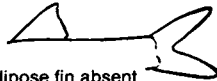
Go to 13

Tail fin forked or almost straight

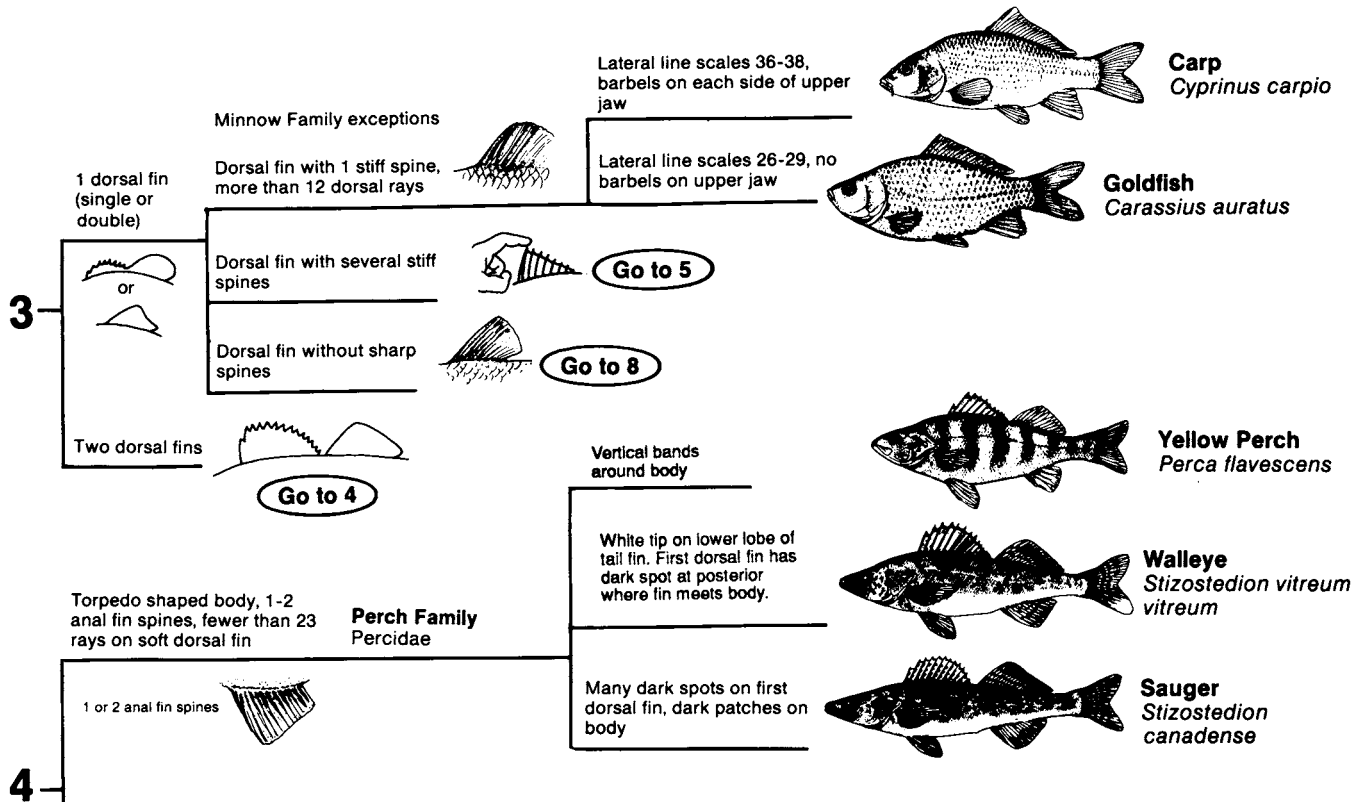


Tail fin forked

Adipose fin absent



Go to 3



4

(cont.)

Flat silvery body, lengthwise striped, 3 or more anal fin spines

Temperate Bass Family
Percichthyidae

3 or more anal fin spines

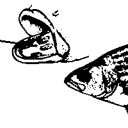


1 tooth patch on base of tongue, broken horizontal lines on side, anal fin spines stair-stepped



White Bass
Morone chrysops

Usually 2 tooth patches on base of tongue, broken and unbroken horizontal lines on side, anal fin spines stair-stepped



Wiper
Female Striped Bass x
Male White Bass
Hybrid

2 tooth patches on base of tongue, unbroken horizontal lines on side, anal fin spines stair-stepped



Striped Bass
Morone saxatilis

Sides with 7 longitudinal black stripes



Yellow Bass
Morone mississippiensis

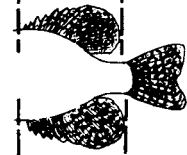
Anal fin spines not stair-stepped, sides plain or with faint horizontal lines



White Perch
Morone americana

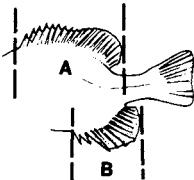
5

Dorsal and anal fin same size



Sunfish Family
Centrarchidae

Dorsal fin (A) longer than anal fin (B)

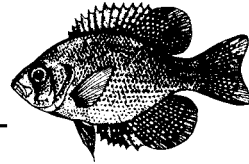


Body torpedo-shaped

Body flat

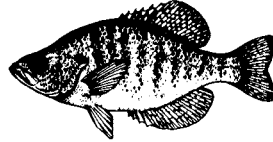
Go to 6

10 or more spines in dorsal fin



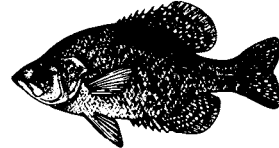
Flier
Centrarchus macropterus

Vertical bands on body, 5-6 spines in dorsal fin



White Crappie
Pomoxis annularis

Spotted body, 7-8 spines in dorsal fin



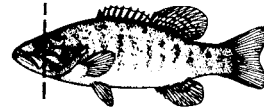
Black Crappie
Pomoxis nigromaculatus

Back corner of mouth extends to back of eye



Largemouth Bass
Micropterus salmoides

Back corner of mouth does not extend to back of eye



Smallmouth Bass
Micropterus dolomieu

Vertical lines on side



Spotted Bass
Micropterus punctulatus

More or less connected broken row of lateral notches

6

Small mouth

Pointed pectoral fin

Rounded pectoral fin

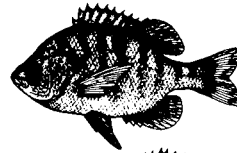
Lateral line with 40 or more scales, 10-20 rays on soft anal fin, dark spot on soft dorsal fin, opercle tab solid dark blue or black

No distinct spots on soft dorsal fin, rear margin of opercle thin and flexible, opercle tab black with broad red or orange trailing edge

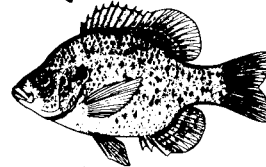
Distinct spots on soft dorsal fin, cheek with wavy bluish line, opercle tab dark in center, margin white top and bottom and red at rear

Lateral line scales fewer than 40, 7-10 rays on soft anal fin, bright orange spots on body

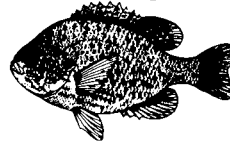
Long black ear flap (opercle)



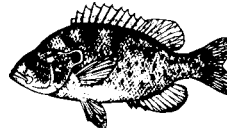
Bluegill
Lepomis macrochirus



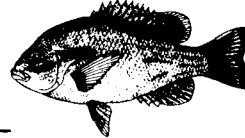
Redear Sunfish
Lepomis microlophus



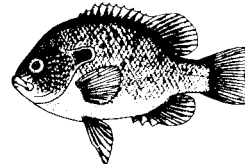
Pumpkinseed
Lepomis gibbosus



Orangespotted Sunfish
Lepomis humilis

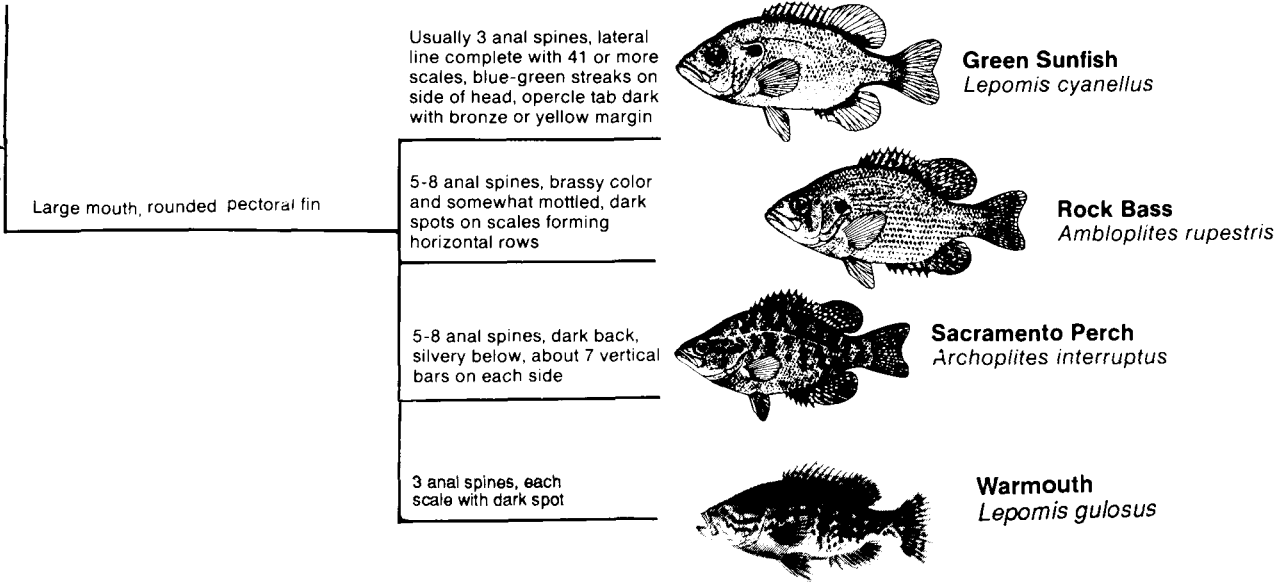


Redbreast Sunfish
Lepomis auritus

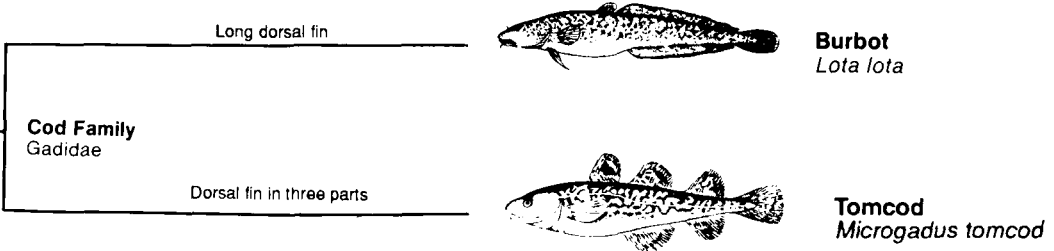


Longear Sunfish
Lepomis megalotis

6
(cont.)



7



8

Sensory pores on lower jaw



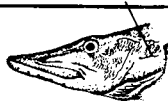
Duck-billed snout with sharp teeth, sensory pores on lower jaw

Scales present on side of head

Pike Family
Esocidae

Snout short, not duck billed
Scales absent on side of head, no sensory pores on lower jaw

Opercle scaled or upper half scaled



Dusky bar below eye
Opercle scaled completely,



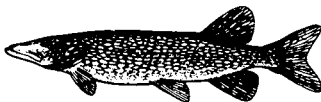
Cheek fully scaled, 5 or less sensory pores (per side) on underside of lower jaw, body has small light spots on dark background

Cheek fully or partially scaled, distinct dark vertical bars and spots up to 30" size, hybrid has characteristics of both parents but looks more like muskie, very difficult to distinguish when over 30" long

Cheek scaled on upper half, 6 or more sensory pores (per side) on underside of lower jaw, body with dark vertical bars or spots, markings distinct in younger fish

Sides and back marked with dark wavy or wormy vertical streaks

Side and back marked with dark horizontal network or chain pattern, bar below eye usually vertical

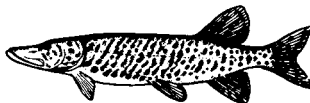


Northern Pike
Esox lucius

Cheek fully scaled



Sensory pores on lower jaw usually 5



Tiger Muskie
Female Muskie x Male Northern Hybrid



Muskellunge
Esox masquinongy

6 or more sensory pores on lower jaw

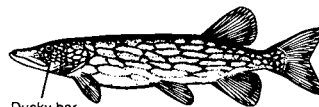


Cheek scaled only on upper half



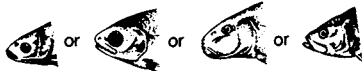
Grass Pickerel
Esox americanus vermiculatus

Dusky bar beneath eye angled slightly backward

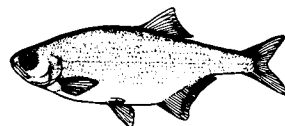


Chain Pickerel
Esox niger

Dusky bar beneath eye usually vertical



Go to 9



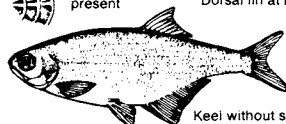
Mooneye
Hiodon tergisus

Dorsal fin with 11 or 12 rays



Lateral line present

Dorsal fin at least partly over anal fin



Goldeye
Hiodon alosoides

Keel without sharp, saw-toothed projections



Dorsal fin with 9-10 rays

Lateral line present, keel midline of belly without sharp saw-tooth projections, dorsal fin partly over anal fin

Mooneye Family
Hiodontidae

Axillary process at base of pelvic fin, keel on belly

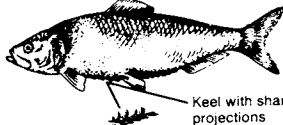


Axillary process present

Lateral line absent, keel on midline of belly with sharp saw-tooth projections, dorsal fin forward of anal fin

Lateral line absent

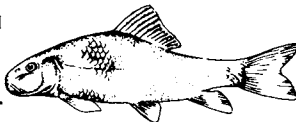
Dorsal fin far forward of anal fin



Keel with sharp, saw-toothed projections

Go to 16

Usually more than 10 dorsal rays, occasionally 9-10; usually thick sucker-like lower lip



Dorsal fin with 10 or more principal rays

Go to 10

Axillary process absent, belly not keeled



Axillary process absent

Usually not more than 10 dorsal rays (Exceptions: carp, goldfish, some western minnows), lips not sucker-like, less than 6" long, no scales on head



Dorsal fin with 8 (in one species 9) principal rays

Go to 12

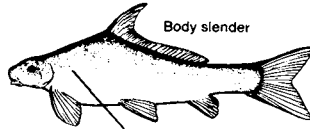
9

10



Dorsal fin long, sickle shaped; 25-40 rays

50 or more lateral line scales, slender body, eyes on back half of head



Body slender

Blue Sucker

Cycoreus elongatus

Lateral line scales more than 50

Sucker Family
Catostomidae

45 or fewer lateral line scales, eyes on front half of head, body thick, sides patterned

Go to 17



Dorsal fin short, rounded or triangular shaped; 10-18 rays



Tail fin red, 55 or fewer scales in lateral line, lips with grooves



Shorthead Redhorse

Moxostoma macrolepidotum

Large sucker (up to 24" long), mouth under snout, dorsal fin margin straight or slightly concave, 40 or more lateral line scales



Redhorse
Moxostoma

Many of the species of redhorse and suckers are identified by their mouth parts and are not separated by species in this key. As a general rule, redhorse have grooved lips and suckers have bumpy lips.



Tail fin not red, no dark body lines, bumpy lips (Papillose)



White Sucker

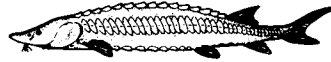
Catostomus commersoni

Barbels not fringed

Barbels not fringed, lower lip with 2 lobes, adult snout rounded



Snout rounded and conical



Lake Sturgeon
Acipenser fulvescens

Lower lip with 2 lobes

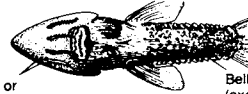
Base of barbels in line or inner 2 behind outer 2 barbels, belly covered with small plates (except in young), dorsal fin rays 36 or fewer, anal fin rays 23 or fewer

Dorsal fin rays 36 or fewer



Anal fin rays 23 or fewer

Shovelnose Sturgeon
Scaphirhynchus platorynchus



Belly covered with small plates (except in young)

11

Sturgeon Family
Acipenseridae

Barbels fringed



Lower lip with 4 lobes

Barbels fringed, lower lip with 4 lobes, snout shovel-shaped

Bases of outer barbels in line with or ahead of bases of inner barbels

Bases of outer barbels usually behind base of inner barbels, belly smooth (without small plates), 37 or more dorsal fin rays, 24 or more anal fin rays

Dorsal fin rays 37 or more



Anal fin rays 24 or more

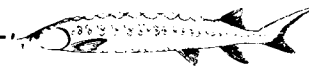
Pallid Sturgeon
Scaphirhynchus albus



Belly without plates

Bases of outer barbels usually behind bases of inner barbels

Front of anal fin just below front of dorsal fin



Shortnose Sturgeon
Acipenser brevirostrum

Length exceeds 14", anal fin closer to tail fin than in native minnows



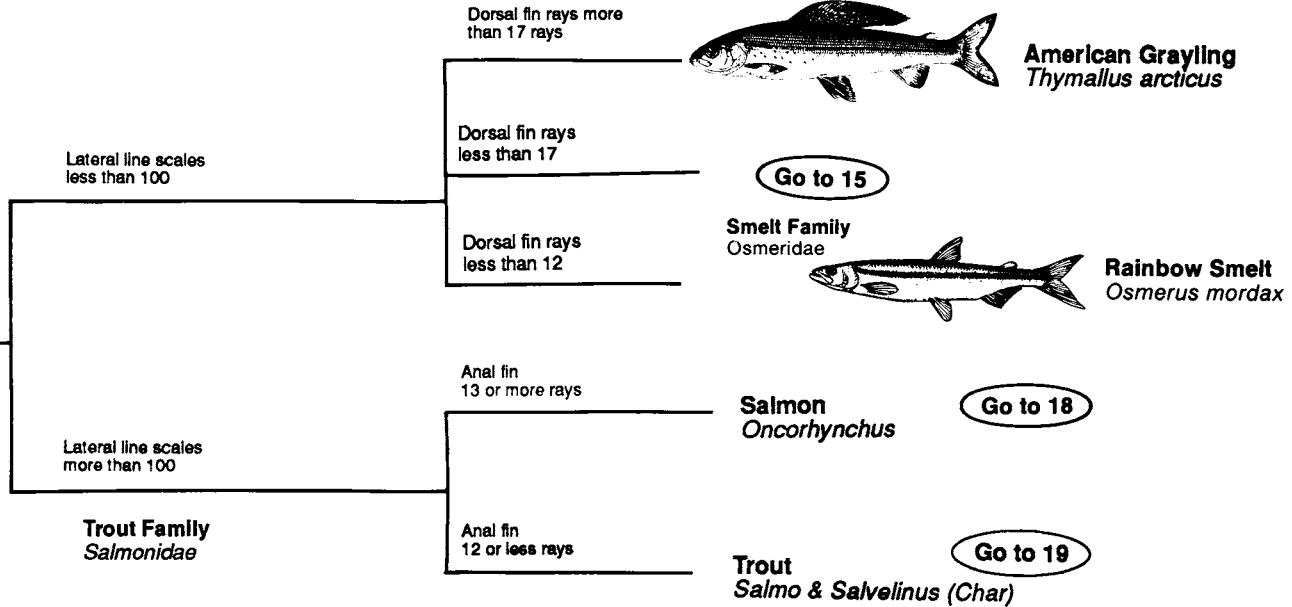
Grass Carp
Ctenopharyngodon idella

12

Minnow Family
Cyprinidae

Most minnow species are not included in key.

13



14

Adipose fin present

Catfish Family
Ictaluridae

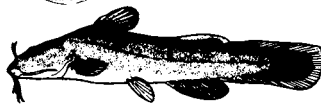
Adipose fin is thin ridge and appears continuous with tail fin, 8" or less in length



Tail fin deeply forked



Tail fin not deeply forked



Stonecat
Noturus flavus

Anal fin rounded 19-23 rays not as deeply forked tail

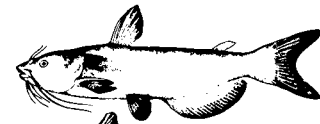
Edge of anal fin rounded with 24-29 rays

Edge of anal fin straight, 30 or more rays

Lower jaw projecting beyond upper jaw, except in smallest young

Lower jaw longer than upper, head flattened, fewer than 16 anal rays, usually yellowish or mottled

Lower jaw not longer than upper jaw, more than 16 anal fin rays



White Catfish
Ameiurus catus



Channel Catfish
Ictalurus punctatus



Anal fin with outer margin rounded and with 24-29 rays



Blue Catfish
Ictalurus furcatus

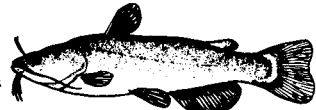


Anal fin with outer margin straight, and with 30-35 rays



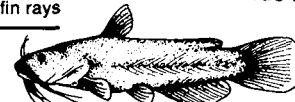
Flathead Catfish
Pylodictis olivaris

Barbels under jaw dark, usually 17-21 anal fin rays



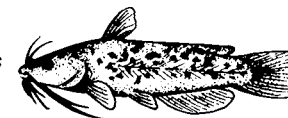
Black Bullhead
Ameiurus melas

Barbels under jaw white, usually 24-27 anal fin rays



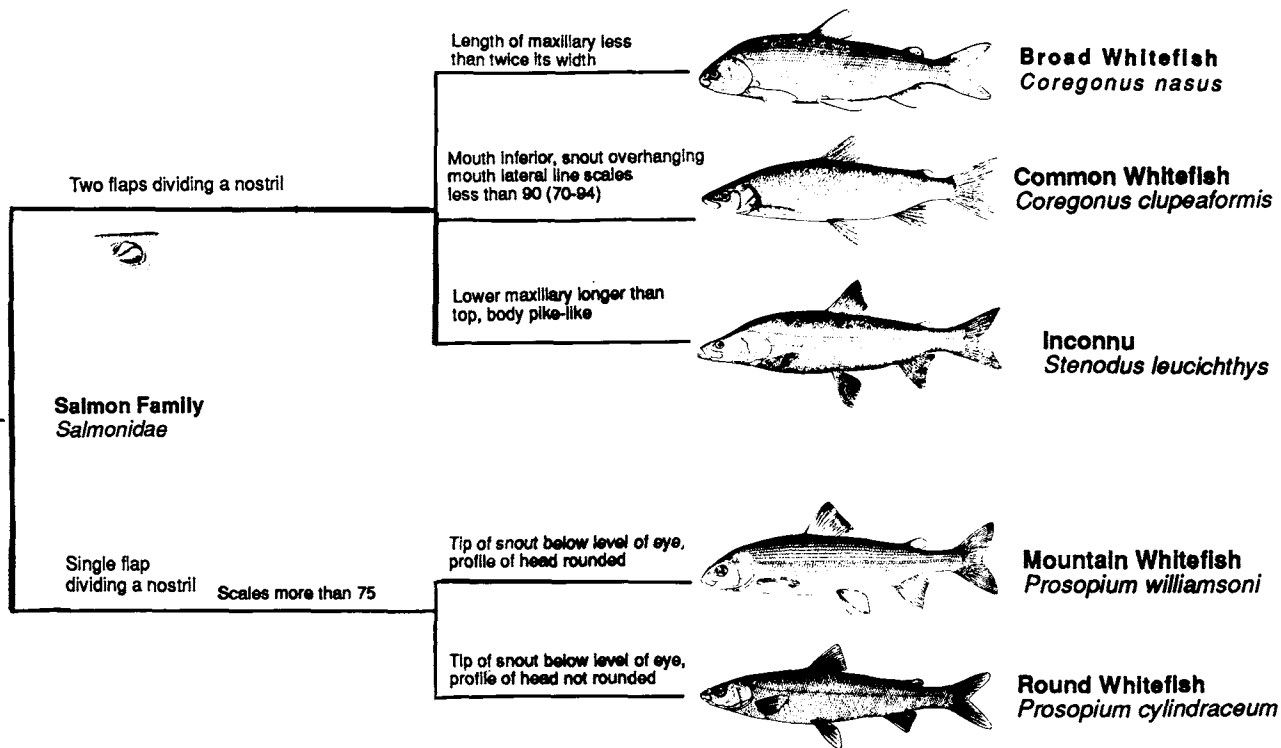
Yellow Bullhead
Ameiurus natalis

Barbels under jaw dark, usually 22-23 anal fin rays



Brown Bullhead
Ameiurus nebulosus

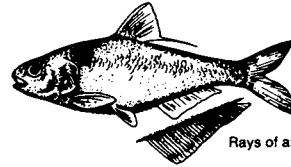
15-





Last dorsal fin ray elongated to slender filament, dark spot behind upper end of opercle

Lower jaw not projecting beyond tip of snout, 29-35 anal fin rays, 55 or more scales in lateral line

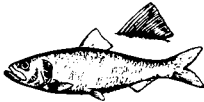


Gizzard Shad
Dorosoma cepedianum

Rays of anal fin usually 29-35

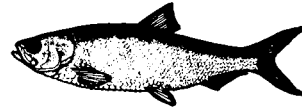
Herring Family
Clupeidae

16



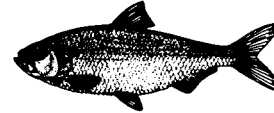
Last dorsal fin ray not elongated to slender filament

Lower jaw projects beyond tip of snout, dark speckles on tip of snout, teeth present on rim of upper jaw



Skipjack Herring
Alosa chrysochloris

Lower jaw equal to or slightly projecting beyond tip of snout, dark speckles on most of lower jaw, teeth absent on rim of upper jaw

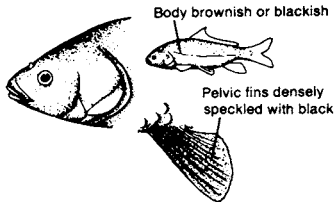


Alewife
Alosa pseudoharengus

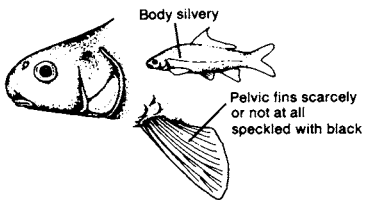
Silver patch on cheek longer than deep, less than 55 gill rakers on lower part of first gill arch



American Shad
Alosa sapidissima



Pectoral, pelvic, anal fins dark, opercle rounded along lower edge



Pectoral, pelvic, anal fins pale, opercle straight along lower edge

Small mouth located well below eye, body surface in front of dorsal fin strongly keeled

Small mouth located well below eye, body surface in front of dorsal fin rounded or weakly keeled

Mouth large, with anterior location; front of upper lip above lower margin of eye

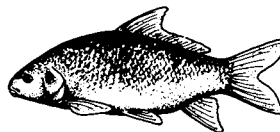
Anterior dorsal rays elongated or as long as base of fin

No pimple-like structure on lower jaw

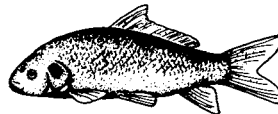


Anterior dorsal rays only slightly elongated, not more than 1/2 base of fin

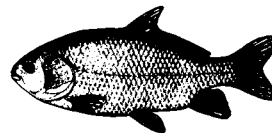
Nipple-like structure on lower jaw



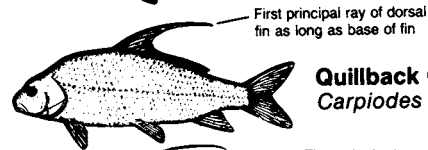
Smallmouth Buffalo
Ictiobus bubalus



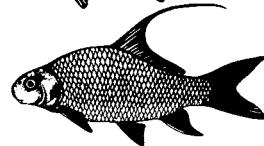
Black Buffalo
Ictiobus niger



Bigmouth Buffalo
Ictiobus cyprinellus

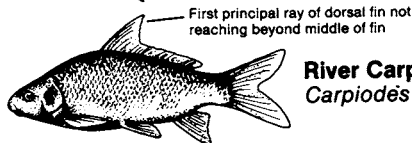


Quillback Carpsucker
Carpiodes cyprinus



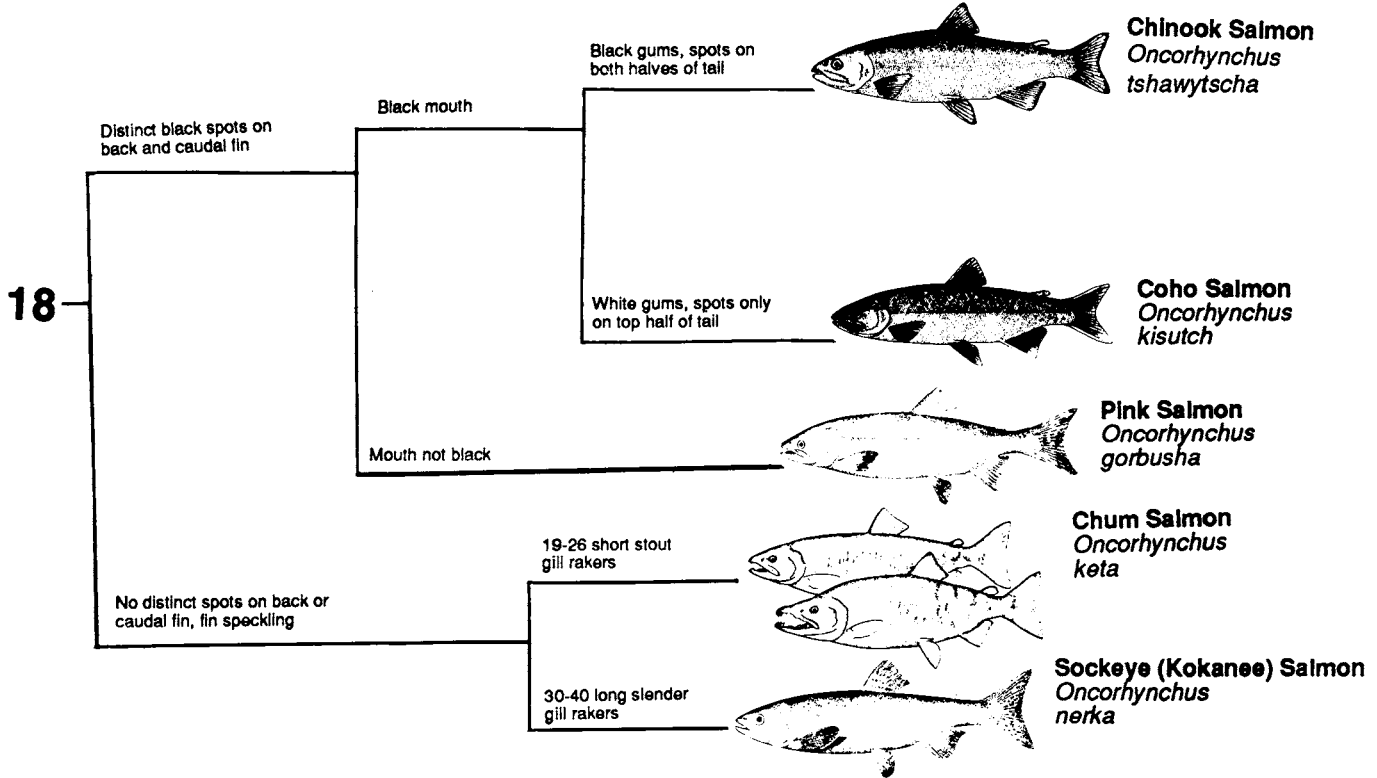
First principal ray of dorsal fin longer than base of fin

Highfin Carpsucker
Carpiodes velifer



River Carpsucker
Carpiodes carpio

17



19

Teeth on shaft of vomer,
dark spots or speckling

Dark shaped "x" spots
on sides of adults



Atlantic Salmon
Salmo salar

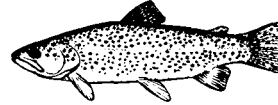
Large black spots, many
surrounded by halos



Brown Trout
Salmo trutta

Longitudinal
pinkish streak

No red slash
under lower jaw



Rainbow Trout
Oncorhynchus mykiss

Red slash under
lower jaw



Cutthroat Trout
Oncorhynchus clarki

Char Family
Salvelinidae

No teeth on shaft of vomer,
spots grey, yellow orange
or red

No vermiculations
on dorsal fin



Dolly Varden
Salvelinus malma

Dark vermiculations
on back and dorsal fin

Reddish spots, blue halos,
pinkish fins edged in white

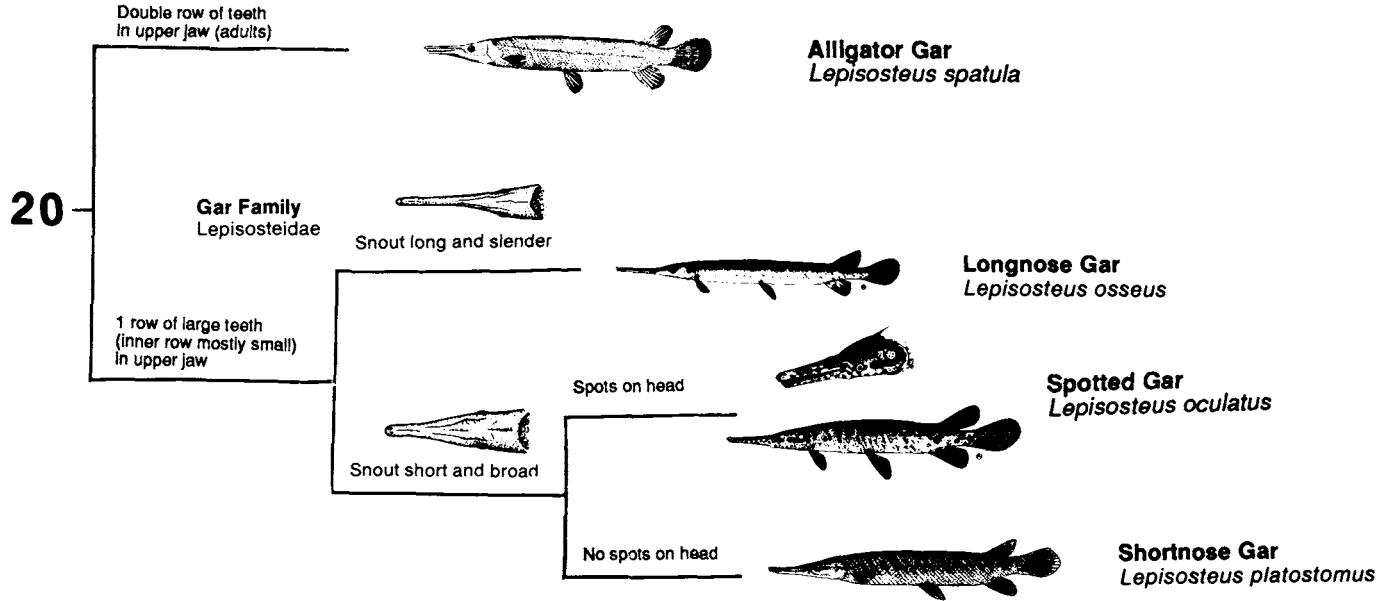


Eastern Brook Trout
Salvelinus fontinalis

Deeply forked tail,
light spots

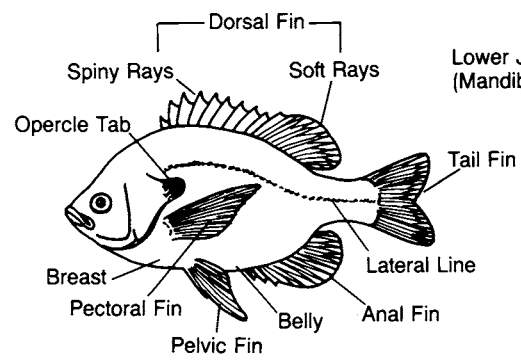


Lake Trout
Salvelinus namaycush

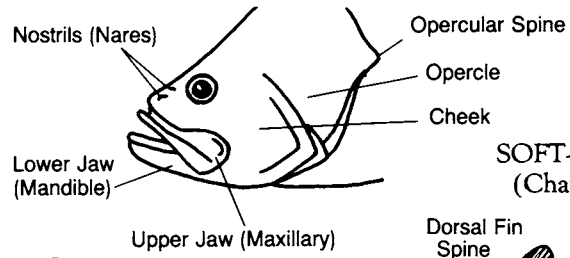


FISH ANATOMY

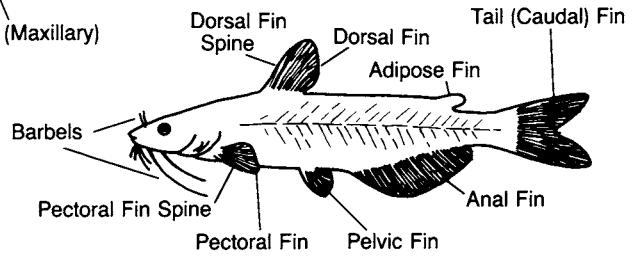
SPINY-RAYED FISH
(Bluegill)



HEAD (Yellow perch)



SOFT-RAYED FISH
(Channel catfish)



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