



Identification of Freshwater Fishes

The ability to properly identify a species is vitally important in the field, lab, and especially the aquarium. Whether you are conducting evolutionary, ecological, behavioral, or conservation/management studies, knowing what organism you are working with is a critical first step.

The goal of this activity is for students to compare and contrast the physical characteristics of five different families of fishes. Throughout the lesson students should be able to recognize the variance in fish adaptations, the purpose these adaptations serve in survival and reproduction, and how family characteristics further separate fish into Genus and species. Students will be divided into pairs or groups of three and given the characteristics to look for in 5 different fish families to observe within the Ridges to Rivers gallery. They will write or draw their observations of the fish and then compare their findings with their classmates and discuss the similarities and differences amongst the 5 most diverse families of freshwater fish.

Optional expansion Students may utilize the ID cards within the gallery to identify a fish down to its specific epithet. Teachers will be provided with supplemental resources to properly confirm the student's identification. If the identification is incorrect, the student could utilize that opportunity to analyze why and cross examine identifying characteristics for similar species.

Students are encouraged to photograph/record their fish with available devices for an easier review upon returning to the classroom.

The five basic methods used in identifying a fish

- **Meristic counts** – generally considered to be the most reliable morphological taxonomic characteristic. This includes anything on the fish that can be counted i.e. fin rays and spines, scale rows, lateral line pores, number of pharyngeal teeth, etc.
- **Color/pigmentation patterns** – most visible characteristic because they change
- **Morphometric measurements** – any standard measurement that can be made on a fish such as standard length, head length, etc.
- **Anatomical characteristics** – usually yes/no characteristics such as body shape, completeness of lateral line, gill rakers, etc.
- **Genetic data** – includes karyotyping, electrophoresis, and DNA sequencing. Extremely useful and popular techniques

How can we identify a fish? We will consider what family the fish is in by creating our own family keys or "picture key" – we will be avoiding using branching/dichotomous keys in consideration of the fact that fishes are **the most** diverse group of vertebrates and many of the characteristics used in these keys are difficult to describe or illustrate. It is also important to consider what watershed

you are in. Closely related species are the hardest to ID, but can be distinguished by their presence in different watersheds.

For this lesson, we will only be utilizing color/pigmentation patterns and anatomical characteristics to identify families of fish. In order to properly identify fishes to *Genus species*, further study in Ichthyology is encouraged. For now, we can get pretty close with the use of these identifying characteristics and the conveniently located ID placards within the exhibit.

Definitions

Extinct – no longer exist anywhere on earth

Extirpated – gone from an area, but still present on Earth

Endemic – native to a certain area

Narrow endemics – a single stream, cave, spring, etc

Dorsal – back or upper side

Ventral – belly or underside

Anterior – the front (head) end

Posterior – the rear (tail) end

Fins – moving appendages that aid in swimming

Flexible segmented rays (soft)

Inflexible spiny rays (spines)

Opercle – gill covering (half moon shape)

Body Regions of a Fish: Nape, caudal peduncle, belly, breast, and cheek – Head, Trunk, Tail

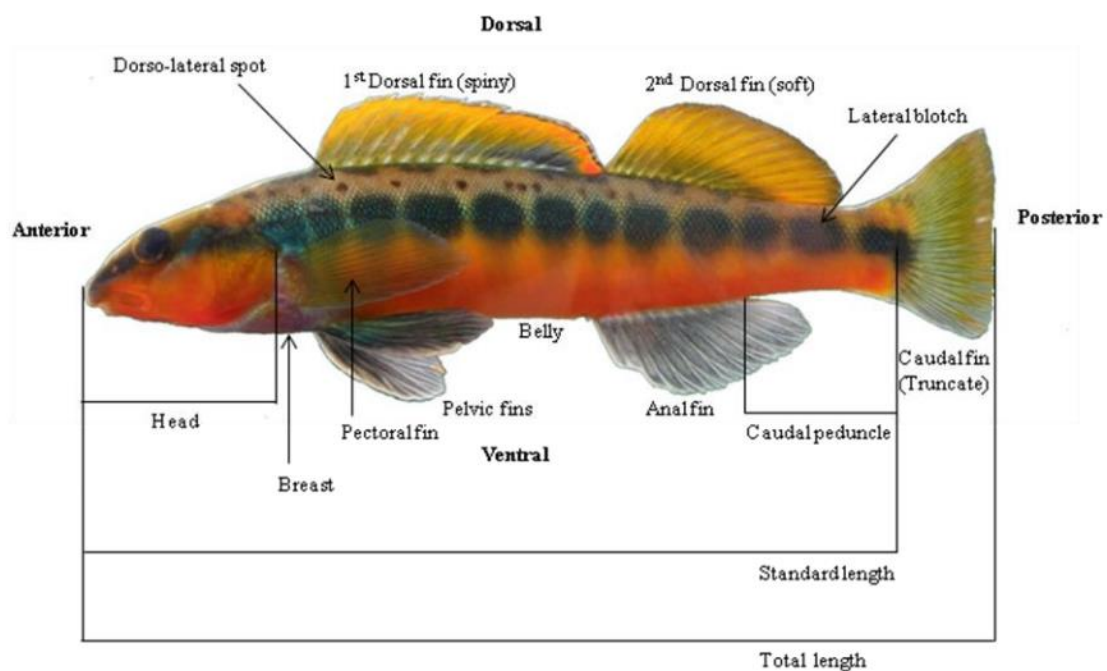


Figure 1.

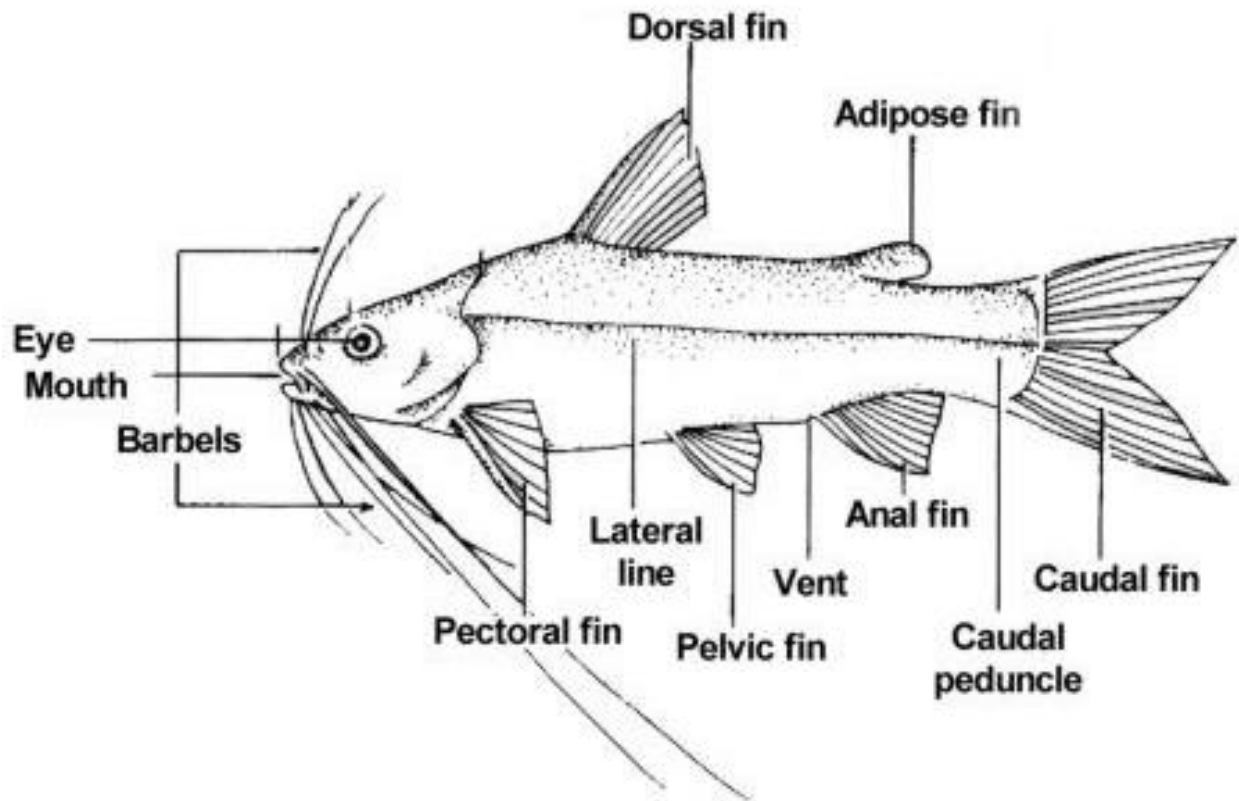


Figure 2.

Albanese 2011

Body Shape: Fish exhibit different body shapes depending on where they live in the water

Fusiform – cigar-shaped, tapering at both ends (streamlined). Common in fish that are constantly on the move or that live off the bottom of fast water. Ex. Most minnows

Ventrally Flattened – ventral surface flattened (belly, opposite dorsal/back). Allow fish to maintain close contact to the bottom, usually in fast currents. Ex. hogsucker, darters

Dorsally Flattened – dorsal surface flattened (back, opposite ventral/belly). Common in fish that live at or near the surface. Ex. Topminnows

Laterally Compressed (compressiform) – body flattened from side to side. Common among fish that live among rocks, plants, etc. and need a high degree of maneuverability. Ex. Sunfish

Fins: the typical fish has 4 single median fins (dorsal, caudal, anal, adipose) and 2 sets of paired fins (pectorals and pelvics)

Dorsal fin – spinal fins, located on the back of the fish. soft (flexible segmented rays) and spinous (inflexible spiny rays). Can be contiguous or separated, if separated (or nearly so) fish is considered to have 2 dorsal fins

Adipose fin – if present, small fleshy fin without spine or rays on the back between the dorsal fin and caudal fin

Caudal fin – tail fin. Heterocercal (sturgeon) vs. homocercal (trout) OR unequal vs. equal upper and lower lobes

Anal fin – located on the ventral (belly) side of the fish, behind the anus/cloaca. may be spineless or have spines anterior to the rays

Pelvic fins – belly fins. abdominal (mid-ventral) vs. thoracic (behind the pectoral fins) vs. jugular (in front of the pectoral fins)

Pectoral fins – arm fins. Located on each side of the fish

Lateral line: the lateral line is a canal, usually located along the midline of the body that is a posterior extension of the sensory canal system of the head. The lateral line contains sense organs which allows the fishes to detect changes in water pressure, inanimate objects (e.g. large rocks), and movement of other large aquatic organisms

Complete vs. incomplete – if the pored scales do not extend all the way to the base of the caudal fin, the lateral line is incomplete

Lips, mouth, and barbels:

Surface of lips: suckers (Catostomidae) have fleshy lips that are either

- Plicate: has folds, creases, or ridges
- Pallipose: has small, fleshy, bumpy papillae (like your taste buds)
- Smooth



Figure 3.

Size of the mouth – does it stop before, under or behind the eye?

Position of the tip of mouth when closed - usually indicative of where the fish feeds in the water column:

- Inferior: mouth distinctly below tip of snout (positioned on the underside of the head)
- Subterminal: nose slightly over end of mouth (mouth usually opens downward)
- Terminal: mouth at tip of snout, ends at the front of the head (mouth opens in a forward direction)
- Superior: mouth opens dorsally (mouth opens upward)

Angle of mouth:

- Oblique: slanting or inclined (up or down/ smiling or frowning)
- Horizontal: straight back, not angled

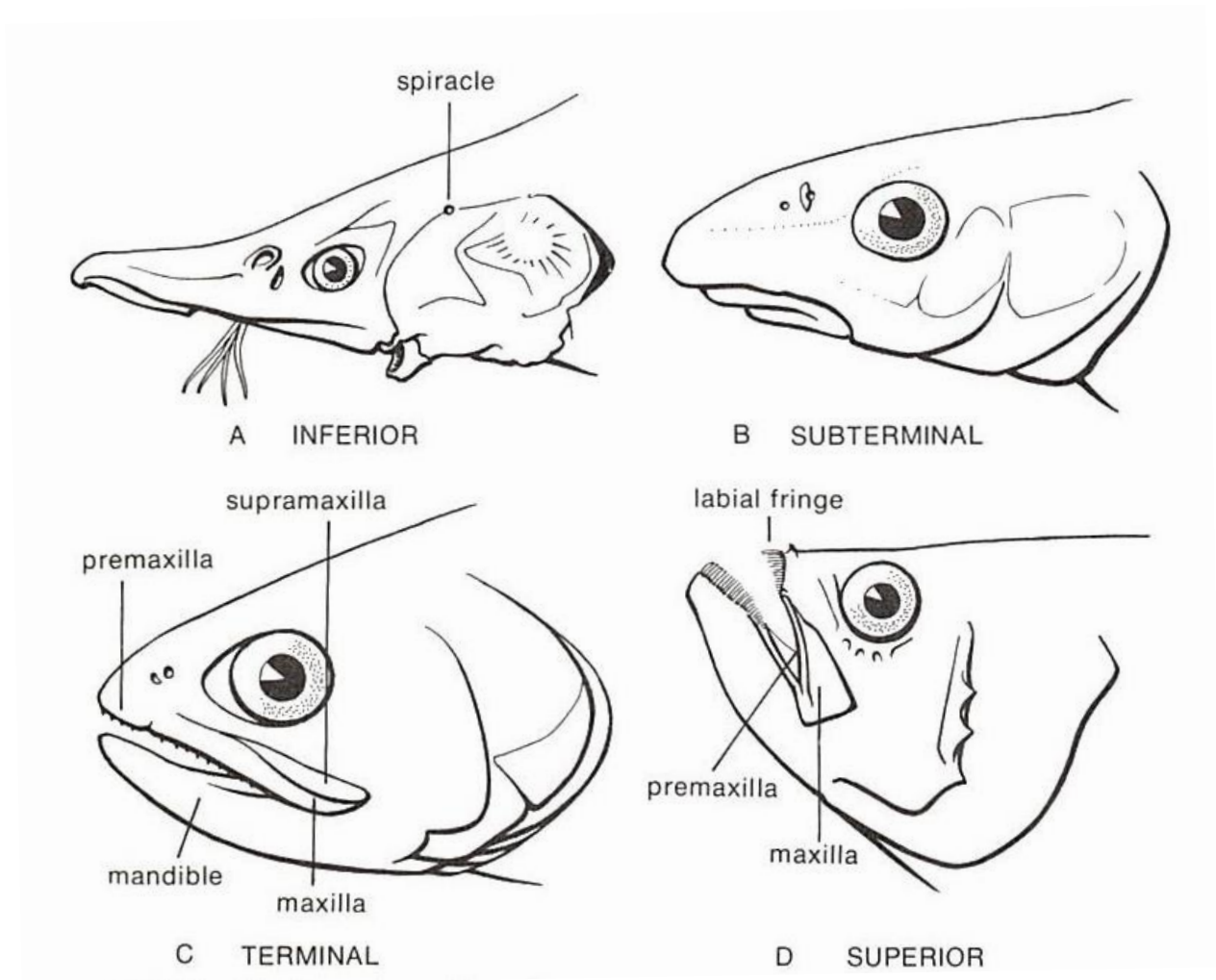


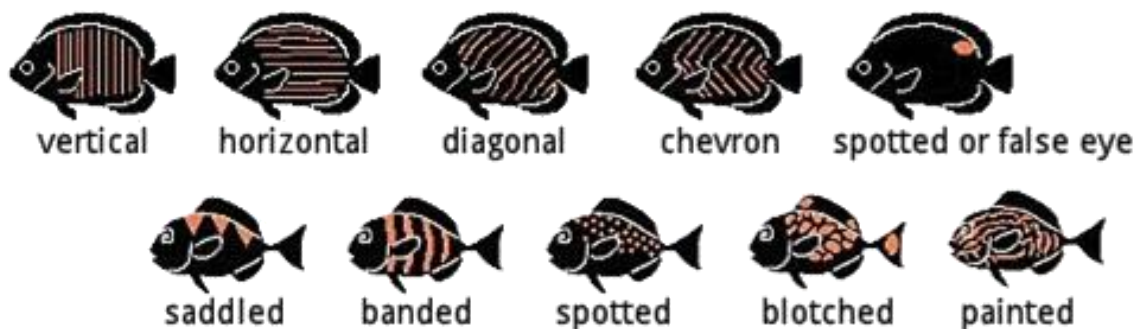
Figure 4.

Barbels – fleshy protuberances (tubercles, projections) that may be long and thread-like. Absent in most fishes (sturgeon, catfishes, madtoms). Barbels are sensitive to touch and taste making them extremely useful in conditions of low light (at night, deep water, turbid/opaque water). They can also be useful for fishes rooting through substrate to find food.

Tubercles – hardened, usually conical (cone-shaped), protuberances (tubercles, projections). Found primarily during breeding season on males (minnows, suckers). Could be on any part of the body, scars could indicate where these were if they have been lost

Pigmentation Patterns:

- Bar: vertical band of color, usually along the sides of the body
- Stripe: horizontal band of color, usually along the sides of the body
- Band: usually refers to a bar/strip on any of the fins
- Teardrop: vertical color mark (small bar) under the eye
- Spot: circular color mark
- Blotch: irregular color mark
- Caudal spot: spot at base of caudal peduncle (tapered region behind the dorsal and anal fins where the caudal fin attaches to the body)
- Vermiculation: color pattern of short, wavy (wormlike) lines
- Mottled: pattern of irregular blotches
- Saddles: blotches across the back



Most Diverse Freshwater Fish families:

Fish in orange color font can be seen in the Tennessee River stream exhibit.

Below are descriptions

Cyprinidae – Minnows

- Minnow Features:
 - Single dorsal fin
 - Abdominal pelvic fins
 - Lateral line (rarely absent)
 - Cycloid scales (round or oval)
 - No true spines in the fins
 - Varied ecologically and morphologically
 - Mouth at end of snout
 - Small body lacking spots
 - Schooling: always in schools, mixed species
 - Feeding: stonerollers and riffle minnows eat algae scraped or sucked off rocks and insects; shiners and chub eat insects and detritus floating in the water
- (Upper Tennessee)
 - Spotfin shiner *Cyprinella spiloptera*
 - Striped shiner *Luxilus chrysocephalus*
 - Saffron shiner *Notropis rubricroceus*
 - Tennessee shiner *Notropis leuciodus*
 - Tennessee dace *Chrosomus tennesseensis* – Black stripe along side, broken under dorsal fin. Small black spots and thin black stripe along side (above larger broken stripe). Habitat: gravel- sand- and silt-bottomed pools
 - Largescale stoneroller *Campostoma oligolepis*
 - Warpaint shiner *Coccotis coccogenis* – Black band on dorsal and caudal fins. Red bar on opercle. Breeding male has pink or red side, red snout, and red on dorsal fin.
 - Whitetail shiner *Cyprinella galactura*
 - River chub *Nocomis micropogon*. Long snout, small eye high on head, Large mouth. Breeding male has hump on head, pink-blue head, body and fins.
 - Rosyside dace *Clinostomus funduloides*
 - Telescope shiner *Notropis telescopus*
- Conasauga
 - Rainbow shiner *Notropis chrosomus* - Iridescent blue and Pink head and body (large individual) Clear to red-purple stripe above silver black stripe along side. Faint to bright red-orange fins. Breeding male has bright purple head, back and fins.

Breeding male will have light blue below the silver strip along side. Compressed body, round snout, terminal mouth. Lateral line complete

- Alabama shiner *Cyprinella callistia*
- tricolor shiner *Cyprinella trichroistia*
- Pop-up
 - Striped shiner *Luxilus chrysocephalus*
 - Golden shiner *Notemigonus chrysoleucas*
 - Creek chub *Semotilus atromaculatus* – Large minnow, think barely to moderately compressed body, broad head. Small flaplike barbels above corner of mouth (most easily seen when mouth is held open). Complete lateral line. Large black spot on dorsal fin origin. Breeding male has pink body, orange fins. Large terminal mouth reaching past front of eye. Pointed snout.

Percidae – Perches & Darters

- Features:
 - Most are small, less than 4 inches (10 cm) long
 - “Dart” along the bottom of streams
 - 2 dorsal fins, first with spines, second with rays
 - Thoracic pelvic fins
 - Lateral line is straight and complete (unless stated otherwise)
 - Small, torpedo shaped body
 - Schooling: solitary or in pairs
 - Habitat: bottom dweller; pools, glides and riffles
 - Feeding: aquatic insects; logperch may flip rocks in search for insects
- Upper Tennessee
 - Greenside darter *Etheostoma blennioides*
 - Redline darter *Etheostoma rufilineatum* – Black dashes on cheek and opercle. Teardrop broken into two black spots. Cream colored caudal fin base. Pointed snout. Dark blotches on side (can look like a checkerboard pattern). Black edge on 2nd dorsal, caudal, and anal fins. Male has red spots on side, orange belly, blue breast, red-orange band on fins. Female has brown spots on side, white to dusky blue breast, black spots on fins.
 - Tangerine darter *Percina aurantiaca* - One of the largest darter species at 7.25 in (18 cm) long! Colorful! Small dark brown spots on upper side. Thin black stripe along back breaks into small spots at rear. Broad black stripe of 8-12 fused blotches along side. Underside of young white, large female yellow, and large male orange. Breeding male bright red-orange belly, blue breast, orange edge of first dorsal.

- Logperch *Percina caprodes* – Also large at 7.25 in (18 cm) long! Many alternating long and short bars along side extend over back and join on other side. Dusky teardrop.
- Gilt darter *Percina evides*
- Banded darter *Etheostoma zonale*
- Tennessee darter *Etheostoma tennesseense*
- Conasauga
 - Greenbreast darter *Etheostoma jordani* – has 8-11 small black blotches along side just below lateral line; less obvious blotches along upper side. Brown above, 8-9 black saddles, white to blue below; dusky yellow fins; dusky teardrop. Dusky to black edge of 2nd dorsal, caudal, and anal fins. Breeding male is bright blue below, has small red spots on side, red edge on 1st dorsal fin, blue edge and red band in 2nd dorsal and caudal fins; blue anal and pelvic fins.
 - Bronze darter *Percina palmaris*

Catostomidae – Suckers

- Features:
 - Single dorsal fin
 - Mouth below snout; fleshy lips
 - Schooling: white sucker and redhorse school; hogsucker solitary
 - Habitat: redhorse in water column of deep pool; hogsucker near the bottom in glides and riffles
 - Feeding: insects sucked from bottom
- Upper Tennessee
 - Sicklefin redhorse

Centrarchidae – Sunfishes (Bream) & Basses

- Bass Features:
 - “Bass” is a common name and the features of these fish vary depending on the species
 - All have 2 dorsal fins
 - Schooling: solitary (“except for accepted exceptions”)
 - Habitat: Deep pool, near cover
 - Feeding: insects, crayfish, fish
- Upper Tennessee
 - Genera *Ambloplites* features – Red eye, white edge on ear flap, dusky to black teardrop. Compressed as young, thicker bodies as adults. Large mouth, short rounded pectoral fin, complete lateral line
 - Rock bass *Ambloplites rupestris* – Adults have a row of black-brown spots along side, largest and darkest below lateral line. Light green above, brassy

yellow flecks on side, about 5 wide dark saddles over back and down midside. White to bronze breast and belly. Black edges on dorsal, caudal, and anal fins.

- Genera *Micropterus* features – Large (at least 14in). Fiesty, amongst the most popular spot fishes in the world. Moderately compressed, elongate body. Large mouth extends under or past eye. Shallowly forked caudal fin. Black spot at rear gill cover (no long flap). Clear to yellow-olive fins.
 - Smallmouth bass *Micropterus dolomieu* – has 8-16 brown bars, bronze specks, on yellow-brown to olive green side. Red eye. Large male has green-brown to bronze with black mottling on back, bars on side. Large mouth, upper jaw extends under eye.
- Sunfish Features:
 - 2 dorsal fins – 1st spiny, 2nd soft, do not appear separated
 - Shallowly forked caudal fin
 - Large, flat, deep body. Strongly compressed “pan fish”
 - Adult males are among some of the most colorful fishes in North America
 - “Ear flap” – fleshy extension at rear of gill cover
 - Schooling: solitary
 - Habitat: shoreline near deep pool
 - Feeding: insects
- Upper Tennessee
 - Redear sunfish *Ambloplites rupestris* – Bright red or orange spot and white edge on black ear flap. Long pointed pectoral fin usually extends far past eye when bent forward. Fairly pointed snout, small mouth
- Pop-Up
 - Longear sunfish *Lepomis megalotis*
 - Longear and Dollar sunfish can be hard to distinguish from one another. Long ear flap; horizontal to slanted downward on adult, slanted upward on young. Wavy blue lines on cheek and opercle. Adult is dark red above, bright orange below, marbled and spotted with blue.
 - Dollar sunfish *Lepomis marginatus*
 - Dollar sunfish look very similar to longear – distinguishing features: shorter, upwardly slanted ear flap, red streak along lateral line
 - Redspotted sunfish *Lepomis miniatus*

Fundulidae – Topminnows

- As the name suggests, many swim at or near the surface of the water
- Several species have bright gold or silver marks on the top of their head and body
- Small, often brightly colored

- Flattened head and back
- Upturned mouth
- Large eyes
- Spineless fins
- 1 dorsal fin located far back on the body
- No lateral line
- Abdominal pelvic fins
- Upper Tennessee
 - Northern studfish *Fundulus catenatus* – Light yellow-brown above, short gold stripe in front of the dorsal fin, rows of small brown (female and young) or red-brown (male) spots on side. Adult has rows of small brown spots on caudal and dorsal fins. Breeding male has bright blue side, red spots on head and fins, usually yellow paired fins, orange edge on caudal fin. Dorsal fin over or slightly in front of anal fin origin
- Conasauga
 - Southern studfish *Fundulus stellifer* – Similar to northern studfish but has few to many brown or red spots scattered over side. Black edge on dorsal and caudal fins on some large males

Creek Chub – *Semotilus atromaculatus*



Warpaint Shiner – *Coccotis coccogenis*



Tennessee Dace – *Chrosomus tennesseensis*



Logperch – *Percina caprodes*



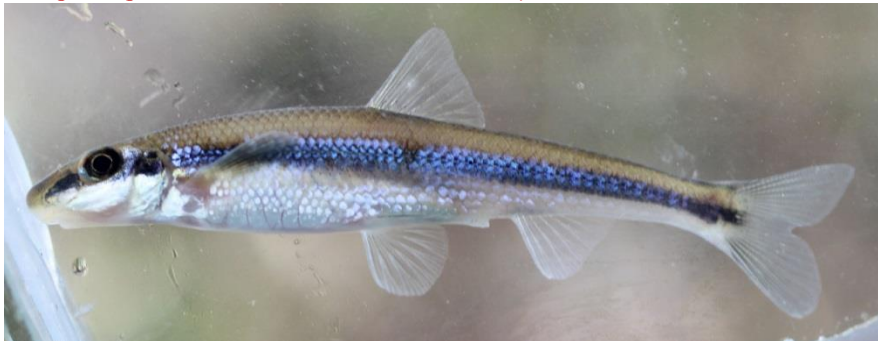
Tangerine Darter – *Percina aurantiaca*



Redline Darter – *Etheostoma ruffilineatum*



Stargazing Minnow – *Phenacobius uranops*



References

Fishes of Tennessee

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