



Sustaining America's Aquatic Biodiversity

Selected Freshwater Fish Families



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Introduction

Minnows (Cyprinidae and Leuciscidae Families)

Minnows belong to the largest and most ecologically diverse family of freshwater fishes in the world. More than 290 species of minnows occur in North America. Recent scientific references classify most minnows into the Leuciscidae family and carp and goldfish into the Cyprinidae family.

Minnows are exclusively freshwater, although some species stray into brackish, tidal waters. They are found in a wide variety of habitats in streams, rivers, and lakes throughout North America.

Most minnows are small (less than 6 inches) shiners, dace, chubs, and minnows that school, feed on insects and algae, and serve as prey for sport fish. Although the term 'minnow' is used in common vernacular to describe any small fish, the minnow family also includes very large species. The largest native American minnow is the endangered Colorado pikeminnow (up to 6 feet in length, 100 pounds in weight); the fallfish (up to 15 inches in length) is the largest native minnow in Virginia. Some species, including the introduced European carp, goldfish, and grass carp grow large (to 50 pounds) and outcompete native species. Non-native fish such as carp should not be released into surface waters by aquaria pet owners.

Minnows are prolific (2 million eggs per carp) spring-spawners that broadcast adhesive eggs over aquatic plants and other substrate. Some species of chubs build large gravel nest mounds to spawn over, while others are cavity spawners. Nest builders usually have larger eggs and provide some parental protection.

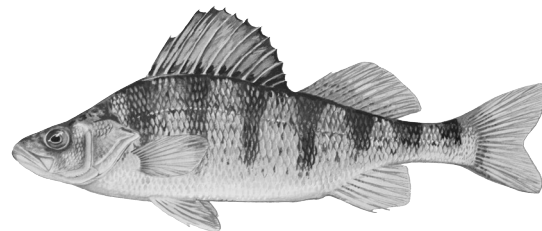
Adult minnows feed widely on plant and animal material, using their characteristic "throat" teeth for grinding weeds, clams, and insects from bottom muds.

Some species, such as the stoneroller and chiselmouth, feed almost exclusively on algae by scraping it from stream-bottom rocks. Herbivorous (plant-eating) species have long, coiled guts because digesting plant materials requires longer intestines than those needed by insect-feeders. Bottom-rooting by carp destroys water plants and increases water turbidity.

Some species, such as the fathead minnow, golden shiner, and others, are farmed and sold as bait fish to anglers for recreational sport fishing. Because of their intermuscular bones, carp and other minnows are not highly prized as food fish in the United States. However, the flesh of chubs and carp can be tasty, and carp is a preferred food fish in Asia and Europe. Many of these minnows are hardy, attractive, and lively for use in home aquaria.

Perch (Percidae Family)

Represented by more than 150 species, the perch is the second largest freshwater fish family in North America. The term "perca" means to be perched or propped up. These fish tend to rest on the bottom using their pelvic fins. Members of the perch family have two dorsal (top) fins. The first fin has hard spines, the second soft rays.



Yellow perch, walleye, and sauger are cool water (60° to 80°F) fish found in the Northern United States. These species school in open water and near the bottom of rivers and lakes and spawn in the spring. The yellow perch, walleye, and sauger are also major sport fish.

The remaining 150 or more species of small, colorful darters occupy streams and rivers throughout the country. Male darters, especially in the breeding season, are as colorful as tropical reef fishes. Darters are very specialized, live in a variety of habitats, and delight ichthyologists because of their diversity and beauty. Darters, as the name implies, dart about on the bottom. They lack a swim bladder for buoyancy control. All perch species feed voraciously on small fish and invertebrates, principally at sunrise and sunset.

Members of the perch family spawn in different ways. Walleye are “broadcast” spawners that distribute their eggs widely over gravel. Yellow perch are “strand” spawners that lay thousands of eggs in a unique accordion-like gelatinous egg mass. Egg strands can be 2 feet in length. Some darters bury their eggs in bottom gravel, others attach adhesive eggs to rocks, while others lay clusters of eggs under rocks or in submerged logs.

Yellow perch and walleye are a preferred sport and food fish in Canada and the Great Lakes region. They have a mild-flavored white flesh and command high prices in food markets and restaurants. Attempts at farming these species have met with limited success.

Catfish (Ictaluridae Family)

Fifty species of catfish are found in North America. Catfish size varies. Small madtom catfish grow to only 1.5 to 6 inches in length, while bullheads grow up to 10 inches in length. Channel and white catfish grow up to 25 inches in length. Flathead and blue catfish are the largest, growing up to 5 feet long and weighing 130 pounds.



All catfish are bottom-dwelling fish with large flattened heads, barbels (whiskers), no scales, an adipose fin, and mildly poisonous dorsal and pectoral spines. The spines do not inject toxin. Rather, glands at the base of the spines secrete a toxin that can run into a puncture wound. Small madtom catfish have a more potent toxin than larger catfish. The “whiskers” (barbels) of catfish do not sting. They are harmless sensory organs for smell.

Catfish have been widely stocked throughout the United States for sport fishing and fish farming. Except for the madtom species that live in cold-water streams, catfish are warm-water fish that thrive in warm (80° to 90°F), slow-flowing rivers and productive lakes and ponds.

Catfish are spring, cavity spawners that lay large masses of adhesive eggs in hollow logs, bank holes, and submerged tires. Male catfish aggressively defend the eggs and young for several weeks after they hatch. Males of some species will hold young catfish in their mouths to protect them.

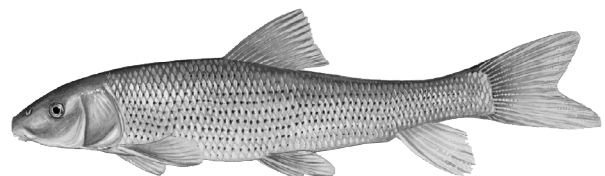
Adult catfish are voracious predators of fish and other aquatic animals, feeding primarily at night using their fine sense of smell and touch (barbels).

Sport and commercial fishing for catfish and the smaller bullheads are very popular, especially in the South. Private fee-fishing ponds frequently are stocked at high density with channel catfish for sport fishing.

Channel catfish are fast growing, mild-flavored fish that have a high-feed conversion efficiency and tolerance for high-density fish culture. The channel catfish is the primary warm-water fish farmed in the United States. The commercial catfish farming industry is centered in Mississippi, Alabama, and other states in the Southeast where the growing season in large ponds (up to 100 acres in size) is nearly year-round. Four hundred million pounds of food catfish worth \$330 million are produced annually.

Suckers (Catostomidae Family)

More than 70 species of suckers occur in North America. Only two species occur elsewhere: one in China (Asiatic sucker) and the other in Siberia. **Catostomus** is a Greek word meaning “under mouth.” All suckers have large thick lips. They are remarkably successful where they live, and because of their abundance and size, they may account for much of the fish biomass in rivers and streams.



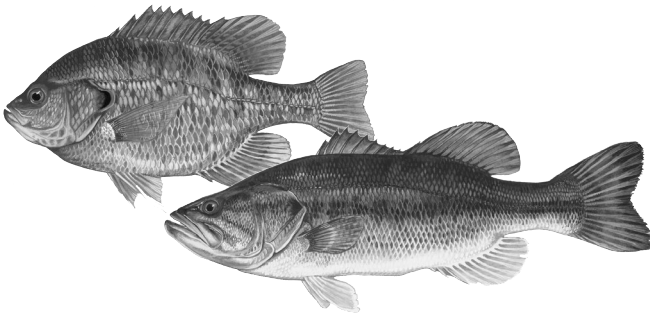
The white sucker, hogsucker, and buffalo fish can reach lengths of 3 feet and exceed 30 pounds. However, most suckers are small, spotted species that hide among bottom rocks in rivers and streams. In contrast to their undeserved reputation as “trash” fish, they prefer clean, unpolluted waters and some species are often found with trout.

Suckers are bottom-feeding specialists, adapted to feed by “vacuuming up” invertebrates and clams on river bottoms with their ventral mouths and large lips. Some of the suckers are specialized to feed on shellfish, mussels, and snails, while others prefer insects. Suckers are mostly solitary, sedentary fish that are strongly oriented to a bottom existence.

A limited commercial fishery for suckers exists in some states. Suckers are erroneously labeled and sold for food as “mullet.” The meat is firm and tasty, but full of inter-muscular bones (as are minnows’ and pikes’), thus they are often sold pickled or smoked. Their greatest value is as a link in the food chain, serving as prey for sport fish. They are sold as bait fish for large sport fish such as pike.

Sunfish (Centrarchidae Family)

The sunfish and bass family in North America is represented by 38 different species. These common lake and pond fish have been widely introduced for sport fishing in warm waters throughout the United States.



Sunfish are the foundation of warm-water sport fishing in ponds and lakes, and are usually abundant, readily caught, and good eating. Sunfish have two dorsal (top) fins that may appear as one, but the front dorsal fin has hard spines and the second dorsal fin has soft rays.

Sunfishes (bluegill, pumpkinseed, redear, green, and others) and crappie (white and black) are pond fish that are widely popular with children and beginning anglers. They are small (up to 2 pounds) and laterally-compressed (squeezed sideways).

Largemouth and smallmouth bass are also in the sunfish family. The most common of the bass are the largemouth and smallmouth bass. They can grow up to 15 pounds and are more streamlined than the sunfishes. Largemouth bass is the most widely distributed and commonly sought sport fish in the United States. Professional bass fishing tournament anglers compete for prizes of \$1 million or more.

Sunfish can spawn multiple times throughout the spring and summer months in shallow nests scooped out of the pond bottom by males. Males vigorously fan and guard the eggs and aggressively defend nests and young from other males and predators. Sunfish feed on plankton, bottom invertebrates, and small fish. Bass quickly become voracious fish eaters. Both sunfish and bass form loose schools (aggregations) around underwater structures (brush piles, piers).

Pike (Esocidae Family)

Pikes are large, voracious predatory fish with long streamlined bodies and long, toothed duckbill-like snouts. All four species in the United States are found in weedy habitats in rivers and lakes. Northern pike are the most widely distributed cool-water, freshwater fish, found across northern North America, Europe, and Asia.



Northern pike and muskellunge (musky) grow to 50 to 100 pounds, whereas the smaller chain and redbfin pickerel seldom exceed 5 pounds.

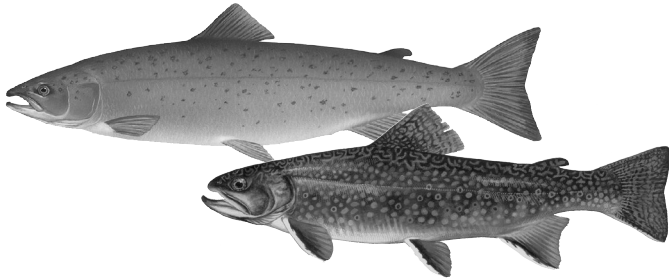
The pikes are prolific (500,000 eggs per fish) broadcast spawners, laying adhesive eggs over flooded vegetation in the early spring. Juveniles become predatory on fish (piscivorous) at about 2 inches in length and continue to be day-active carnivores eating fish, frogs, waterfowl, and small mammals throughout their solitary lives.

Trophy-size musky and pike are difficult to catch and actively sought by sport anglers because they strike and fight hard. They have been widely distributed outside their native range for sport fishing. Pike and pickerel are good eating, but the flesh contains small intermuscular bones similar to those found in suckers and carp.

Salmon and Trout (Salmonidae Family)

The salmonids comprise about 38 species in North America, including Pacific salmon, the Atlantic salmon, trout, and whitefish. All salmonids have soft fin rays, an adipose fin, and fine cycloid scales.

The Pacific and Atlantic salmon are native, anadromous fish that hatch in coastal streams, spend most of their adult life in the ocean, and return to their home stream as adults to spawn and die. The five species of Pacific salmon native to North America are the chinook (king), coho (silver), sockeye (red), pink, and chum (dog) salmon. There is only one species of Atlantic salmon.



Trout inhabit cold-water streams and cold, clear lakes across the nation. Brook trout is a native Eastern species, whereas rainbow (steelhead) trout, cutthroat trout, and bull trout are all native Western species. The brown trout is a European import. Lake trout, found in the Northern states and Canada, have been widely stocked throughout the nation wherever cold water temperatures exist. Whitefish include about 20 morphologically similar species and are found in cold, Northern lakes.

Adult female salmon returning from the ocean dig a depression (redd) in stream bottom gravel. The eggs are deposited, fertilized by males, and then covered with gravel by the female. Adult salmon die after spawning and provide no parental care for the young.

Salmon produce eggs with very large yolk sacs. After hatching, young salmon may remain in the stream from one to three years before they turn silver (smolt) and begin their seaward migration. At this time, they become imprinted on their home stream odor, allowing them to return to the stream as adults many years later.

Salmon and trout support important commercial and recreational cold-water fisheries. The commercial high-seas fishery for salmon employs thousands of people. Salmon, whitefish, and lake trout are commercially caught in the Great Lakes. Salmon and trout are widely farmed in fresh and saltwater ponds and pens as food fish. Brook, rainbow, and brown trout are frequently stocked for put-and-take angling in freshwater lakes and streams.

Lamprey (Petromyzontidae Family)

These are primitive eel-like fish that lack jaws, scales, paired fins, and bone. The skeleton is composed of cartilage. There are lamprey species that live in salt water, some that live in brackish water, and still others in freshwater for some or all of their life cycle.

Nineteen species of lamprey are found in freshwater streams and lakes in North America, most along the Atlantic and Pacific Coasts and in the Mississippi River system.

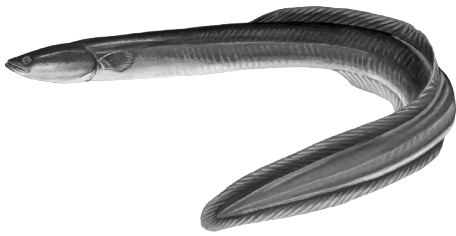


Lampreys are river-spawning fish that swim upstream to spawn at sites excavated by removing stones in the stream bottom. The young hatch into blind larvae called ammocetes that burrow into stream mud and remain there for three to eight years. Larvae feed by filtering organisms from the water. Eventually some species metamorphose to the parasitic adult form with rasping teeth, sucker mouth, and eyes. Other species do not feed as adults (are non-parasitic) and spawn after metamorphosis. Most species do not have a damaging effect on host (prey) populations, but the sea lamprey nearly exterminated the lake trout and whitefish from the Great Lakes.

Eels (Anguillidae Family)

The American eel is the only eel species found in freshwater rivers in North America. Adults migrate downstream into an area in the Atlantic Ocean known as the Sargasso Sea (near Bermuda) where they spawn and then die. The young are ribbon-like larvae (called leptocephali) that float and swim for one to three years in the ocean before returning to nearshore and freshwater habitats. As they near the coast they transform into “glass-eels,” a transparent form of the adult. The glass eel then transforms into an “elver,” a dark form that transforms into the adult.

Some adults remain and mature in estuaries, but others migrate upstream and inland as far as Minnesota and Nebraska. They may remain in freshwater for as long as 15 years before returning to the ocean to spawn. Adult eels, up to 4 feet in length, live in rivers where they hide in the mud by day and feed at night on fish, crayfish, and aquatic insects. Their ability to breathe air allows them to move on land around dams and other obstructions.



A growing aquaculture industry is harvesting elvers as seafood or to rear in tanks to adult size. Adult eels are sold fresh, frozen, or smoked. The flesh is firm and well flavored, and it is considered a delicacy in Europe and Asia.

Sturgeon (Acipenseridae Family)

Sturgeon, along with paddlefish, gar, and bowfins are ancient fishes. More than 25 species of sturgeon survive worldwide; nine species live in the large rivers in North America.



Although sturgeon are anadromous, some spend most of their lives in the ocean. They are prolific spawners, laying up to 3 million eggs, but do not reach maturity until they are 10 years old.

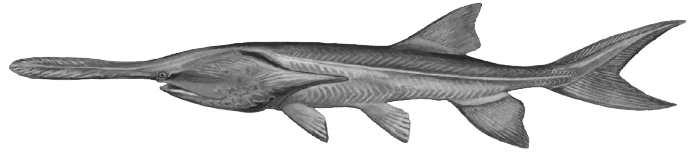
Sturgeon have a suction mouth, and feed on insects, clams, snails, and other bottom-dwelling animals. The body is scaleless with bony plates. Sturgeon are very slow to reproduce and overfishing has diminished their populations. Water pollution and the damming of large rivers have contributed to their decline. All sturgeon species North America are listed as endangered or threatened. The shortnose and Atlantic sturgeon are rare, and efforts are being made for their restoration.

The eggs (which are processed into caviar) and flesh are sold as luxury food items and command extraordinarily high prices. The flesh is superior, especially smoked. Limited farming of white sturgeon is being practiced in California and elsewhere.

Paddlefish (Polyodontidae Family)

The paddlefish is a close relative of the sturgeon. Only one species of paddlefish is native to the United States. Another species was found in China but is suspected to be extinct. The huge snout (paddle) of paddlefish is covered with sensitive taste buds which may help locate

plankton. A filter-feeder, the paddlefish can grow up to 200 pounds. Dams have caused a sharp decline in paddlefish distribution and abundance in the United States.

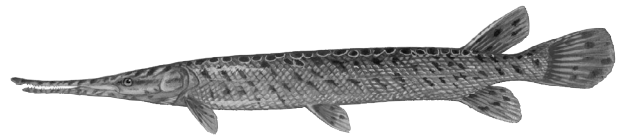


Snagging paddlefish with bare hooks when they congregate below dams on their spring spawning runs is a popular sport in some areas.

Attempts at paddlefish farming have met with limited success. The flesh and eggs of paddlefish are similar to those of sturgeon and are of excellent quality and high-priced in seafood markets.

Gar (Lepisosteidae Family)

Primitive, pike-like fishes, gar are easily recognized by their long, narrow, toothed jaws and diamond-shaped, non-overlapping scales. Gars have lung-like gas bladders that permit air-breathing. This allows gars to live in low-oxygen conditions where they sometimes are observed floating at the water surface.

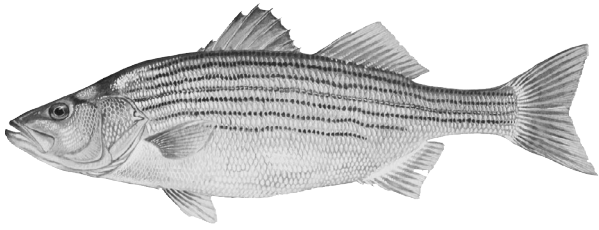


Seven species of gars live in North America, including the giant alligator gar which can grow to 10 feet long. Gars are predators on a wide variety of fish, ambushing their prey with a sudden attack. The eggs are adhesive and poisonous.

Gar fishing provides sport to anglers and archers (bowfishers), but gar flesh has little value. At times gar populations become too abundant and overconsume desirable sport fish. Gar are considered a nuisance fish in sport-fishing ponds.

Temperate Basses (Moronidae Family)

Four freshwater species, including the striped, white, and yellow bass, and the white perch (not a true perch) are found in this family. As in the perch family, these species have two dorsal fins (the first with spines and the second with soft rays). The striped bass is a marine, anadromous fish that can grow to 80 pounds. It generally spawns in tidal rivers, but it has adapted well to a landlocked, completely freshwater existence in some reservoirs.



Striped bass are schooling, spring-broadcast spawners that release as many as 500,000 small eggs. Striped bass eggs are semi-buoyant, meaning they must be kept moving for several days prior to hatching. Most freshwater populations must be maintained by stocking. The young lack a yolk sac and must feed on tiny zooplankton as soon as they hatch. Adult striped bass are voracious predators, preferring herring, shad, and alewife prey.

The striped bass is a premier sport fish, a strong fighter, and good eating. Striped bass fishing contributes hundreds of millions of dollars to the economy in the United States. Farming hybrid striped bass in outdoor ponds and indoor tanks has proven successful and is a growing form of commercial aquaculture.

Further Reading

Learn more about freshwater fishes through two other Virginia Cooperative Extension publications:

- Biology, Ecology, and Management of Virginia's Freshwater Fishes, <https://www.pubs.ext.vt.edu/CNRE/CNRE-73/CNRE-73.html>.
- Sustaining America's Aquatic Biodiversity - Freshwater Fish Biodiversity and Conservation, <https://www.pubs.ext.vt.edu/420/420-525/420-525.html>.

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