



# Common Farm-Raised Baitfish

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The three main fish species raised for bait in the southern region are the golden shiner, the fathead minnow, and the goldfish. Together, these three species account for more than 90 percent of farm-raised bait and feeder fish sales in the United States. *Baitfish* are used by anglers to catch crappie, largemouth bass, walleye, and other fishes. *Feeders* are small fish sold through pet stores and to zoos as food for ornamental fish and invertebrates.

Golden shiners, fathead minnows, and goldfish are particularly suited for culture as bait and feeder fish because they adapt well to the environment of culture ponds, have a small adult size, readily accept prepared feeds, reproduce freely in ponds, and are found in most states in the country. Other fish, invertebrates (crawfish and shrimp), and amphibians are also used for bait, and culture methods are under development for a number of alternative species.

A problem with new baitfish species is that non-native fish might be transferred in bait buckets to waters where those fish species do not currently exist. There is widespread concern about the potentially serious ecological effects of introducing new types of fishes (and other animals) into areas where they are not native. That may lead to more restrictions on the use of non-native bait species. Regulations regarding the sale and culture of fish for bait vary widely among the states, and potential producers are encouraged to check with their state natural resource agency for additional information.

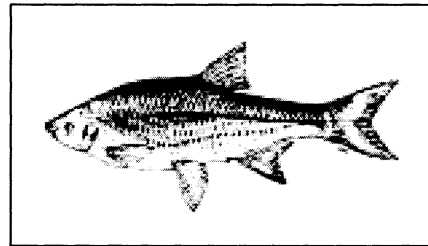
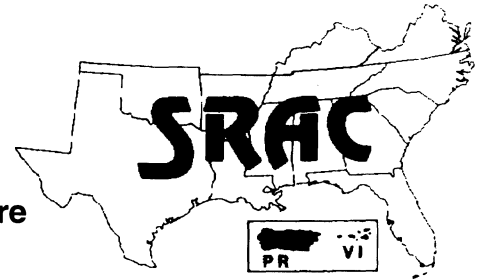
About half of all baitfish sold are farm-raised, while the other half are harvested from the wild. Harvesting from the wild can yield a mix of different fish species. Harvested fish must be sorted carefully to remove undesirable species which, if transferred in bait buckets to new areas, could cause environmental damage. Sea Grant specialists have developed Hazard Analysis Critical Control Point (HACCP) plans to minimize the risk of exotic species spreading when wild bait is harvested and transferred. Baitfish from farms consist of a few known species that are already widely distributed. There are fewer environmental concerns. However, baitfish farmers must make sure their fish are not contaminated with undesirable species.

## Golden shiner

(*Notemigonus crysoleucas*)

A thin, deep-bodied fish with a small, triangular head and large, loose, reflective scales, the golden shiner is a flashy, attractive baitfish. The mouth is small and turned up, and the tail deeply forked. From the side, golden shiners are silver or sometimes golden; from above they are dark greenish

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Golden shiner

brown. Young fish often have a dark, horizontal stripe along the midline, running the length of the body. The sexes can be distinguished when fish are in breeding colors. Males develop a fine,

sandpapery texture on the lower body, and the lower abdomen and vent area may have a dusky color. The abdomen of the female (and some males) remains smooth and white. The pectoral and pelvic fins of the male become bright gold, while those of the female are either clear or have gold on the outer edge only. It is easy to obtain milt from ripe males with gentle pressure to the lower abdomen. Many females are larger than males by the spring of the first year, as they begin to reach sexual maturity.

Golden shiners are native to or have been introduced into much of the continental United States. They have been used widely as a baitfish since the 1940s. Golden shiners eat a wide variety of natural foods and readily accept prepared fish feeds. Zooplankton, insects, and algae (including filamentous algae) make up most of their diet. Larval golden shiners (fry) feed on small zooplankton and algae either in the water or attached to underwater surfaces.

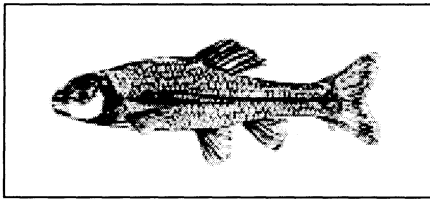
Golden shiners spawn in the spring when water temperatures rise above 68°F (20°C). They quit spawning when temperatures exceed 81°F (27°C). Once spawning begins, fish will continue to spawn even when temperatures drop below 68°F. Golden shiners spawn frequently, attaching their adhesive eggs to aquatic vegetation or spawning mats. No care is given to the young. Eggs are about 4/100ths of an inch (1 mm) in diameter and hatch in 3 to 4 days, depending on water temperature.

## Fathead minnow

(*Pimephales promelas*)

The fathead minnow has a thick body with a blunt head and small mouth.

Fathead minnows are normally dark olive on the upper body, with a lighter silvery shade below, and have a black stripe along the middle of each



Fathead minnow

side. The "rosy red" fathead minnow, developed by Billy Bland Fishery, is orange shading to a lighter silvery orange on the lower body. Male fatheads generally are larger than females; during breeding, normal-colored males develop black heads with several rows of small breeding tubercles (bumps). Females develop an ovipositor, a fleshy protuberance near the vent, which is used to help position eggs during spawning. Fatheads usually live only a few years.

Fathead minnows are found over much of North America, ranging from Canada to northern Mexico. They are commonly found in slow streams, ponds, lakes, and wetlands. Fathead minnows eat a variety of animals and plants mixed with mud because they feed on the bottom. Zooplankton is another of their natural foods.

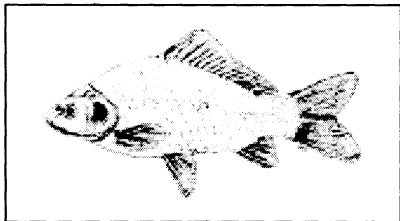
Males set up territories under submerged objects and defend these breeding sites from other males. Females are attracted to the males and lay eggs on the undersides of hard surfaces in the water. Spawning substrates provided by farmers include boards, pallets, plastic tarps and irrigation tubing. Once eggs are laid, the male defends the nest until the eggs hatch. Water temperatures higher than 64°F (18°C) trigger spawning. Females spawn at frequent intervals, up to several times a week. Once the water warms to 84°F (29°C) or higher, spawning stops. Fathead minnow eggs are small (1.2 to 1.6 mm), just slightly larger than golden shiner eggs.

## Goldfish

(*Carassius auratus*)

Most people recognize goldfish. Occasionally goldfish are confused with the koi carp. Carp have barbels ("whiskers"), while goldfish do not.

The body is often heavy and thick, while the forked tail fin may be either short or long and flowing. Goldfish are dark in color until 2 to 4 months of age, when they develop their adult coloration.



Goldfish

The preferred color for feeder goldfish is orange, although goldfish can be a variety of other colors. Goldfish are very hardy and withstand poor water conditions, including low dissolved oxygen.

Goldfish were first introduced into the United States more than 300 years ago. In the late 1800s and early 1900s, goldfish farms were established in Maryland and southern Pennsylvania. Goldfish are now found all over the country. Culture of goldfish for the feeder or ornamental markets is usually allowed, but some states prohibit the sale of goldfish as bait because they uproot plants while feeding. Goldfish eat a wide variety of plant and animal foods, including insect larvae, invertebrates, algae and aquatic vegetation.

Mature female goldfish develop bulging bellies in the breeding season. Males tend to be smaller, slimmer and have fine bumps on the gill flaps, pectoral fins and upper body. Water temperatures higher than 60°F (16°C) trigger spawning, and females may spawn several times during the season. The adhesive eggs are scattered onto aquatic vegetation or on spawning mats supplied by fish farmers. Spawning season ends when water temperature reaches the upper 70s (24 to 26°C). Eggs range in size from 4 to 7/100ths of an inch (1.0 to 1.7 mm) in diameter.

## Other species

A brackishwater baitfish, the gulf killifish (*Fundulus grandis*), also known as bull minnow or mud minnow, is raised along the Gulf Coast and shows promise for expanded production. Another species used for bait is the common carp (*Cyprinus carpio*). The carp is hardy and large, but many states prohibit carp. Similarly, the tilapia (*Oreochromis* spp.) is an excellent summer baitfish, where legal. Occasionally, farm-raised green sunfish (*Lepomis cyanellus*) are also sold as bait.

The rudd (*Scardinius erythrophthalmus*) is an exotic species of minnow native to Europe. It was brought into the United States on several occasions in the past, and was re-introduced about 1980 and sold for a decade as a bait species. It looks much like the golden shiner, but its dorsal fin is reddish-brown and its other fins are bright red. The rudd was a popular baitfish until it was discovered that the rudd could interbreed with the golden shiner. It was then prohibited as a baitfish species.

## Sources of additional information

Other SRAC publications containing information on baitfish species and their culture include:

SRAC-121, Baitfish: Feeds and Feeding Practices

SRAC-122, Baitfish Production: Enterprise Budget

SRAC-140, Forage Species: Range, Description and Life History

SRAC-141, Forage Species: Production Techniques

SRAC-142, Forage Species: Return on Investment

(Original publication by D. Leroy Gray)

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