

# State's Newest Forage Fish



CRAIG BIRKLE

*Gizzard shad are beneficial as a forage fish in the Missouri River and other waters in southwestern North Dakota.*

**By Scott Gangl**

*Shad. The name conjures up images of a baitfish popular across the southern United States.*

*Few other baitfish have been as inspirational to lure makers than shad. Open any sporting goods catalog and you'll find baits with names like Shad Rap, Sassy Shad, Swimming Shad, Rattling Shad, the list goes on.*

*But if you've spent most of your life in North Dakota, odds are you've never seen a shad. Your chances are improving, however, because the State Game and Fish Department has been stocking shad in southwestern North Dakota reservoirs since 2001, and they have become prominent forage in Lake Oahe and the Missouri River below Garrison Dam.*

## **Range**

Gizzard shad are the only species of shad that have historically been sampled in North Dakota. Favoring medium to large, warm, slow-flowing rivers, these fish were collected in the Missouri and James rivers decades ago before dams were built. Shad have little tolerance for cold water, however, so length and severity of North Dakota winters has generally

kept them from becoming year-round residents. Shad captured in North Dakota probably migrated upriver long distances in summer when water temperatures were warmest. After dams were built, the physical structures and cold water discharges impeded the gizzard shad's ability to migrate and occupy North Dakota waters in summer.

*Jason Lee, south central district supervisor for the Department's fisheries division, samples gizzard shad at night on the Missouri River.*

## Description and Biology

The gizzard shad has a deep, compressed body. Its belly is sharp, with a ridge that resembles saw teeth. When fresh, shad can be distinguished from other fish like goldeye by their trademark look, including a blunt nose, long thread-like rear dorsal fin ray, and shoulder spot directly behind the gill covers. This spot is present in young gizzard shad, but becomes faint and eventually disappears as the shad matures. After they've been eaten by a predator, partly digested shad are much more difficult to identify. Anglers will often report fish with "stomachs full of shad," that are actually full of other young fish, like white bass, crappie or goldeye.

Gizzard shad are filter feeders, feeding on algae, zooplankton and small insects. They are one of the few native North American fish capable of surviving solely on plant materials. This makes them ideal forage for larger predator fish, because they provide a direct link from the plant level of the food chain to the upper levels.

The gizzard shad gets its name from its muscular stomach, which resembles a bird gizzard. Some researchers have found grains of sand in the shad's gizzard, leading to speculation that the fish intentionally consumed sand to use as grit to help break down plant material in the gizzard. However, this has never been proven and other researchers have suggested the sand was accidentally consumed while foraging for prey.

Spawning takes place in late spring or early summer. Female and male gizzard shad swim together near the surface, expelling eggs and milt over open water. Fertilized eggs drift and slowly sink, adhering to submerged vegetation and other objects. Larval gizzard shad hatch from the eggs after only two to four days.

Gizzard shad are temperature sensitive, and can't tolerate rapid fluctuations or prolonged cold periods. Though not scientifically proven, a good rule of thumb is that gizzard shad typically don't survive winters in waters where ice cover lasts 100 days or longer.



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***Gizzard shad outgrow the mouths of most predators by the time they're 10-12 inches long. In southwestern North Dakota waters this happens at about age 2.***

## **Management**

Since gizzard shad eat plants and insects, they are difficult to catch with hook and line and aren't an attraction for anglers. Instead, most wildlife agencies manage gizzard shad as a forage fish to bolster game fish populations. They are ideal forage because of their high calorie content, and their body shape and soft fin rays make them easy to consume.

However, due to their prolific nature and ability to survive on plant material, gizzard shad are a threat to overpopulate water bodies. Across the South, gizzard shad are notorious for overpopulation, especially in productive lakes and reservoirs. Some reports suggest that shad can tie up to 80 percent of the total fish biomass in fertile impoundments. When this happens, shad are so numerous they can out-compete game fish for food. Shad that overpopulate a lake usually grow too large for predators to consume, and don't provide any benefit to the game fish community.

Biologists in North Dakota and other states outside the gizzard shad's range have capitalized on the shad's intolerance for cold to bolster their forage populations while minimizing the threat of overpopulation. Adult

gizzard shad stocked in spring will spawn over summer, producing millions of young forage fish that are suitable for many sizes of predators. However, most adult and young shad won't survive a typical North Dakota winter, and won't live long enough to overpopulate a lake.

Department fisheries biologists traveled to Nebraska in spring 2001 and collected 137 adult gizzard shad, which were stocked in Bowman-Haley Reservoir in southwestern North Dakota. From 2002-05, Game and Fish biologists made trips to Nebraska to collect adult gizzard shad, stocking between 40-250 adult shad in Bowman-Haley, Patterson Lake near Dickinson, and Lake Tschida in Grant County. These stockings have been fairly successful, with good reproduction. Because winters are considerably warmer in southwestern North Dakota, and recent winters have been especially mild, there has been some limited adult survival. As a result, no shad were stocked in 2006.

The South Dakota Department of Game, Fish, and Parks has stocked shad in some western reservoirs, similar to North Dakota. Shad from either state's stockings have made their way downstream into Lake Oahe. During 2005, biologists sampled exceptional numbers of young shad at virtually all sampling sites from Garrison Dam to the South Dakota border. Young gizzard shad occupied the Missouri River again in August 2006, though in slightly lower numbers than 2005. These pulses of young shad in late summer likely came from adults that survived and spawned in Lake Oahe. Young shad vacate the river when water temperatures cool in late fall and winter, seeking refuge in warmer waters of Lake Oahe.

In the short term, the influence of shad on the recreational fishery has been favorable. Immature shad provide a valuable forage base for the river's walleye population, and the timing of their runs has not negatively affected spring or fall walleye fishing in the Missouri. Cold winter temperatures combined with coldwater releases from Garrison Dam probably won't allow shad to survive year-round in the Missouri River in North Dakota, although some adults may seek refuge in the warm water effluent below the power plants along the river.

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## **Shad in Sakakawea**

The benefits of shad as forage for the Missouri River walleye fishery have prompted some to question why shad are not stocked to improve forage conditions in Lake Sakakawea as well. The sheer size and cooler climate of Sakakawea make this unfeasible.

Over the last 53 years, the ice-covered period on Sakakawea has averaged 116 days, indicating winter survival for shad would be highly unlikely. In fact, Lake Sakakawea is the only Missouri River reservoir that has totally frozen every year of its existence (it is not uncommon for portions of Lake Oahe to remain open year-round).

Although over-winter survival of shad in Lake Sakakawea is highly doubtful, if they were in the lake it is possible some shad could migrate upstream into the warmer waters of the Yellowstone River which would complicate the fish management efforts of neighboring Montana where shad aren't welcome. Also, if weather conditions allowed shad to establish a surviving population, they would compete with other fish for plankton and other insect food.

The Game and Fish Department has evaluated the logistics of annually stocking adult gizzard shad in Lake Sakakawea to boost the prey base, similar to southwestern North Dakota reservoirs. Approximately 15,000 mature shad (30,000 pounds) would need to be stocked annually to spawn enough young to meet predator demand. Simply put, a local source, or even multiple sources, of adult shad of anywhere near this magnitude does not exist.

While shad remain a viable option for bolstering the forage base of smaller North Dakota reservoirs, they are not a logical option to increase forage in Lake Sakakawea. Long-term, all efforts must continue to address the one and only issue needed to resolve the Sakakawea forage issue – improving habitat conditions for rainbow smelt by implementing proper water management measures.