



Catches of paddlefish in North Dakota yesterday and today.

Unlocking the Secrets of Lake Sakakawea's Young Paddlefish

By Dennis Scarnecchia, Jim Fredericks and Fred Ryckman



Bob Fenstermaker

Of the nearly 100 species of fish known to inhabit North Dakota's waters, none is larger, more distinctive, or more mysterious than the paddlefish. This ancient inhabitant of the Missouri and Yellowstone rivers in North Dakota commonly reaches weights of 80-90 pounds; the current state record fish (caught in 1993) weighed 120 pounds.

Because paddlefish feed by filtering tiny zooplankton from the water with their long gill rakers, they cannot be caught using conventional fishing methods. Thus, the only way anglers can harvest them is by snagging their tough outer skin by jerking hooks and heavy weights through the water with long spinning or trolling rods.

Although paddlefish have been known from the Missouri River in North Dakota since early times, only in the last few decades has snagging for paddlefish become popular with anglers. Each season from May 1 to June 15, the excitement of hooking into a truly large fish brings many enthusiastic anglers to the confluence of the Missouri and Yellowstone rivers, 25 miles southwest of Williston. Other anglers try their luck at Sundheim Park near the North Dakota-Montana border, at "the pumphouse" area near Williston, and at a few other more remote locations between these sites.

After the closure of Garrison Dam in 1953, Lake Sakakawea gradually filled from 1954 to 1966. During this initial filling period, the paddlefish population above the dam (called the Yellowstone-Sakakawea stock) evidently increased greatly. The increase was thought to result from the creation of good feeding conditions in the reservoir to complement good spawning habitat in the turbid, free-flowing Yellowstone. This population boom was opposite the fate of many other paddlefish stocks in other portions of the species' range, where habitat loss and overharvest were causing depletion or elimination.

Since the population boom, large numbers of mature, adult paddlefish have moved upstream each spring from Lake

Sakakawea into the Yellowstone and Missouri rivers to spawn. Most of these spawning paddlefish move up the Yellowstone River after reaching the confluence, although a few ascend the Missouri River into Montana.

Those fish finding the right combination of flows, water temperatures, and gravel substrate spawn in groups over flooded gravel bars. Small, grey-black fertilized eggs stick to the substrate, and hatch in about a week, depending on water temperature. The young fish move (or are swept along with the current) downstream, eventually reaching the headwaters of Lake Sakakawea. There they feed for several years, until they become sexually mature and make the upriver spawning migration.

Males typically begin spawning at ages 9-11 years and females at 15-18 years. Compared with most fishes, paddlefish are long lived; 25- to 35-year-old fish are not uncommon, and one was even reported to be 55 years old. Individual males and females do not generally spawn annually – perhaps every other year for males and every three or four years for females.

The Yellowstone-Sakakawea stock first began to provide an important fishery in Montana in about 1963. Between 1963

and 1994, 500 to 5,000 paddlefish have been caught annually in Montana as they migrated upriver to spawn. In North Dakota, the first snagging season was authorized in 1976, but it was not until the late 1980s that significant paddlefish snagging developed. Today both states harvest similar numbers of paddlefish each year from the Yellowstone-Sakakawea stock, and biologists from both states cooperate closely in managing these fish.

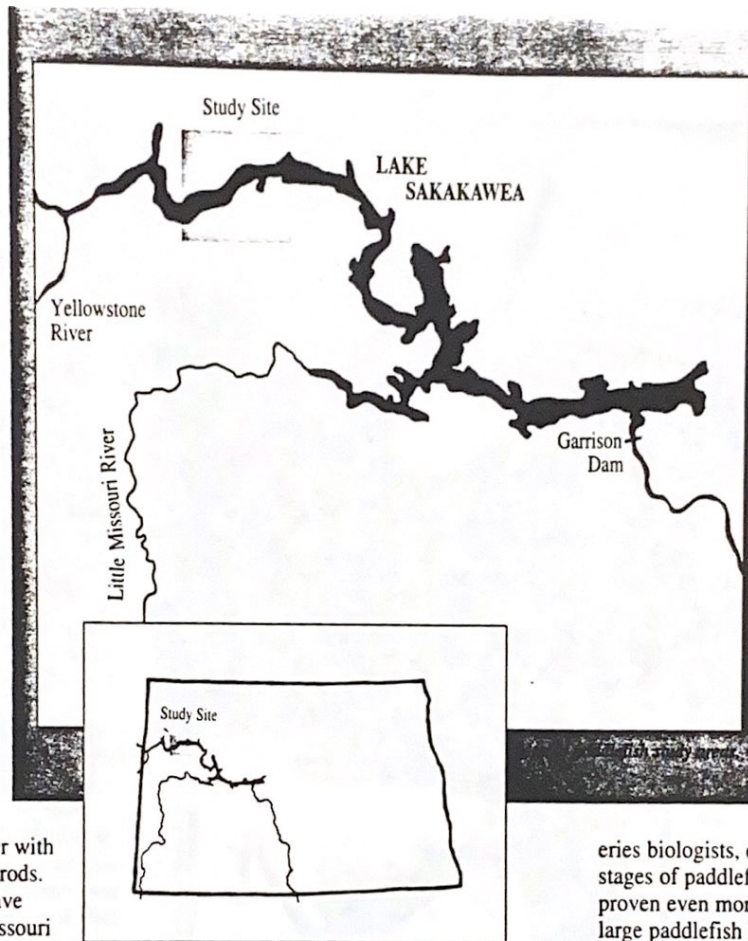
Landing a "whopper" (70 or more pounds) paddlefish can be a real challenge. But for fish-

eries biologists, catching small, young stages of paddlefish in the wild has proven even more difficult. Although large paddlefish have been reported since the earliest European explorers, young paddlefish were virtually unknown until the 20th century.

In 1910, scientist C. H. Danforth reported a three-inch long paddlefish from the Mississippi River near St. Louis, and the next year, after reading Danforth's paper, T. Barbour of the Harvard Museum of Comparative Zoology reported that the museum had in its collection several small paddlefish (as small as 1 1/2 inches) that had been caught in the 1850s from Missouri and Arkansas. Tiny, newly-hatched paddlefish larvae were not reported until 1932, when D. H. Thompson caught seven of them from the Mississippi River in Illinois.

Several decades after those reports, young paddlefish remain elusive, and their ecology during their first years is still poorly understood. In fact, until recently, biologists knew little about the paddlefish of the Yellowstone-Sakakawea stock until they were caught in the fishery as adults during their first spawning migrations.

Because paddlefish are known to be finicky spawners, requiring particular combinations of flows, temperatures, and other factors for success, unsuccessful spawning for a number of consecutive years could forewarn of problems for this or any paddlefish stock. But without



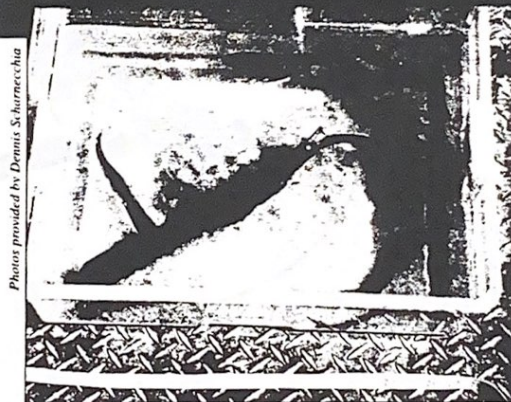
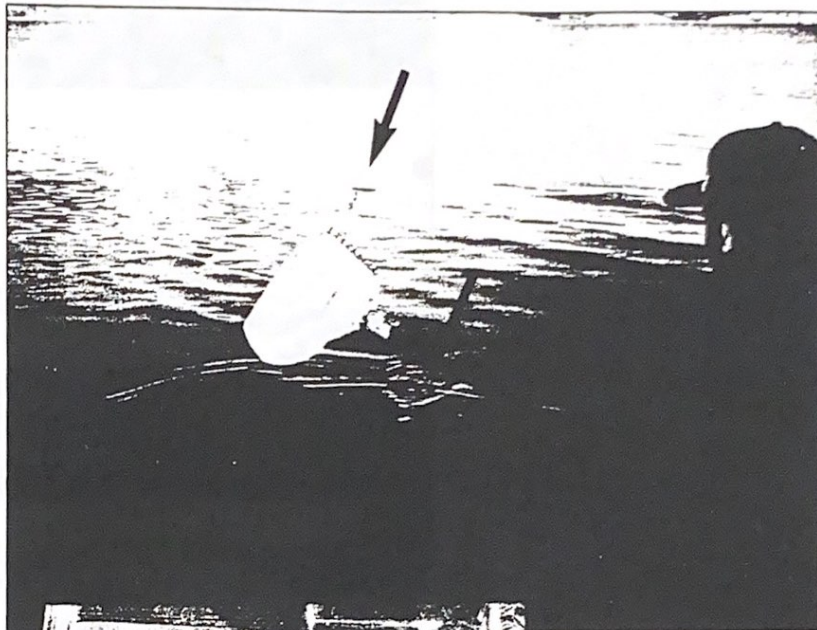
some way to assess the annual spawning success, based on the presence of young, recently-born fish, biologists would have to wait at least nine years after a given year's spawning before the presence or absence of 9-year-old mature males harvested by anglers would tell them if successful spawning had occurred.

Clearly, a better early warning system for paddlefish reproduction is needed, preferably one that involves estimates of abundance of young-of-the-year (YOY) or yearling paddlefish, after they have reached at least 6-10 inches and 15-18 inches in length, respectively. By the end of the first growing season, the effective success of spawning and early survival should be established. After the second growing season, the strength of the year class is probably established since little natural mortality is thought to occur after the fish reach this age.

In the past few years, biologists of the North Dakota Game and Fish Department and U. S. Fish and Wildlife Service, as well as local fishermen, have reported sighting YOY and yearling paddlefish in the upper end of the reservoir in late summer and fall as the young fish swam near the surface. In July 1991, Game and Fish biologists reported numerous YOY paddlefish about six inches long swimming near the surface just upstream from Lewis and Clark State Park, 20 miles east of Williston. The large numbers observed that summer coincided with high discharges on the Yellowstone River earlier that spring, which suggested to biologists that the high flows, which are thought to aid in paddlefish spawning, may have resulted in a strong 1991 year class of paddlefish.

Counts of YOY paddlefish were nearly five times higher in 1993 than in 1992, and no YOY were counted at all in 1994.

In response to these findings, and because of the need to develop better methods of assessing the well-being of the paddlefish stock, Game and Fish has since 1992 sponsored efforts to quantify abundance of YOY and yearling paddlefish in the reservoir. The Department also wants to better understand the causes of annual variations in year class success, the factors affecting the distribution of the young paddlefish in the reservoir, and



Photos provided by Dennis Schumacher

Above: Young-of-the-year paddlefish swimming (note V-wake in foreground) and jumping (above net).

Left: Young-of-the-year (YOY) and yearling paddlefish netted with dipnets in 1992.

the ecology (including food habits) of young paddlefish.

Several techniques have been tested for use in estimating the relative abundance of YOY and yearlings in the reservoir; the results to date indicate that a visual count is the most useful method. From about July 20 until early October, counts from slow-moving motorboats are conducted along straight lines (called transects) perpendicular to the reservoir within the 40-mile headwater reach of Lake Sakakawea from Hofflund Bay to the American Legion boat ramp above Williston.

When young paddlefish sense moving boats, their attempt to flee is thwarted by their large, flat rostrum (paddle), which forces the rapidly-swimming fish to the surface. They are then counted, and often netted. By using this method, strong year classes of paddlefish were documented in 1991 and 1993, which were high-flow years (in May-July) on the Yellowstone River. In contrast, 1992 and 1994, low-flow years (in May-July) on the Yellowstone, produced weak year classes.

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A surface trawl towed between two boats has also been used to count and sample young paddlefish. Up to 48 YOY paddlefish per mile were trawled in 1991 and an average of 18 per kilometer in 1993; the catch rate in 1992, a low flow year, averaged only 2-3 YOY per kilometer. No trawling was done in 1994 because no visual sightings of YOY were confirmed.

Visual counts and trawl counts show similar trends in paddlefish numbers, which indicates that both methods are useful in developing some idea of annual reproductive success and year class strength. Visual counts are more efficient, however; in 1993, we sampled 43 YOY per hour with visual counts compared to slightly more than five per hour with the trawl. Visual counts are the most useful and cost-effective method of assessing reproductive success that has been developed thus far.

Another important result of this investi-

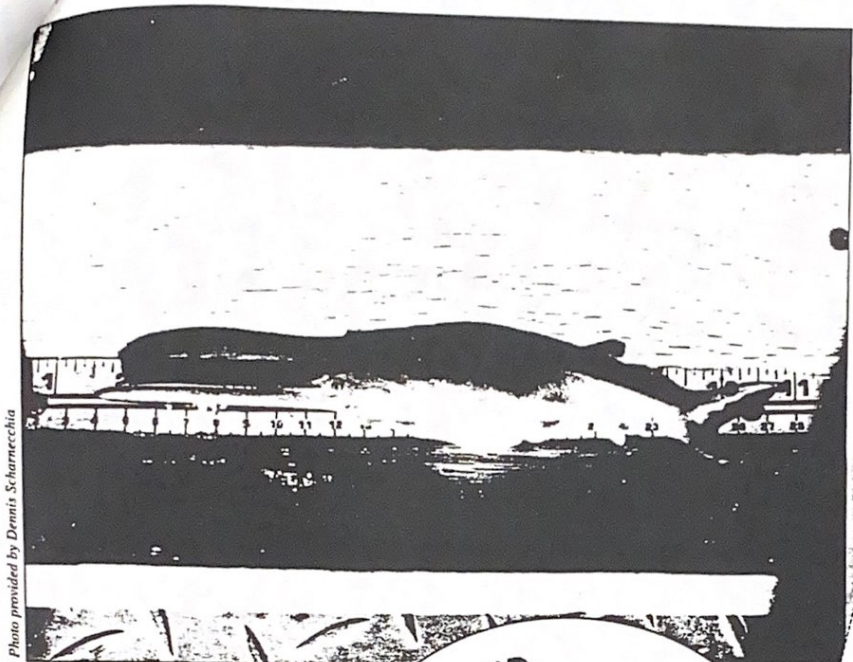


Photo provided by Dennis Scarneccchia

Above: A well-fed young paddlefish.

Right: *Leptodora*, the preferred paddlefish food.



gation has been the identification of the main food of YOY paddlefish. In the summer of 1993, their preferred food was a large, predaceous species of zooplankton called *Leptodora*. Nearly nine out of 10 items eaten were *Leptodora*, even though they were less than one percent of the zooplankton in the water.

YOY paddlefish were evidently not feeding by filtering the water with their gill rakers, as yearlings and older fish have been shown to do, but were instead individually choosing these large zooplankton. In addition, they were selecting the largest *Leptodora*, because the average size of those *Leptodora* in the stomachs was greater than those sampled with a plankton net in the reservoir. This preference for large food items may help the YOY paddlefish's chances for rapid growth, and thus increase their likelihood of survival. At some point between their first autumn and the next summer, the young paddlefish begin to filter feed, and the stomach contents of yearling paddlefish sampled was a wide mix of zooplankton species similar to that sampled in our plankton net.

We also found that YOY paddlefish with the fullest stomachs were found at times and in areas where the largest concentrations of zooplankton were found. These areas of high zooplankton concentrations were located where the high suspended sediment load of the Yellowstone

River began to settle out, yet where sufficient turbidity in the water remained to perhaps protect the young paddlefish from being eaten by other fish.

Despite considerable progress, much remains to be learned about young paddlefish in Lake Sakakawea. We still do not clearly understand the factors affecting year class strength, even though the recent sampling has suggested the importance of high river flows in spring.

The role of predation on young paddlefish by other fishes and birds is also poorly understood, although we have learned that young paddlefish are easy for us to catch in nets, and also appear to be easy for predators to catch. We also must learn more about where the YOY paddlefish are before they mysteriously show up as six-inch fish in our transects in August.

There is still little known about the ecology of immature paddlefish in this stock after their second year of life. Gradually, Game and Fish-sponsored research is unlocking the mysteries of the paddlefish, a fish ever so reluctant to give up its secrets.

Fishing for Photos

The photo of paddlefish on page 10 was taken in August, 1916. It was provided by Mrs. Rosie Dishon, a lifelong resident of the Buford area near the confluence of the Yellowstone and Missouri rivers near Williston. Do you have anything similar in your old photo albums or attic? If you do and wouldn't mind sharing the photographs or information about the photographs please contact Fred Ryckman, fisheries biologist at the Williston office of the Game and Fish Department at P.O. Box 2476, Williston, ND 58502 or call him at 701-774-4320. We are interested in as much as we can learn about the history of paddlefish in the Missouri River system and old photographs and information about them might help us a great deal.

(For more information on North Dakota's paddlefish, see the article by Brooks Tenney and Greg Power in the March, 1992 issue of *North Dakota OUTDOORS*).

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