Dinosaurs of the Deep

by Pat Clancey

MARK CALAMAR

The Missouri and Yellowstone rivers of eastern Montana may be the last stronghold of the endangered pallid sturgeon—a species that has existed for 200 million years.

Pangaea, the great land mass which separated into present-day continents, had drifted together 50 million years earlier, and would still be whole for 20 million years. Dinosaurs had inhabited the land for 25 million years, but had not yet begun to dominate the planet. The first birds and mammals were still millions of years away. It was over 200 million years ago that the pallid sturgeon evolved in large, turbid prairie rivers.

The pallid was well equipped to live in its world. Water flowing up over its long snout and head and along its humped back made it easy for the fish to stay close to the river bottom, even in the strongest currents. The four barbels, whiskerlike sensory organs on the underside of the snout in front of the mouth, were much more useful than eyes for locating food. The soft, protruding mouth acted like a vacuum cleaner sucking up insects, crustaceans, worms, and fish sensed by the barbels. Unlike fish that evolved later, the pallid did not have scales; most of the body was covered with skin the texture of sandpaper. Five rows of sharp, bony plates (scutes) ran the entire length of the body.

The world has changed a great deal in the last 200 years, let alone the last 200 million. But the pallid sturgeon has changed little. The thought of stepping outside and seeing a *Tyrannosaurus rex* or a *maiasaurus* today occurs only in a child's imagination. But pallid sturgeon still swim in Montana's Missouri and Yellowstone rivers. Yet few people share the wonder of this fact.

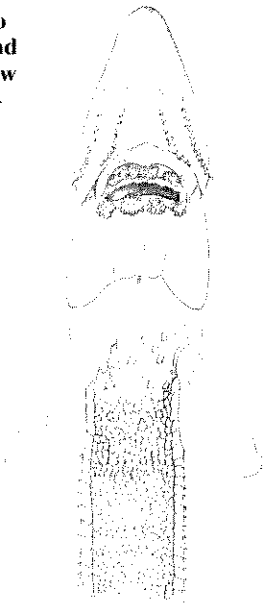
RELATIVELY FEW SPECIES OF PRIMITIVE FISH REMAIN TODAY, but eastern Montana waters are home to three—the paddlefish, shovelnose sturgeon, and pallid sturgeon. All three have skeletons composed mainly of cartilage, not bone, and all survived the Ice Ages, the last a mere 10,000 years ago. Today the pallid sturgeon faces what may be its greatest threat. The changes that are believed to have brought the pallid to the brink of extinction after 200

Pallid Sturgeon

- inner barbels much shorter than outer barbels
- barbels attach about one-third of the way between mouth and tip of snout

Anglers must look closely to distinguish between pallid and shovelnose sturgeon. The law requires that all pallid sturgeon be released.

Shovelnose Sturgeon



- inner barbels about the same length as outer barbels
- barbels attach about halfway between mouth and tip of snout

million years of existence have occurred in just the past 50 years—the equivalent of less than .00001% of the time the species has existed.

Once abundant enough to be captured in commercial fish nets, pallids are uncommon today. Commercial fishing operations in the Missouri River in North and South Dakota during the late 1800s severely reduced sturgeon populations. The pallid may have been heavily harvested at that time, but harvest records do not distinguish species (the pallid was not described as a separate species until 1905) or list sizes of individual sturgeon. Pallids were also relatively common and were commercially harvested in the Dakotas during the 1950s and '60s when the Missouri River reservoirs were first constructed.

Anglers who fished the Missouri and Yellowstone years ago tell of catching several pallids per day. Photographs taken in the 1950s and '60s show daily catches of up to six or seven pallids, but today they are rarely hooked. The U.S. Fish and Wildlife Service (USFWS) compiled a list of all known pallid sightings for the past three decades. They found 500 sightings in the 1960s, 209 in the '70s, and only 56 in the '80s. The USFWS classified these prehistoric bottom-dwelling fish as endangered under the Endangered Species Act on October 9, 1990.

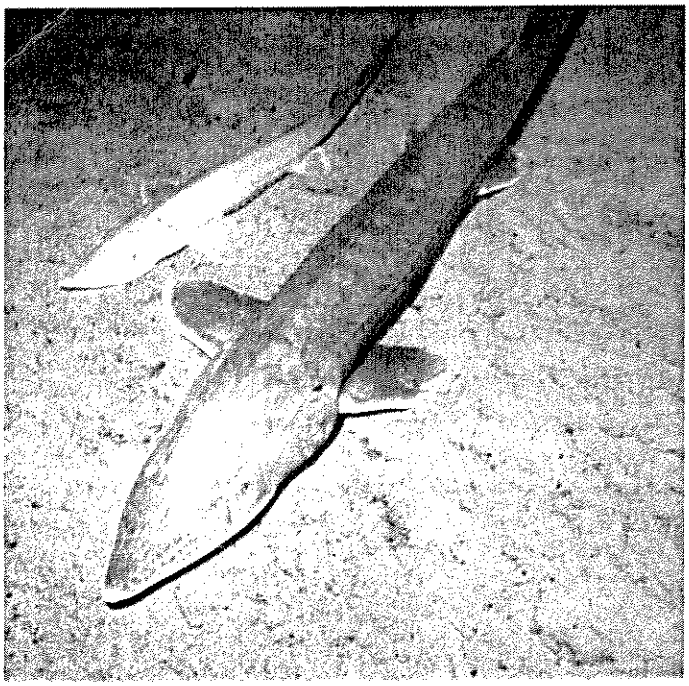
THE HISTORIC RANGE OF THE PALLID

extends from the Missouri River near Fort Benton to the mouth of the Mississippi River; and includes some of the larger, more turbid tributaries of the system. Records suggest they were most abundant in the Missouri River in the Dakotas. Today, Montana may be their last stronghold, due mostly to the relatively unaltered stretches of the Missouri and Yellowstone rivers. The channelization and damming of the Missouri through the Dakotas and Nebraska for flood control, hydropower, and barge traffic has drastically reduced the pallid's habitat. In the proposal that appeared in the *Federal Register* to list the pallid as endangered, it was noted that 51% of the pallid sturgeon's range has been channelized, 28% impounded, and 21% affected by upstream impoundments, with resulting alterations in flow and temperature regimes. Factors such as these affect the fish by blocking access to, or outright destruction of, spawning, rearing, and food-producing areas; they also alter flow and temperature conditions necessary for successful spawning and incubation of the eggs and rearing of the young.

These developments—which have changed the Missouri River from an uninterrupted, free-flowing turbid river with a large spring flood into a series of lakes separated by stretches of clear, cold, regulated rivers—pose serious problems for the pallid sturgeon, as well as other species that evolved with the "old" river. The least tern has been classified as endangered and the piping plover as threatened; both nest on the banks of the river. A petition has been filed to list the paddlefish as well; the USFWS will make its decision on the petition in 1991. Other fish species are candidates for listing, but no action has yet been initiated.

Additional threats to the pallid include hybridization with shovelnose sturgeon, overharvest by uninformed anglers, inability to successfully spawn due to their low numbers, and pollution of the waters in which they live.

An angler has to look closely to distinguish between a pallid and a shovelnose. Until recently, Montana regulations only required the release of any sturgeon over 16 pounds. The Montana Fish and Game Commission has amended the regulation to require release of all pallid sturgeon, regardless



GLEN MEIER

The sturgeon shown above were photographed in the tailwaters of Fort Peck Dam. The larger fish is a pallid, the smaller a shovelnose.

of size, but still includes the 16-pound rule for the shovelnose. North and South Dakota changed their regulation to require release of *all* sturgeon.

Smaller pallids may be distinguished from shovelnose by easy-to-spot differences in the barbels (see diagrams). On a pallid sturgeon, the inner two barbels are much shorter than the outer two; on a shovelnose, all four barbels are nearly the same length. On the pallid, the barbels are closer to the mouth than to the tip of the snout; on the shovelnose, they are about halfway between the mouth and snout. Other differences are described in the department's 1990-92 fishing regulations.

The sparsity of pallid sturgeon throughout their range, coupled with their infrequent readiness to spawn, could preclude a male and female from finding each other when both are ripe. This could result in either no reproduction by pallids (which may already be the case) or hybridization of pallids with shovelnose, which would further imperil the species.

The feeding habits and the longevity of the pallid leave it vulnerable to toxins and pollutants. Pallids actively feed on bottom-dwelling insects, crustaceans, worms, and other fish, so they are vulnerable to toxins which settle in the river bottom and accumulate in food items. They are also susceptible to the toxins present in the water used during respiration. Because they are long-lived, they are exposed to these toxins for decades and the gradual accumulation could affect the pallid sturgeon and its ability to reproduce.

Preliminary tests conducted on shovelnose sturgeon, captured in August 1988 near the confluence of the Missouri and Yellowstone rivers, showed elevated levels of lead. The source of the lead is unknown. Further tests are scheduled to confirm these results and to determine the extent of the contamination, or if this was an isolated case involving a few fish.

THE ENDANGERED SPECIES ACT MANDATES DEVELOPMENT of a recovery plan for any species listed under it. The recovery plan is intended to ensure survival of the target species. It identifies the causes for the species' decline and specifies actions needed to reverse the decline. The USFWS is responsible for preparing the recovery plan for the pallid sturgeon, and has assembled a recovery team composed of pallid sturgeon researchers to develop the plan. Montana's representative periodically meets with other sturgeon researchers from the state so they can develop the best possible program for Montana's pallid sturgeon.

A critical aspect of the recovery plan is determining which factors limit numbers. This requires in-depth knowledge of pallid sturgeon biology. Despite the fact that pallids have been around for over 200 million years and concern for their welfare is widespread among fish and wildlife agencies throughout the Missouri River Basin, biologists simply do not understand enough about their habitat requirements or life cycle. Once their biology is better understood, it will be possible to identify those limiting factors and recommend actions to reverse the pallid's decline.

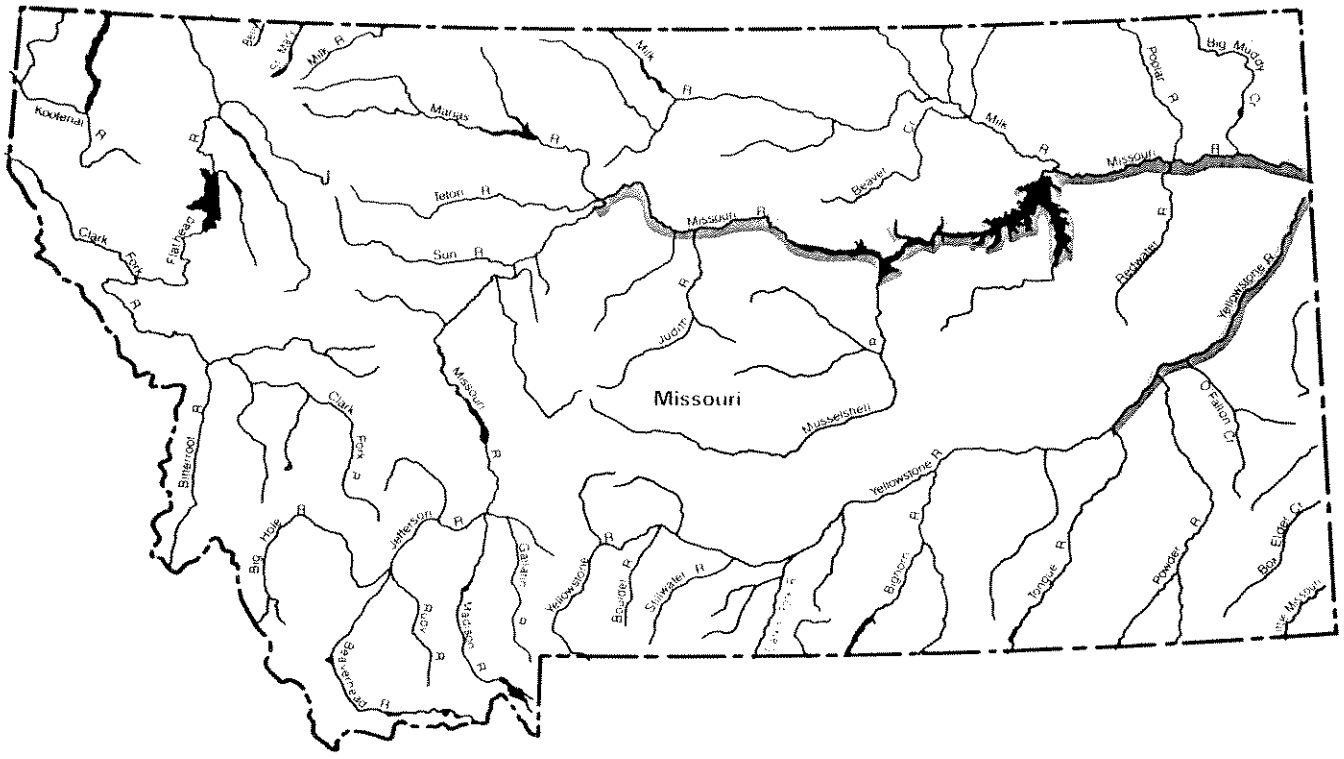
It is likely that a program to propagate the pallid sturgeon through hatchery production will be an important part of the recovery plan. Researchers have outlined a program which will be implemented cooperatively by various state and federal agencies, provided certain conditions are met. Those conditions include proper training of the personnel who perform the surgical removal of eggs from the female and determining if the surgery should be performed at the capture site or if the fish should be transported to a hatchery. Two years of preliminary work with shovelnose sturgeon has provided encouraging results.

RECREATIONAL SCUBA DIVERS KNEW that shovelnose sturgeon concentrated in the tailwaters of Fort Peck Dam during the winter and were often so abundant that the river bottom was literally blanketed with them. In February 1988, three divers reported to Montana Department of Fish, Wildlife, & Parks biologists at Fort Peck that they had seen three extremely large sturgeon while SCUBA diving the previous weekend. Biologists knew these had to be pallids—and seeing three at one location demanded further investigation. Biologists accompanied the divers on subsequent dives and confirmed the pallids' presence. This finding provided new impetus for pallid sturgeon research efforts.

In March 1989, FW&P biologists began researching the pallid sturgeon population in the Missouri River above and below Fort Peck Dam and in the Yellowstone River (see distribution map). The work under way on the Missouri downstream from Fort Peck and on the Yellowstone is funded mostly by the U.S. Army Corps of Engineers, which owns and operates the dam. Objectives include determining the status, abundance, and life-cycle requirements of the pallid sturgeon population in Montana.

In cooperation with the Prairie Divers SCUBA Club of Glasgow, three pallid sturgeon were captured in the tailwaters of Fort Peck Dam in March 1989, and two more were captured

DISTRIBUTION OF THE PALLID STURGEON IN MONTANA



in the winter of 1990. Biologists measured each fish and wired radio transmitters to the dorsal scutes (the series of sharp, bony plates that lie along the back). Biologists have taken the same series of measurements from shovelnose sturgeon throughout the Missouri and Yellowstone rivers to document structural differences between pallid and shovelnose and to see if any hybrids exist in Montana.

Unfortunately, all three pallids tagged in 1989 dropped their transmitters in June of that year. Before losing the transmitters, two were tracked as they moved downstream. One traveled over 100 river miles, and the other almost 60. The third pallid could not be located with the radio telemetry gear, and probably never left the Fort Peck area. This pallid was recaptured in a gill net in the Fort Peck tailwaters in August 1989. Biologists attached a replacement transmitter, using a modification of the original technique. This same modification was used on transmitters attached to two pallids captured in winter 1990, and to four more pallids captured near the mouth of the Yellowstone River in September 1990.

Because of the chemical make-up of water in the Missouri River, the signal cannot be detected from deeper than about 15 feet. The area in the Fort Peck tailwaters that sturgeon prefer is 30 to 40 feet deep. The transmitters attached to the pallids in the winter of 1990 have a sonic component as well as a telemetry component. The sonic component requires use of an underwater hydrophone to receive the signal, so it cannot be used from an airplane. But the advantage is that it allows for reception of the signal in water deeper than 15 feet. Areas this deep and deeper exist near the mouth of the Yellowstone River as well as around Fort Peck. SCUBA surveys in the river are fruitless after the ice is off the reservoir because of poor water clarity.

In addition, each captured pallid is injected near the dorsal fin with a Passive Integrated Transponder (PIT) tag. When a hand-held detector is passed over the area of the PIT tag, the tag is electronically stimulated to emit a signal which is then received and displayed by the detector. With this system, each fish is individually identifiable throughout the remainder of its life. This is useful since the radio transmitters have a life span of only one year.

As the pallids move out of the Fort Peck tailwaters, they are tracked by airplane to identify migration patterns and important habitat. Once biologists determine a location from the air, a crew returns to the area by boat and relocates the fish in the water. They measure several habitat variables which enable them to add to knowledge about the specific type of habitat preferred by pallids. During the late spring and summer, biologists attempt to recapture the pallids to see if they are in spawning condition.

Using nets and setlines, FW&P crews have captured five pallid sturgeon in the Missouri River upstream from Fort Peck Reservoir and have attached radio transmitters to them. Biologists are tracking these fish in a fashion similar to those below Fort Peck.

Until we understand the requirements of the pallid sturgeon to successfully complete its life cycle, and make strides to meet those needs, the pallid will remain imperiled. Anglers can help by complying with the commission's recently adopted regulations and by reporting the presence of any pallids seen to a department biologist.■