

Introduction

The paddlefish is native to the Mississippi River basin, requiring large expanses of free-flowing river in which to complete its life cycle. Throughout its range, the paddlefish has experienced declines in abundance and distribution (Becker 1983). In Minnesota, paddlefish historically occurred in the Minnesota River to Granite Falls, in the Mississippi River to St. Anthony Falls, and in the St. Croix River to Taylors Falls (Cox 1897). Today, Minnesota's paddlefish are limited to small populations in the St. Croix and Mississippi rivers, including Lake St. Croix and Lake Pepin (Hatch et al. in preparation), with occasional reports from other waters. For example, in the early 1990s there were 2 angling reports of this species from the Minnesota River at Mankato and St. Peter. Minnesota DNR fisheries crews sampled a paddlefish in May 2004 near Granite Falls, an exceptional reappearance of this species.



The paddlefish's decline is probably due to habitat loss and degradation, overharvest, alterations to natural river flow regimes, and the construction of navigation dams on the Mississippi River, which limit or eliminate spawning migrations. The paddlefish was originally listed as a special concern species in Minnesota in 1984, but given evidence of long-term declines in abundance and distribution and the continued deterioration of habitat, the species was afforded threatened status in 1996. As a result of these protections, the paddlefish is now exhibiting a slow but significant recovery.

Description

The paddlefish has a long, paddle-like snout, small eyes that are set far forward, and a shark-like tail. It is blue-black or gray in color on the back, and white below. Its body is scaleless except for small patches of scales on the throat, pectoral girdle, and caudal (tail) fin. Small, paired barbels are present on the under surface of the paddle near the mouth. As adults, paddlefish reach a maximum size of 2.2 m (7.3 ft.) in total length and can weigh over 23 kg (50 lbs) (Page and Burr 1991). Historically, paddlefish have been reported to be over 91 kg (200 lbs.). A more recent record of a paddlefish taken from the lower Chippewa River in western Wisconsin in 1998 measured 1.8 m (5.9 ft.) long and weighed 39.4 kg (86.9 lbs.).

Habitat

Paddlefish occur in open waters of large rivers and river lakes (such as Lake Pepin and Lake St. Croix), oxbow lakes, and backwaters. In the upper Mississippi River drainage, they have been associated with areas of deep water and low current velocities (Zigler et al. 2003). Paddlefish need waters rich in zooplankton, on which they feed (Becker 1983), and free-flowing rivers with gravel bars that are inundated in spring floods for spawning.

Biology / Life History

Paddlefish are one of the few true large river species found in Minnesota. Spawning occurs in early spring over gravel bars in temporarily flooded tributaries when water temperatures reach about 10°C (50°F) (Purkett 1961). Zigler et al. (2003) found the linear range of paddlefish in the upper Mississippi River and 2 tributaries to be significantly larger during the spring compared to other seasons, suggesting a possible correlation with the onset of spawning activity. Paddlefish eggs hatch in 7 days or less at 18°C-21°C (65°F-70°F) (Purkett 1961) and newly hatched larvae average 8.5 mm (0.3 in.) long (Hatch et al. in preparation). Most male paddlefish mature at 7-9 years and most females mature at 9-12 years. Mature adults probably do not spawn every year. Paddlefish are long-lived species, surviving



for at least 20 years, and females grow larger and live longer than males. Adults are filter feeders, swimming with their mouths open to pass water over their gills and trap zooplankton on the gill rakers. Their snouts have thousands of sensory pits, which may help in the detection of food (Hatch et al. in preparation).

Management

Construction of dams and flood impoundment structures on large rivers has eliminated much of the paddlefish's spawning grounds and interfered with migration. Dredging, overfishing, and pollution have also been implicated in the species' decline since the start of the 20th Century. Some river construction projects have helped paddlefish populations temporarily, but the long-term effects have been negative (Sparrowe 1986; Unkenholz 1986). Injuries and death from propeller strikes on pleasure crafts in Lake Pepin are increasing and pose a significant threat to the slowly recovering paddlefish population. Additionally, paddlefish can be heavily parasitized by lampreys, which can weaken the fish and cause death (J. T. Hatch, University of Minnesota, pers. comm.).



Zigler et al. (2003) concluded that general area types (for example, channels, tailwaters, or impoundments) based on gross geomorphological features may be inadequate for describing paddlefish habitat and therefore making management recommendations. Rather, microhabitat characteristics (depth, current velocity, and water temperature) appear to be more important factors in habitat selection by paddlefish. The ability of paddlefish to pass through dams and move freely between spawning and non-spawning habitats will be critical for their population recovery. Zigler et al. (2004) found that strong flood pulse (high discharge), low dam head (0.3 m; 12 in. or less), and reduced current velocities positively influenced paddlefish passage through navigation dams in the upper Mississippi River. To effectively manage for this rare species, additional research on paddlefish reproductive and recruitment success is needed. Locating specific spawning areas and evaluating lock chambers as possible avenues for fish passage of navigation dams will be important components of any future studies.

Conservation Efforts

Tagging and radio telemetry studies of 71 paddlefish in the Upper Mississippi River drainage conducted by the Upper Midwest Environmental Sciences Center of the U.S. Geological Survey in collaboration with the U.S. Fish and Wildlife Service from 1994-1997 provided greater insight into the habitat use, long-term movement patterns, and dam passage of this species in Minnesota (Zigler et al. 2003, 2004). Additional paddlefish surveys were conducted in 2004 by the Minnesota DNR Section of Fisheries on the Minnesota River and by the Minnesota DNR Division of Ecological Services on the Minnesota, Mississippi, and St. Croix rivers. The Division of Ecological Services also recently received a grant to conduct surveys for rare fish species in the Mississippi River from the Twin Cities to the Iowa border. These surveys were conducted from 2006-2008, and the paddlefish was a targeted species.

The continued recovery of paddlefish to historic habitats and abundance is dependent on the removal or retrofitting of dams with fish passage features such as ladders or lifts. This will include dams on the Mississippi River from Minneapolis to the Iowa border, and the Minnesota River from Granite Falls to Big Stone Lake. Long-term monitoring of paddlefish populations is essential and can be achieved through non-standardized and non-lethal survey techniques such as snagging and short duration gill net sets during the fall, winter, and spring. Another avenue that is being pursued on a limited basis is the funding of on-board fish biologists who observe and gather data on the incidental catches of commercial operators. The commercial nets, catch methods, and seasonal timing of commercial operations have proven to be far more effective on paddlefish and other rare, large river fish species than the standard gear and methods fish biologists typically utilize. Further paddlefish research needs include mortality frequency of propeller strikes from large recreational watercraft and basic life history to identify the critical spawning, rearing, and seasonally-utilized habitats.