

Neosho Madtom: A Small Fish with Complex Problems

By Mark Wildhaber

The Neosho madtom (*Noturus placidus*) is a small catfish endemic to the mainstems of the Neosho and Cottonwood rivers in Kansas and Oklahoma and the Spring River in Kansas, Oklahoma, and Missouri. Much of the species' historical habitat has been inundated or isolated by reservoirs and low-head dams. Additional habitat has been degraded by in-stream gravel mining, feedlot operations, historical lead-zinc mining, sedimentation, and flow

manipulation. In 1991, the U.S. Fish and Wildlife Service (FWS) listed the Neosho madtom as threatened.

Neosho madtoms occupy riffles of pebble and gravel bars and feed at night on larval insects (Wildhaber 2006). Recruitment of young-of-year (YOY) to the adult population occurs annually when the previous year's adults begin to disappear. Neosho madtoms spawn in nests constructed under large objects. Spawning occurs from May through July



Neosho madtom

A low-head dam on the Upper Neosho River, Kansas.



as temperatures approach 77°F (25°C). Male parental care has been observed in the laboratory and lasts 8 to 9 days.

In 1993, the Columbia Environmental Research Center (CERC) of the U.S. Geological Survey (USGS) began a study to assess effects of historic zinc-lead mining on Neosho madtom populations (Wildhaber 2006). The work, expanded to address issues associated with the ecology and recovery of Neosho madtoms, continues today. Its success is due to collaboration with, and funding from, partners that include the FWS; Environmental Protection Agency; universities in Missouri and Kansas; Kansas, Missouri, and Oklahoma state natural resource agencies; Army Corps of Engineers; and many private landowners. The study has provided much needed information regarding the relationship of habitat, flow, and contaminants to Neosho madtom populations. Work on low-head dams has demonstrated localized effects on not only Neosho madtom populations but the entire aquatic ecosystem (Tiemann et al. 2004; Gillette et al. 2005). Analysis of long-term population trends demonstrated a strong relationship between water regulation patterns and survival and recruitment of Neosho madtoms (Wildhaber 2006). Spring River research and modeling demon-

strated that fish community patterns are related not only to presence of heavy metal contamination but also lack of high-quality habitat and food availability (Wildhaber 2006). Additionally, CERC research extended the known distribution of the Neosho madtom in Spring River to Willow Creek in Kansas (Wildhaber 2006) and demonstrated that competition with other species was not likely limiting Neosho madtom populations (Wildhaber 2006).

In 1996, researchers at Emporia State University in Kansas successfully spawned Neosho madtoms (Wildhaber 2006). More recently, our laboratory research demonstrated relationships between light, temperature, and flow and Neosho madtom reproductive behavior, including how Neosho madtom select nesting sites (Wildhaber 2006). We used highly innovative approaches, including time-lapse infrared videography, underwater cameras, and simulated winter conditions to assess laboratory stimulation of reproductive development, and medical ultrasound to validate gender and estimate fecundity over several annual cycles. Twenty-one pairs of Neosho madtoms reproduced and provided the first visual record of madtom spawning (Albers and Wildhaber 2002).

This experimental tank equipped for controlling temperature, flow, and photo-period in Neosho madtom research is monitored by external and underwater cameras.





A researcher uses ultrasound to determine the sex and reproductive condition of Neosho madtoms.

This research has provided natural resource managers with critical information needed to recover the Neosho madtom, and it is being used by the Army Corp of Engineers to assess the benefits of low-head dam removal and the potential impact of increased water storage. The CERC continues to work with the FWS on population status and trends, the University of Kansas on population genetics, and the Peoria Tribe of Indians of Oklahoma on developing hatchery facilities for Neosho madtoms for the Tribe's reintroduction efforts. Although the madtom is a small fish rarely seen or appreciated by the public, its status reflects the overall health of the aquatic community. By addressing the needs of the Neosho Madtom, all aquatic residents of these streams will benefit.

References

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