ADOPT-A-STURGEON

Advancing the Science of Sturgeon Restoration

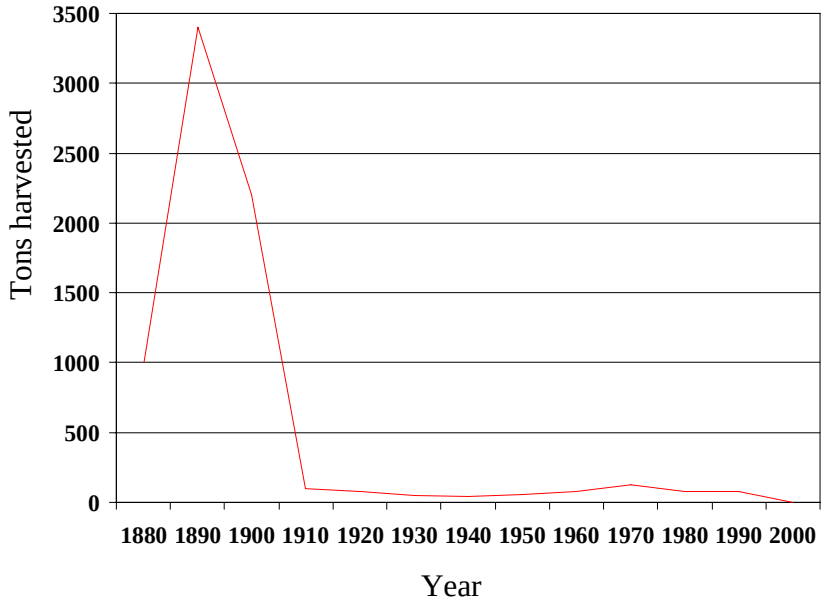
Program objectives

The sturgeon restoration program at Horn Point Laboratory (HPL) is a collaborative effort among numerous private, state, and federal partners to advance the science and technology of restoring the Atlantic sturgeon in the mid-Atlantic region. One purpose is to increase the knowledge of the current population status and ecology of this fish, and of environmental challenges to its recovery.

A key to our long-term ability to evaluate the potential for restoration involves test releases of hatchery reared juveniles spawned by using wild-caught fish. Current efforts at HPL focus on establishing a captive broodstock population for future spawning and release, research into feed training and diet studies, and development of hatchery technology.

Historical significance

Sturgeon fossil records date back more than 150 million years, making them some of the oldest vertebrates. Sturgeon are one of a few Jurassic fish species still in existence today, with 26 species distributed in cold to temperate climates of the northern hemisphere. Eight species are found in North America. Two species, the Atlantic *Acipenser oxyriynchus* and shortnose *Acipenser brevirostrum*, are native to Chesapeake Bay, with natural ranges from Canada to Florida. Both species were an important food source for native Americans. They were also of significant commercial importance in the past, being harvested primarily for their highly prized roe or caviar. In the late 1880's, Atlantic sturgeon was an important cash crop with a peak harvest of about 7 million pounds, of which about 10% was harvested from Chesapeake Bay. The commercial catch declined rapidly after the turn of the century, with annual harvests from 1905 to the 1990s amounting to less than 5% of the record catch.



Historical records of east coast Atlantic sturgeon landings.

With roe content being about 15% of a mature female's weight and worth $100-200 per pound (in 2006 dollars), a large fish was a big financial incentive for fishermen.

Present Situation

Due to a decline in populations of shortnose sturgeon as a result of over-fishing, dam construction, deforestation, and habitat destruction throughout the Atlantic coast, the species was listed as an endangered species by the US Fish and Wildlife Service in 1967. Subsequently, a moratorium on US commercial harvest of Atlantic sturgeon was established in 1997. Current estimates for the Chesapeake Bay suggest that the shortnose population is extirpated, or too low to sustain a viable population. Recently, increased numbers of fish caught near the Susquehanna and Potomac Rivers were determined to have migrated through the C&D canal from the Delaware River. The situation for Atlantic sturgeon appears to be similar, with only two observations of young-of-year fish in Chesapeake Bay in the past 45 years.

Life History and Recovery Implications

The unique life history of sturgeon has contributed to population declines of various species and presents challenges for their recovery. Like most sturgeon, Atlantic and shortnose sturgeon are anadromous, living in salt or brackish waters and migrating into freshwater to spawn. Given this reproductive requirement, it is easy to understand the negative effect that damming rivers has had on sturgeon spawning and populations. Another reproductive characteristic of sturgeons that adds to the challenge of recovery is the relatively long period (5 to 30 years depending on species and location) required to reach sexual maturity. In addition, sturgeon may only spawn once every two to five years. By contrast, many fishes, including the anadromous striped bass, begin to spawn at three to four years of age, and can spawn every year.

Adult sturgeon begin migrating into freshwater rivers to spawn in late winter and early spring, seeking a hard or pebble/gravel bottom with water currents capable of preventing settling of sediments. Soil erosion from human disturbances or weather events can significantly increase sediment deposition and degrade sturgeon spawning grounds. Additionally, young and adult sturgeon are bottom feeders that prefer small crustaceans, bivalves, and worms. Excessive sediment accumulation and hypoxic bottom conditions caused and elevated nitrogenous compounds can further affect sturgeon negatively, especially fry and juveniles. To be effective, restoration or recovery efforts must take these special characteristics and spawning habitat needs into account.

Spawning characteristics of the Chesapeake Bay sturgeons.

Trait	Atlantic Sturgeon	Shortnose Sturgeon
Maximum length/weight	13.9 feet; 880+ pounds	4.3 feet; 36 pounds
Age at maturity	8-12 years (FL); 17-30 years (NY)	4-8 years (NY); 9-11 years (Canada)
Spawning water temperature	13-18 ^{o}C (April/May in Chesapeake Bay)	10-12 ^{o}C (March in Chesapeake Bay)
Fecundity (number of eggs)	1.0-3.7 million (160-350 lb. fish)	50,000-100,000 (20-35 lb. fish)

Restoration Potential

Despite the environmental challenges and its unique biological requirements, sturgeon is a good candidate for stock enhancement or restoration. Without an existing fishery or an expectation for one, sturgeon populations, either naturally occurring or hatchery reared, would not be affected by harvesting. The knowledge base for spawning and culturing sturgeon via aquaculture is significant with proven technology. Controlled conditions of hatchery culture can significantly increase the survival of eggs and fry and produce advanced fingerlings that could better survive current environmental conditions. Stocking larger fish could greatly supplement existing stocks and serve as a boost towards achieving a viable reproductive base in the next decade when improved water quality conditions will better support survival of fry and juveniles. This approach was investigated in 1996 when Maryland Department of Natural Resources (DNR) conducted an experimental stock enhancement project by stocking 3,000 juvenile Atlantic sturgeon in the Nanticoke river on the Eastern Shore. A reward program was established and 14% of these fish were recaptured from stocking to 2001, indicating good survival. In addition to the capture of stocked fish, over 500 wild sub-adult Atlantic sturgeon were caught, but no wild juvenile fish. The results of the project further supports the notion that it is unlikely that Atlantic sturgeon are currently reproducing in Maryland, but that the potential for using hatchery-reared fish for restoration is promising.

Hatchery reared Atlantic sturgeon could be an important restoration tool allowing stocking of larger fish more able to survive current water quality.

Restoration plans and outlook

Successful recovery of sturgeon hinges on many factors, including spawning and nursery habitat restoration, pollution reduction and other water quality improvement, and potential reintroduction of stocks. Recovery and management plans have been developed for both species to integrate these and other factors. The Atlantic State Marine Fisheries Commission (http://www.asmfc.org/) (ASMFC), a consortium of all 15 of the Atlantic coast states' fisheries resource management agencies, regulates Atlantic sturgeon and has developed a protocol for stock enhancement. The National Marine Fisheries Service (http://www.nmfs.noaa.gov/pr/) (NMFS), is responsible for marine and anadromous species listed under the Endangered Species Act (ESA), and therefore regulates

shortnose sturgeon. NFMS, through a specified recovery team, has also developed guidelines for restoration of shortnose sturgeon in a comprehensive recovery plan. Both plans review current populations and habitat and water quality enhancement needs. They also address other important considerations of recovery such as concern over genetic diversity and long-term viability of stocks including potential hatchery supplementation.

Through DNA analysis, it has been determined that fish from specific rivers or adjacent rivers have distinct genetic characteristics. In the ASMFC breeding and stocking protocol for cultured sturgeon, specific recommendations on broodstock sources and hatchery production programs are presented to address genetic diversity concerns. Among these recommendations are:

- Use broodfish from the same river (preferred source) or adjacent river (if only source available) to be stocked
- Give highest priority for stocking to populations that are determined to be extirpated
- Use a pool of least 100 broodfish representing a minimum of six year classes, with stocking to be continued for many years
- Stock a maximum of 50,000 fingerlings per female per season, with all fish tagged or marked and monitored

Recommendations outlined in both species recovery plans require dedication to habitat restoration, and a major commitment of broodstock, time, and financial resources in order to be successful. In Maryland, DNR Fisheries Service along with partners, University of Maryland Horn Point Laboratory, Delaware Division of Fish and Wildlife, Delaware State University, U.S. Fish and Wildlife Service and Virginia Sea Grant are developing a captive population of Atlantic sturgeon that is dependent on fish collected by watermen through a reward program. To meet the ASMFC recommendations, additional broodfish of more year classes are needed.

A major challenge of using broodstock from the wild is getting the fish to accept commercial feed. One study at HPL is evaluating diet regimes to train wild fish to accept commercial pelleted diets. Accomplishing this objective is an essential first step to establish the necessary broodstock population and genetic diversity prior to any test releases.

Summary

Sturgeon are an interesting and unique species of fish that have played a major role in the historical fishing industry of the Chesapeake Bay. The decline in Bay sturgeon populations, caused by over-harvest and by habitat and water quality degradation, has persisted for over a century. Thus sturgeon are the only resource species that is near extinction today. Recovery plans and protocols outlining the role of aquaculture hatcheries and results of the 1996 restocking study provide sound guidance and encouragement that sturgeon stocks can be restored. Recovery involves a long-term commitment to an integrated approach of habitat and water quality improvements and development of adequate captive broodstock and hatchery resources. Investment in this effort can be beneficial to the entire ecosystem as well as assisting in the return of one of the Chesapeake Bay's signature species.

Adopt a sturgeon today!!
http://www.adoptasturgeon.org

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