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Identifying Sturgeon Populations and Their Contributions to Coastal Aggregations



Atlantic Sturgeon—Background

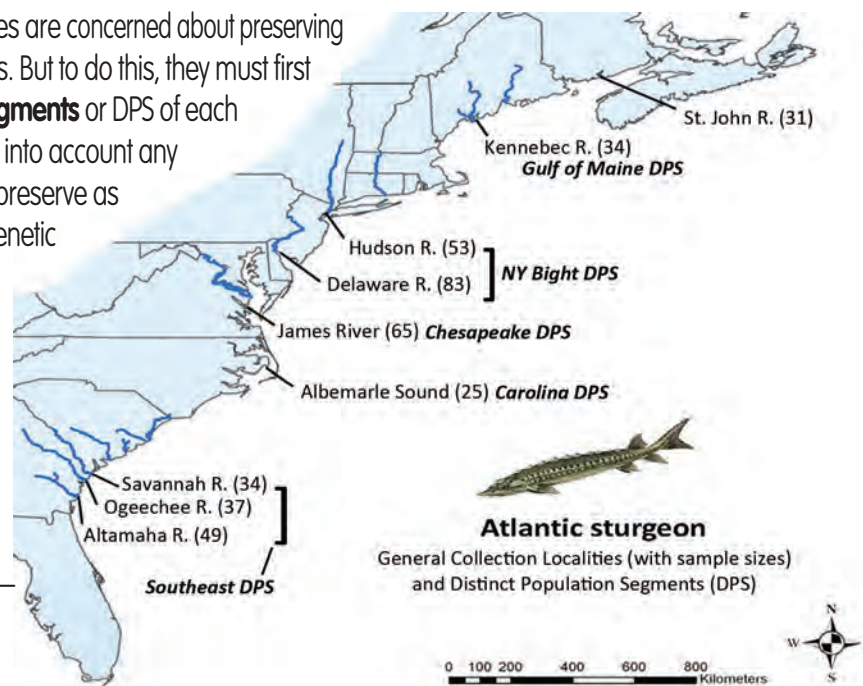
What is it about sturgeon that has fascinated people for centuries? Maybe it's the diamond pattern of bony scutes that set this behemoth apart from all other fish in North American waters. Maybe it's the unique snout and barbels that help it feed along the river bottom. The Atlantic Sturgeon (*Acipenser oxyrinchus*) was once abundant along the eastern seaboard and in major river systems from Labrador to Northern Florida. But human activities such as damming rivers, pollution and extensive harvesting have reduced the number and size of its populations and in February 2012, the Atlantic Sturgeon was federally listed as **endangered**.

What are Distinct Population Segments (DPS)?

The agencies that manage fisheries are concerned about preserving and restoring endangered species. But to do this, they must first identify the **distinct population segments** or DPS of each species. Then managers can take into account any unique regional populations and preserve as much as possible of the natural genetic structure of each species in their restoration plans. In the case of Atlantic sturgeon, the DPS correspond to the individual or combinations of estuaries along the eastern seaboard.

The key to this management strategy is genetic detective work—much of it done by researcher **Dr. Isaac Wirgin** of New York University School of Medicine (aided by

NY Sea Grant funding). This map of Atlantic sturgeon's DPS was greatly dependent on Wirgin's data identifying the genetic characteristics of each distinct population segment based on its estuary of origin.



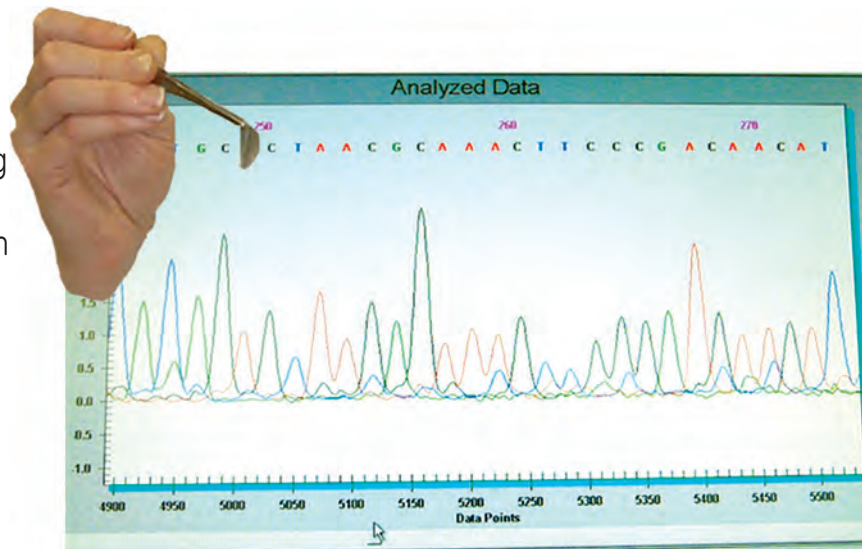
Identifying Sturgeon Populations

Sturgeon do go home again

Before doing genetic analysis on sturgeon, there was no way of knowing whether or not they showed **homing fidelity**. But Dr. Wirgin discovered that sturgeon do go home to the rivers of their birth. Sturgeon can live in salt water but swim into the rivers and tributaries of their birth to spawn. Using **biomarkers** on **mitochondrial DNA**, Wirgin was able to identify DPS of sturgeon by distinct genetic characteristics. His lab can identify whether a sturgeon has come from the Hudson, the Chesapeake or the Delaware—all from a tiny clip from the fish's fin. In the 1990s, using such data, the National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (FWS) listed the Gulf sturgeon as a threatened species, and helped designate the Gulf sturgeon as a distinct subspecies.

From fin clip to DNA snip

There are a few steps to identifying what population an individual sturgeon comes from. Starting with a sturgeon fin clip, a technician extracts the DNA and adds enzymes to speed **replication** of the mitochondrial or nuclear DNA from the fin. Once the DNA has replicated to about a 200-700 base sequence, the sequence of base pairs can be analyzed. The particular genetic characteristics in both genomes help identify the estuary of origin.



Atlantic Sturgeon now listed as endangered

In 1998, because populations of the Atlantic sturgeon were so low, the Atlantic States Marine Fisheries Commission adopted a 40-year **harvest moratorium**. With the moratorium in place, the Atlantic sturgeon was considered a “species of concern” and not listed as endangered under the Endangered Species Act. In the years since, Wirgin has continually been analyzing sturgeon fin samples from different locations. The NOAA Observer Program which uses commercial boat observations out of Woods Hole, MA, sent Wirgin samples so he could identify the distinct population segments of origin of individual specimens from the Gulf of Maine to North Carolina. He and **Dr. Tim King** of the USGS found that adult and subadult sturgeon from all populations undergo long migrations and mix in coastal aggregations. This makes them vulnerable to distant anthropogenic impacts such as coastal bycatch. However, fish tend to aggregate within the geographic region of their spawning river.

Based on work by Wirgin and King, a review team assessed the status of the Atlantic sturgeon, and determined that four of the five DPS of Atlantic sturgeon should be listed as endangered as of February 2012.

Important links:

Federal register listing sturgeon as endangered

http://www.nero.noaa.gov/nero/regs/frdoc/12/12AtlSturgeonFR_NER.pdf

Dr. Wirgin's slide show

http://www.nero.noaa.gov/prot_res/atlsturgeon/wsdoc/day2/Research%20Updates/Wirgin_sturgeon%20workshop%20MSA%20talk.pdf

images courtesy of Dr. Isaac Wirgin