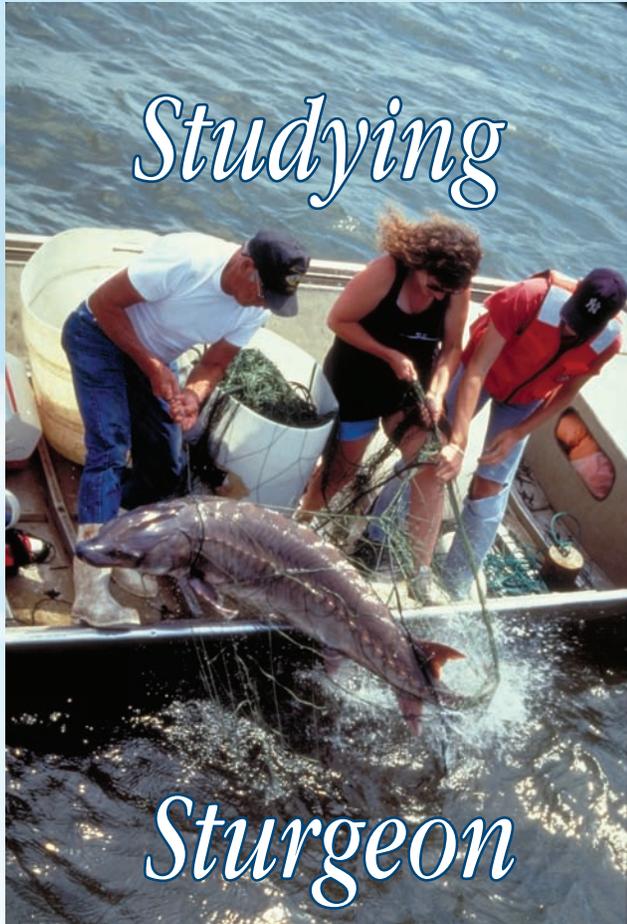


Studying



Sturgeon

Long-time (and now deceased) Hudson River commercial fisherman Everett Nack (left) and a grad student crew bring in an Atlantic sturgeon. Photo by John Waldman

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. But the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*), once abundant along the eastern seaboard and in major river systems from Labrador to Northern Florida is no longer so. Human activities such as damming rivers, pollution and extensive harvesting have dwindled

populations of the Atlantic Sturgeon as they have for the Gulf Sturgeon (*Acipenser oxyrinchus desotoi*), and the shortnose sturgeon (*Acipenser brevirostrum*). The smaller shortnose sturgeon, found in coastal rivers of the Atlantic seaboard including the Hudson, is federally listed as endangered.

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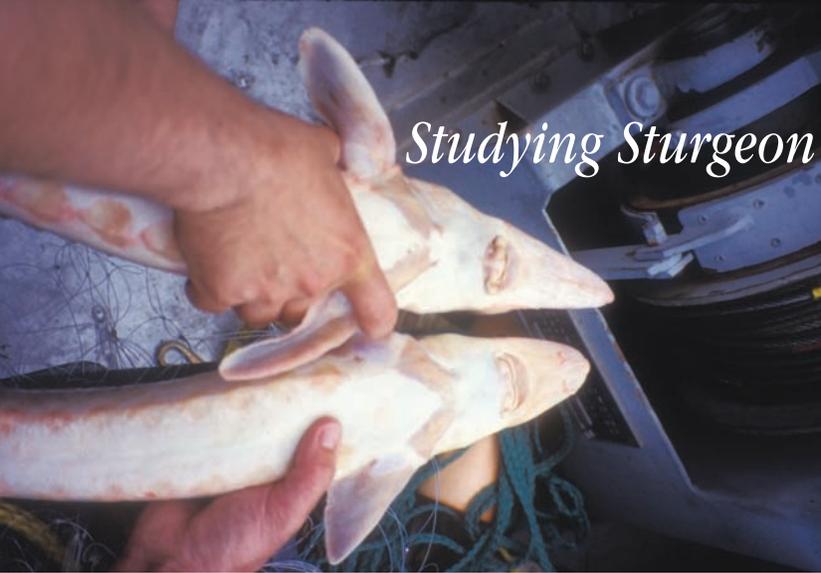
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COASTAL LIVES

Studying Sturgeon



How can you tell a shortnose from an Atlantic? By the shape of their snouts. The shortnose (on the bottom) doesn't have the elongated snout of the Atlantic.

Photo by John Waldman



From Fin Clip to DNA Snip

Identifying which estuary a fish is from can't

be done by eye. It's done by genetic markers on a sturgeon's DNA, specifically mitochondrial DNA.

Research technician Lorraine Maceda receives a sturgeon fin clip in ethanol. She extracts the DNA, adds DNA polymerase enzyme (1) to replicate a selected portion of its mitochondrial DNA with the polymerase chain reaction (PCR) in a DNA replicator called a thermocycler (2). She then sequences the selected portion of mitochondrial DNA and reveals the DNA sequence on slab gels (3) as well as on the automated DNA sequencing system (4).

Within two days of receiving a fin clip, Maceda can send a 600-700 base DNA sequence back to the hatcheries or agencies where management decisions can be made. The managers can then decide if they have viable broodstocks that could be mated to repopulate that distinct population segment.

Due to the threatened and endangered status of sturgeon species, state and federal fisheries agencies are concerned about preserving and restoring them. But to do this, they must first identify the distinct population segments of each species. Then managers can take into account any unique regional populations and preserve as much as possible natural genetic structure of each species in management and/or restoration plans.

The key to this management strategy is genetic detective work, much of it done by a research team that got its start with two NYSG-funded projects over a decade ago. As presented in a 2005 article published in *Estuaries*, the NYSG-funded research team provided data that identifies the genetic characteristics of the 19 distinct population segments of the endangered shortnose sturgeon population. The researchers found that there are strong genetic differences among most shortnose sturgeon population

segments along the Atlantic coast, usually differing by estuary of origin.

"Before we did genetic analysis on sturgeon, there was no way of knowing whether or not they showed 'homing fidelity' – and sturgeon do go home to their natal rivers," says **Isaac Wirgin**, the project's lead investigator from his lab at New York University School of Medicine. His lab is capable of identifying whether a shortnose has come from the Hudson, the Chesapeake or the Savannah –all from a tiny clip from the fish's fin. Sturgeon, like salmon and other anadromous fish, can live in salt water but swim into the rivers and tributaries of their birth to spawn. Wirgin's long-time collaborator, **John Waldman** of Queens College (formerly of Hudson River Foundation), has spent years studying and helping to conserve sturgeon in the Hudson, North America and internationally. Waldman has always had a fascination for anadromous fish and, like Wirgin, began fishing at a tender age.

Using DNA markers to identify distinct populations of sturgeon began with an earlier NYSG funded project in the mid to late 1990s when Wirgin and Waldman first examined the DNA of Atlantic and Gulf Sturgeon populations to determine their stock structure. The National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (FWS) jointly listed the Gulf sturgeon as a threatened species in 1991, and share jurisdiction for this species under the Endangered Species Act. This research reinforced the designation of the Gulf sturgeon as a threatened, distinct subspecies. As such, the Gulf States Marine Fisheries Commission (GSMFC) along with FWS developed a Gulf sturgeon management and recovery plan that came out in 1995.



Photo sequence by Barbara A. Branca

According to **Frank Parauka** of FWS, Wirgin’s research helped inform the development of that plan. And **Ron Lukens** of GSMFC noted that the research helped delineate Gulf sturgeon populations by drainage allowing managers to de-list recovered populations while others remain listed. The genetics work from this project on this subspecies has been used by FWS, GSMFC, and the state of Florida for management and stock enhancement, and to help avoid mixing unique stocks.

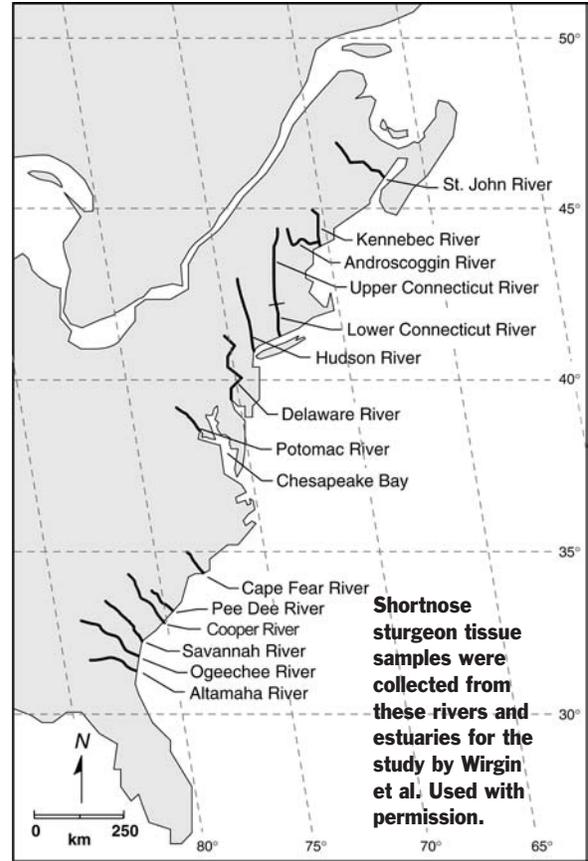
As part of this research, genetic markers were developed for use in hatchery programs to maintain the genetic diversity in native stocks. The study also determined that the Hudson River Atlantic sturgeon, which seem to be quite robust, contributed the overwhelming majority of fish to the New York Bight intercept fishery. It was also determined that younger fish in the Delaware River were likely a mixture of fish from the Hudson River and southeastern stocks.

The results of this research increased knowledge of the biology of these species by determining genetic stock structure of populations. Says Waldman, “Our data results have been heavily used by the Atlantic States Marine Fisheries Commission (AMSFC), especially in their stocking and culture protocol for the Atlantic sturgeon.” Because populations of the Atlantic sturgeon were so low, the Atlantic States Marine Fisheries Commission adopted a 40-year fishing moratorium in 1998. The research results were an aid for the status review of the species prior to implementing the 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.

Shortnose sturgeon were first listed under the Endangered Species Preservation Act in 1967. As with the Atlantic sturgeon, a management and recovery plan was developed in 1998. The genetics research from NYSG-funded projects has helped inform development of those plans and enables review of endangered status by condition of local populations. Populations doing well enough could be reclassified while others remain classified as endangered.

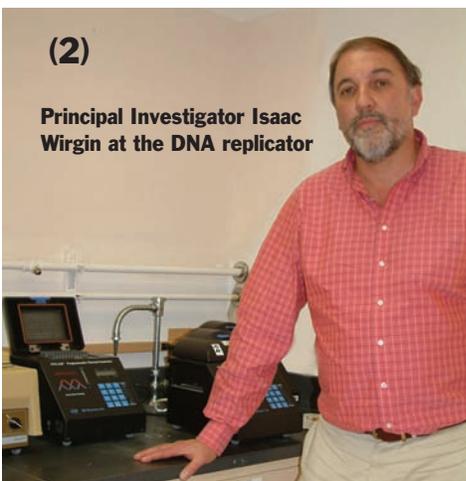
Currently, a status review team is assessing the status of the Atlantic sturgeon to determine if listing the species as threatened or endangered is warranted. Wirgin’s research is playing a role. According to **Kimberly Damon-Randall**, Proactive Conservation Program Coordinator in the Protected Resources Division of NMFS, the ongoing status review was initiated because NMFS has concerns over the current status of the Atlantic sturgeon throughout its range. Says Damon-Randall, “The genetic work that Wirgin is currently conducting and his past work are being used to assist us in determining if distinct population segments exist for Atlantic sturgeon and, if so, what the appropriate management parameters are for these distinct population segments.”



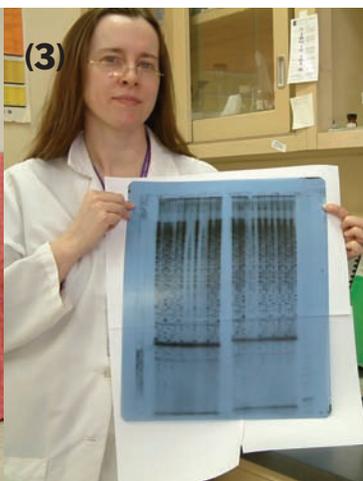
— Lane Smith and Barbara A. Branca

(2)

Principal Investigator Isaac Wirgin at the DNA replicator



(3)



(4)

