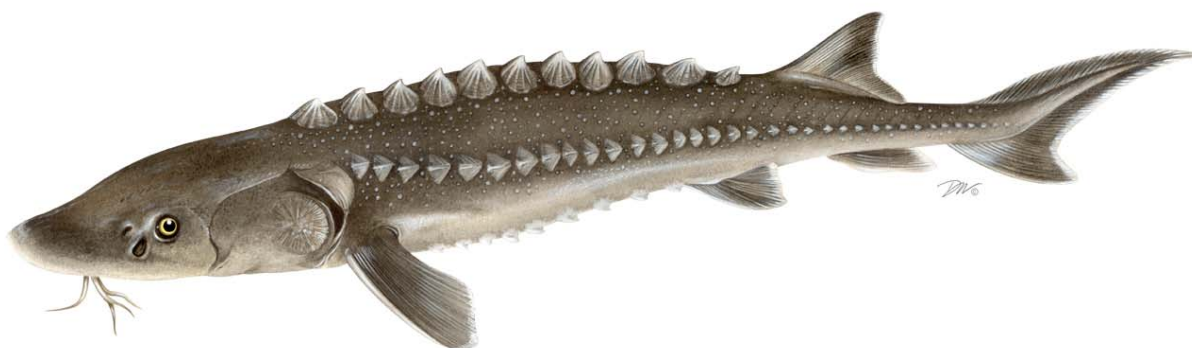


REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR
ATLANTIC STURGEON (*Acipenser oxyrhincus*)
FOR 2006



Prepared by:

The Atlantic Sturgeon Plan Review Team
Kim McKown, New York Department of Environmental Conservation
Mark Collins, South Carolina Department of Natural Resources
Kate Taylor, Chair, ASMFC

2007

**REVIEW OF THE ASMFC FISHERY MANAGEMENT PLAN FOR
ATLANTIC STURGEON (*Acipenser oxyrhincus*) FOR 2004**

I. Status of the Fishery Management Plan

<u>Year of plan's adoption:</u>	1990
<u>Amendments:</u>	Amendment 1 (June 1998)
<u>Addenda:</u>	Technical Addendum #1 (October 16, 2000) Addendum I (January 31, 2001) Addendum II (May 2005) Addendum III (November 2006)
<u>Management unit:</u>	Migratory stocks of Atlantic sturgeon from Maine through Florida
<u>Jurisdictions with a declared interest:</u>	Maine through Florida, including District of Columbia and the Potomac River Fisheries Commission
<u>Committees:</u>	Sturgeon Management Board, Plan Review Team, Technical Committee, Stock Assessment Subcommittee, Advisory Panel, Culture and Stocking Committee

In 1995, the states determined that the original 1990 FMP was insufficient for conservation and restoration of Atlantic sturgeon stocks, and initiated development of Amendment 1. The amendment was approved in June 1998 by ASMFC. Its goal is to restore Atlantic sturgeon spawning stocks to population levels that will provide for sustainable fisheries and ensure viable spawning populations. Specific objectives include:

- Establish 20 protected yearclasses of females in each spawning stock;
- Close the fishery for a sufficient time period to reestablish spawning stocks and increase numbers in current spawning stocks;
- Reduce or eliminate bycatch mortality of Atlantic sturgeon;
- Determine the spawning sites and provide protection of spawning habitats for each spawning stock;
- Where feasible, reestablish access to historical spawning habitats for Atlantic sturgeon; and
- Conduct appropriate research as needed, especially to define unit stocks of Atlantic sturgeon.

To achieve this goal, states must maintain complete closure of any directed fishery for and landings of Atlantic sturgeon, through prohibiting possession of Atlantic sturgeon, and any and all parts thereof including eggs, until the fishery management plan is modified to reopen fishing in that jurisdiction. Exceptions to the moratorium on possession were approved via Technical Addendum # 1 for the purposes of scientific research and educational display.

Formal exemptions to the harvest and possession moratorium may be permitted to states that intend to import non-indigenous Atlantic sturgeon for the purposes of private aquaculture development.

Amendment 1 requires that from 1999 on, states report annually on the following topics to ASMFC:

- Results of bycatch monitoring for Atlantic sturgeon in other fisheries;
- Monitoring results (tagging, juvenile abundance indices, etc.);
- Habitat status (restoration efforts, FERC relicensing studies, etc.), in accordance with the recommendations in the FMP; and
- Aquaculture operations authorized, status of regulations, disease-free certification status, etc. Additional reporting requirements for aquaculture are outlined in the ASMFC Terms, Limitations, and Enforcement Document. These requirements are specific to states exempted from the harvest and possession moratorium by the Sturgeon Management Board for the purposes of importation and development of private aquaculture facilities.

Annual reports must cover the previous calendar year at a minimum and should include significant findings of the current year.

II. Status of the Stock¹

Current Atlantic sturgeon populations throughout the species' range are either extirpated or at historically low abundance. Recruitment is variable at low levels in most regions. Survival of Atlantic sturgeon during the 20th Century implies that enough spawning and nursery habitats exist to perpetuate the species. In the absence of major threats to existing habitat, reduced fishing mortality is of greater importance to stock restoration efforts than habitat limitations. Adult population abundance in some systems may be so low as to significantly impede reproduction success and timely recovery.

The target fishing rate was defined as that level of F that generated an eggs-per-recruit (EPR) equal to 50% of the EPR at $F = 0.0$ (i.e., virgin stock). This rate (F_{50}) equals 0.03 (annual harvest rate of 3%) for a restored population. This target is far below recent estimates of F prior to enactment of fishing moratoria, which ranged from 0.01 - 0.12 for females and 0.15 - 0.24 for males in the Hudson River. These numbers may not apply to southern stocks, where more signs toward recovery are being seen.

Based on information presented at a technical workshop in November 2003, the population abundance in various rivers appears to vary substantially. The Hudson River stock may be showing a small increase in abundance, little or no signs of recovery are apparent in most if not all northern stocks, while certain rivers in Georgia and South Carolina are showing increasing numbers of sub-adults, suggesting some population rebuilding.

¹ Portions of this report were taken from "Atlantic States Marine Fisheries Commission: Atlantic Sturgeon stock assessment peer review. Terms of reference and advisory report." ASMFC 1998, Wash., D.C. 29 pp.

III. Status of the Fishery

Reported landings of Atlantic sturgeon peaked in 1890 at 3.4 million kilograms and declined precipitously thereafter. Currently, all states and the National Marine Fisheries Service have enacted bans on harvest and possession of Atlantic sturgeon and sturgeon parts. As per Amendment 1, these moratoria will remain in effect until stocks exhibit a minimum of 20 protected yearclasses of spawning females and the FMP is modified to permit harvest and possession.

Addendum I to the Interstate Fishery Management Plan for Atlantic sturgeon exempts the State of Florida from the possession moratorium for the purposes of developing private aquaculture facilities for cultivation and propagation of the species. Addendum II exempts a private company in North Carolina from the moratorium on possession, propagation, and sale of Atlantic sturgeon meat and eggs. Addendum III was approved on November 17, 2006, exempting a private company in North Carolina from a moratorium on possession, propagation, and sale of Atlantic sturgeon meat and eggs and exempting a Canadian exporter from exporting Atlantic sturgeon fry and fingerlings into North Carolina.

The November 2003 technical workshop on status of Atlantic sturgeon identified several new issues regarding bycatch of Atlantic sturgeon. Another workshop focused on recovery techniques was held in November 2004 and provided more recommendations for dealing with bycatch. ASMFC hosted an Atlantic sturgeon bycatch workshop in February 2006 that: (1) evaluated genetic and mark-recapture data and approaches to identifying stock composition of bycatch; (2) reviewed and summarized jurisdictional reports on bycatch; and (3) estimated fishery-specific bycatch and bycatch mortality of Atlantic sturgeon during the past ten years in New England and Mid-Atlantic waters.

Tables 1 and 2 are a summary of commercial bycatch of Atlantic sturgeon data reported by the states in the most recent compliance reports. Note that sources of data across states are not consistent. Not all fisheries or water bodies are monitored.

IV. Research Needs

Assessments of population status

- Determine levels of by-catch and compare to F_{50} target levels for individual populations. By-catch, particularly in coastal waters may represent largest threat to Atlantic sturgeon rebuilding. Characterize Atlantic sturgeon bycatch in various fisheries by gear and season. Include data on fish size, health condition at capture, and number of fish captured. Develop markers that permit identification of bycatch by population origin.
- Conduct assessments of population abundance and age structure in various river systems. Particular emphasis should be placed in documenting occurrence of age 0-1 juveniles and spawning adults as indicators of natural reproduction.
- Continue to determine the extent to which Atlantic sturgeon are genetically differentiable among rivers. Interpret biological significance of findings.
- Conduct further analyses to assess the sensitivity of F_{50} to model inputs for northern and southern stocks.

Assess current habitat suitability

- Quantify the amount and quality of sturgeon habitat in important sturgeon estuaries and rivers, including spawning and nursery habitats. Define and map bottom water quality, velocity, and substrate types for suitable sturgeon spawning habitat. Define and map bottom water quality and substrate types suitable for sturgeon nursery habitat.

Identify mortality factors

- Assess loss to ship/boat strikes.

Develop culture and stock enhancement information

- Further develop techniques for capture, transport, and long-term holding of wild brood stock.
- Refine maturation-induced spawning procedures. Refine sperm cryo-preservation techniques to assure availability of male gametes.
- Continue basic cultural experiments at all life stages to provide information on: a) efficacy of alternative spawning techniques; b) egg incubation and fry production techniques; c) holding and rearing densities; d) prophylactic treatments; e) nutritional requirements and feeding techniques; and f) optimal environmental rearing conditions and systems.
- Conduct research study to identify suitable stocking protocols for hatchery fish (e.g., fish size, time of year, site, marking technique).
- Conduct and monitor pilot-scale-stocking programs before conducting large-scale efforts that encompass broad geographic area.
- Establish stocking goals and success criteria prior to development of large-scale stock enhancement or recovery programs.

Elucidate life history and ecological characteristics

- Develop methods to determine sex and maturity of captured sturgeon.
- Identify rates of tag loss and tag reporting.
- Establish coordinated tagging programs to delineate migratory patterns and stock composition. Priority should be to mark juveniles in important sturgeon rivers before they begin ocean life phase.
- Standardize PIT tagging and ultrasonic telemetry equipment and procedures.
- Analyze existing sea sampling data to characterize at-sea migratory behavior. Use electronic tagging to model coastal migrations of juvenile and adult Atlantic sturgeon.
- Evaluate aging techniques for Atlantic sturgeon with known age fish. Emphasis should be placed on verifying current methodology based on fin rays.
- Determine length, fecundity, and maturity at age for North, Mid, and South Atlantic stocks.
- Establish tolerance of different life stages to important contaminants.
- Establish tolerance and preference of different life stages to important environmental factors (e.g., DO, pH, temperature, salinity).

Other

- Encourage shortnose sturgeon researchers to include data collection for incidentally captured Atlantic sturgeon.

V. Ongoing and Completed Research and Activities

Amendment 1 does not require any research in participating jurisdictions/states. Nonetheless, several state and federal agencies are conducting or have completed research projects on Atlantic sturgeon to further understand the species' life history, genetics, behavior, and aquaculture. Some of these include:

- Reproductive conditions of Hudson River stock (UC Davis and Hudson River Foundation)
- Diet in marine waters (USGS-BRD, assisted by NJ DEP)
- Hydroacoustic surveys in Connecticut River and Hudson River (USGS-BRD and USFWS)
- Mitochondrial DNA analysis to delineate subspecies (NYU, Hudson River Foundation, and SCDNR)
- mtDNA analysis to determine stock contributions in NY fishery (NYU and Hudson River Foundation)
- Behavior and diet studies in early life history stages (USGS-BRD)
- Juvenile sturgeon habitat use in Hudson River (U. Mass. and NMFS, Cornell University)
- Ultrasonic telemetry studies of sturgeon movement (USGS-BRD, Hudson River Foundation, Cornell University)
- Fin ray aging studies (Chesapeake Biol. Lab and UC Davis)
- Sturgeon bycatch in Winyah Bay shad fisheries (SC DNR)
- Tagging of juvenile and adult Atlantic sturgeon in the Delaware and Hudson Rivers (USGS-BRD and DE DNREC)
- Ultrasonic telemetry study of juvenile Atlantic sturgeon movement and habitat use in Delaware River (DE DNREC and Del. State Univ.)
- Abundance of juvenile Atlantic sturgeon in Delaware River (DE DNREC)
- Population status and identification of spawning areas of Atlantic sturgeon in Delaware River (Del. State Univ.)
- Survival of juvenile Atlantic sturgeon with pectoral spine and barbel removal (SC DNR)
- Seasonal abundance of juvenile Atlantic sturgeon in lower Edisto River (SC DNR)
- Movement and distribution of stocked Atlantic sturgeon in Nanticoke River, MD, through the use of sonic tags (Chesapeake Biol. Lab, MD DNR, NBS)
- Release and monitoring of approximately 3,500 coded wire tagged juvenile Atlantic sturgeon of Hudson River parentage in Nanticoke River, MD (Chesapeake Biol. Lab, MD DNR, and the USFWS)
- Tagging program/rewards for live Atlantic sturgeon captured in Chesapeake Bay (USFWS, VMRC, MD DNR, and the Chesapeake Bay Foundation)
- Tagging of juvenile Atlantic sturgeon in A.C.E. (Ashepoo-Combahee-Edisto) Basin, SC (SC DNR)

- Diet and genetic studies are underway in the Savannah, Edisto, and Waccamaw rivers (SC DNR)
- Identification of genetic diversity in Atlantic sturgeon using microsatellite markers is underway at the Leetown Science Center (USGS-BRD).
- Domestic Atlantic sturgeon (ASN) held on station at USFWS-Lamar from the 1993-1994 year classes were biopsied for gender determination and degree of gonadal maturity. Tissue samples from 24 fish were sent to UC-Davis for histology. Numerous photos and body measurements were taken from these fish in an effort to use image discrimination analysis with the objective of developing a discrete index, which may be used to determine gender of sub-adults without surgery.²
- Habitat use of adult Atlantic sturgeon in A.C.E. (Ashepoo-Combahee-Edisto) Basin, SC (SC DNR)
- Distribution of juvenile Atlantic sturgeon in the Savannah River estuary (SC DNR)
- A comprehensive Culture Manual for Atlantic Sturgeon has been completed and it is now available in PDF format on-line at *northeast.fws.gov/fisherycenter* (US FWS Northeast Fishery Center at Lamar, PA).
- Development of a blood assay technique to determine sex (MD DNR)
- Hudson River sub-adult Atlantic sturgeon were stocked in 2004 and are being monitored to provide information on movements, habitat uses, timing of exodus, coastal movements, etc. (NYDEC, USFWS)
- Sturgeon population assessment in the Altamaha River, GA during 2004-2005 (UGA)
- Distribution of Sturgeon and tagging in the near shore ocean off Long Island, NY (NYDEC, Stony Brook University)
- Adult mark-recapture study in the Edisto River and Winyah Bay, SC (SCDNR)

VI. Status of Management Measures and Issues

Mandatory management measures include:

1. Complete closure, through prohibiting possession of Atlantic sturgeon, and any and all parts thereof including eggs, and of any directed fishery for and landings of Atlantic sturgeon until the fishery management plan is modified to reopen fishing in that jurisdiction. In February of 1999, the National Marine Fisheries Service imposed a harvest and possession moratorium on Atlantic sturgeon in the EEZ.
2. In addition, states shall implement any restrictions in other fisheries as outlined in bycatch reduction sections of the FMP.
3. States may grant limited specific exceptions to prohibitions on possession for imports of non-U.S. Atlantic sturgeon and/or cultured Atlantic sturgeon upon adoption of FMP addenda that specify the terms, limitations, and enforcement requirements for each such

² ASN inventory at Lamar as of December 2004: Wild captive fish = 11 including Hudson, NJ coastal and Delaware Bay adults and sub-adults. Domestic (Hudson) juveniles from: 1998 year-class = 47; 1996 year-class = 20; 1995 year-class = 35; 1994 year-class = 35; 1993 year-class = 32.

exception. It is intended that each such addendum shall be developed by a PRT, in consultation with representatives of the ASMFC federal partners, applicable state aquaculture authorities, the ASMFC Law Enforcement Committee, the state(s) for which shipments are intended, and the party(ies) requesting the exception.

In addition to these mandatory regulations, states are implementing several recommendations in the FMP including development of a coast-wide tagging database and culture techniques, incorporation of shortnose sturgeon issues in Atlantic sturgeon research (and vice versa), stock identification, and habitat restoration.

In September 21, 1998, the Secretaries of Commerce and Interior determined that listing of Atlantic sturgeon under the Endangered Species Act (ESA) is not warranted. This finding was in response to a petition filed on June 2, 1997 for listing the species as endangered or threatened under the ESA. A NMFS and USFWS status review team should finalize a new status review of Atlantic sturgeon stocks by mid December and formally submit the report to NMFS. NMFS will then use the report to make a listing determination, which will most likely be published by late February/early March.

VII. Current State-by-State Implementation of FMP Compliance Requirements

Compliance requirement: Complete closure, through prohibiting possession of Atlantic sturgeon, and any and all parts thereof including eggs, and of any directed fishery for and landings of Atlantic sturgeon until the fishery management plan is modified to reopen fishing in that jurisdiction. As described in Sections 3.4 and 5.1.2 of Amendment 1, states/jurisdictions must report on monitoring programs and provide estimates of bycatch of Atlantic sturgeon in other fisheries under their jurisdiction.

All states and jurisdictions maintain compliance with Amendment 1 at this time. See Table 3 for a state-by-state summary of compliance.

VIII. Recommendations of Plan Review Team

The PRT recommends that states:

1. Further improve sturgeon bycatch reporting from their commercial fisheries for meaningful data. One means of doing so would be to encourage the completion of the ACCSP discard module and implement the use of the discard module to record bycatch of Atlantic sturgeon once it has been developed.
2. Continue Atlantic sturgeon tagging programs consistent with current guidelines and that the information enter the USFWS tagging database program. All states are encouraged to include PIT tagging in their monitoring programs. See “Standardized Tagging Methodology for Atlantic Sturgeon.”
3. Continue to educate fishing communities on identification techniques to distinguish shortnose and Atlantic sturgeon.

4. Expand upon state-initiated programs to estimate sturgeon bycatch in their fisheries. The PRT stresses the importance of mandatory reporting requirements to effectively monitor sturgeon bycatch in their fisheries. The PRT notes that bycatch estimates using self-reported data are likely largely underestimated.
5. Take tissue samples (i.e., fin clips about the size of a dime), preserve them in 95% ethanol, and send them to the NOAA tissue repository in South Carolina.
6. Utilize new technology such as sonic and radio telemetry to get a better sense of important habitat.
7. Develop basic techniques and provide information on the potential for population restoration using release of stocked fish as an additional management tool if wild populations do not rebound in response to the moratorium. This recommendation is specifically directed at states that are contemplating restoration and who are willing to commit time, money, and facilities to it.

Table 1. Reported bycatch of Atlantic sturgeon in ASMFC jurisdictions during 2006

State	Location	Fisheries	Target Species	Data Source	Type of Program	Number	Dead	Sub-sample or Total Fishery?
ME	Ocean (513)	shrimp trawl	Shrimp	NMFS observer	bycatch			-
NH	ocean	Gillnet	groundfish	NMFS observers	bycatch			-
MA	Merrimack River	Recreational	Striped bass	-	bycatch			-
RI	ocean	trawl	summer flounder	NMFS observer	bycatch			-
	ocean	Gillnet	summer flounder and monkfish	NMFS observer	bycatch			-
CT	Connecticut River	drift gillnet	American shad	logbook	bycatch			total
NY	Hudson R. Estuary	anchored gillnet	American shad	logbook & observer	bycatch			total
NJ	Delaware Bay	unspecified	American shad	mandatory logbook	bycatch			Sub-sample
	Coastal	unspecified	American shad	mandatory logbook	bycatch			Sub-sample
DE	Delaware Bay	gillnet	striped bass, Am. Shad & weakfish	voluntary logbook	bycatch			Total
	Delaware River	gillnet	striped bass, Am. Shad & weakfish	voluntary logbook	bycatch			Total
	Delaware River	ship strike	-	reporting	ship strike			-
MD	ocean	trawl	-	state observers	bycatch			sub-sample
	unspecified	gill net	-	reward program	bycatch			sub-sample
	unspecified	pound net	-	reward program	bycatch			sub-sample
PRFC	Potomac River	gillnet	-	mandatory reports	bycatch			total
VA	Ches. Bay & Tribs	-	-	fishermen	bycatch			-
	James River	-	sturgeon	USFWS/VIMS	reward program			-
NC	Pamlico Sound	gillnet	flounder	observers	bycatch			sub-sample
	Cape Fear River	drift gillnet	American shad	observers	bycatch			sub-sample
	ocean	trawl	shrimp	logbook & observer	bycatch			sub-sample
SC	Edisto River	unspecified	shad	reporting	bycatch			sub-sample
GA	ocean	trawl	shrimp and whelk	GA CRD	bycatch			unspecified
	Savannah River	recreational	-	GA CRD & WRD	bycatch			sub-sample
FL	ocean	purse seine	-	unspecified	bycatch			-
	inshore	cast net	baitfish	unspecified	bycatch			-
TOTAL						635	17	

^ number extrapolated from logbook data and effort

Table 2. Fishery-independent collection of Atlantic sturgeon in ASMFC jurisdictions during 2008.

State	Location	Fisheries	Target Species	Data Source	Number	Dead
ME	ocean	shrimp trawl	groundfish	ME/NH joint survey		
MA	ocean	trawl	-	DMF		
RI	RI Sound	trawl	-	RI DFW		
CT	Connecticut River	unspecified	-	CT DEP		
	Long Island Sound	trawl	-	CT DEP		
	estuarine	unspecified	-	CT DEP		
NY	Hudson R. Estuary	trawl	-	utility survey		
	Hudson R. Estuary	anchored gillnet	-	NYSDEC-USFWS		
NJ	ocean	trawl	-	NJ DEP		
	Delaware Bay	unspecified	striped bass & American shad	NJ DEP		
PA	Delaware River	unspecified	American shad	PA FBC		
DE	Delaware Bay	trawl	juvenile sturgeon	DE DFW		
	Delaware Bay	gill net/trammel net	Atlantic/shortnose sturgeon	Env. Research & Consulting		
DC	Potomac River	unspecified	-	DC sampling		
VA	Ches. Bay & tribs	trawl	-	VIMS		
	James River	trawl	-	Ches. Bay Found.		
	James, York & Rapp. Rivers	anchored gillnet	-	VA MRC		
NC	Albemarle Sound	gillnet	-	NCDMF		
	Pamlico Sound/River	gillnet	-	NCDMF		
	Cape Fear River	gillnet	-	NCDMF		
SC	Edisto River	unspecified	-	SCMRD		
	Savannah River	unspecified	-	SCMRD		
	Winyah Bay/Cooper River	unspecified	-	SCFFS		
GA	Altamaha River	drift gillnet	shad	GA WRD		
	ocean	trawl	-	GA CRD		
	Altamaha & Wassaw Sound	trammel & gill nets	spotted sea trout & red drum	GA CRD		
	Altamaha River	trammel & gill nets	-	UGA		
				TOTAL		

* same fish reported in ME and NH reports