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

Prepared by:

The Atlantic Sturgeon Plan Review Team
Kim McKown, New York Department of Environmental Conservation
Tom Meyer, National Marine Fisheries Service
Ted Smith and Mark Collins, South Carolina Department of Natural Resources
Braddock Spear, Chair, ASMFC

January 31, 2006

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I. Status of the Fishery Management Plan

Year of plan's adoption:	1990
Amendments:	Amendment 1 (June 1998)
Addenda:	Technical Addendum #1 (October 16, 2000) Addendum I (January 31, 2001) Addendum II (May 2005)
Management unit:	Migratory stocks of Atlantic sturgeon from Maine through Florida
Juris. with a declared interest:	Maine through Florida, including District of Columbia, Potomac River Fisheries Commission
Committees:	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, 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. 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 states report annually (initiated Oct. 1, 1999) 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 Stock[1]

Reported landings peaked in 1890 at 3.4 million kg and declined precipitously thereafter. Currently, populations of Atlantic sturgeon 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

[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.

all northern stocks, while certain rivers in Georgia and South Carolina are showing increasing numbers of subadults, suggesting some population rebuilding.

III. Status of the Fishery

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 at least exhibit 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 III exempts a private company in North Carolina from the moratorium on possession, propagation, and sale of Atlantic sturgeon meat and eggs.

The November 2003 technical workshop on status of Atlantic sturgeon raised several new issues regarding bycatch of Atlantic sturgeon. Another workshop focused on recovery techniques held in November 2004 provided more recommendations for dealing with bycatch. ASMFC will host a workshop in February 2006 to estimate bycatch and bycatch mortality and develop recommendations for coastwide monitoring and improved population abundance estimates.

Table 2 is 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 (as of October 1, 2005).

<u>Assessments of population status</u>
-Conduct assessments of population abundance and age structure in various river systems. Particular emphasis should be placed in documenting occurrence of age 0-2 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 F50 to model inputs for northern and southern stocks.

-Develop a protocol for ageing validation

<u>Assess current habitat suitability</u>
-Quantify the amount and quality of sturgeon habitat in important sturgeon rivers, including spawning and nursery habitats. Define and map bottom characteristics and substrates types for suitable sturgeon spawning.

Identify mortality factors

-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 culture and stock enhancement information

-Further develop techniques for capture, transport and long-term holding of wild broodstock.

-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.

-Analyze existing sea sampling data to characterize at-sea migratory behavior.

-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).

Maintain long-term tagging database and repository for tissues

-Standardize collection procedures and develop suitable long-term repository for biological tissues for use in genetic and other studies.

-Maintain database for tagged Atlantic sturgeon.

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 (U. Calif./Davis and Hudson River Foundation)
- Diet in marine waters (USGS-BRD, assisted by NJ Dept. of Environmental Protection)
- Hydroacoustic surveys in Connecticut River and Hudson River (USGS-BRD and U.S. Fish and Wildlife Service)
- Mitochondrial DNA analysis to delineate subspecies (NY University, Hudson River Foundation, and SCDNR)
- mtDNA analysis to determine stock contributions in NY fishery (NY University 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 U.)
- Ultrasonic telemetry studies of sturgeon movement (USGS-BRD, Hudson River Foundation, Cornell U.)
- Fin ray aging studies (Chesapeake Biol. Lab and U. Calif./Davis)
- Sturgeon bycatch in Winyah Bay shad fisheries (SC Dept. of Nat. Resources)
- Tagging of juvenile and adult Atlantic sturgeon in the Delaware and Hudson Rivers (USGS-BRD and DE Dept. of Natural Resources & Environmental Control)
- Survival of juvenile Atlantic sturgeon with pectoral spine and barbel removal (SC Dept. of Nat. Resources)
- Seasonal abundance of juvenile Atlantic sturgeon in lower Edisto River (SC Dept. of Nat. Resources)
- Movement and distribution of stocked Atlantic sturgeon in Nanticoke River, MD, through the use of sonic tags (Ches. 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 (Ches. 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)
- 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)
- Stocked Hudson River subadult 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)

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] 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.

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 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 coastwide tagging database, 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 ESA. It is expected by Spring 2006, NOAA Fisheries and USFWS will complete their status review of Atlantic sturgeon stocks and revisit their earlier decision not to list the species.

VII. Current State-by-State Implementation of FMP Compliance Requirements (as of October 1, 2005)

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 1 for a state-by-state summary of compliance.

VIII. Recommendations of FMP Review Team

The PRT recommends that states:

1. further improve sturgeon bycatch reporting from their commercial fisheries for meaningful data.

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.

3. continue to educate fishing communities on identification techniques to distinguish shortnose

from 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 other 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% ETOH, and send them to the NOAA tissue repository in SC.

6. 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.

	ATLANTIC STURGEON – COMPLIANCE MATRIX				
	Bycatch Monitoring [1]	Monitoring Results [2]	Habitat Status [3]	Aquaculture Operations [4]	Moratorium on Harvest and Possession[5]
ME	C	C	C	C	C
NH	C	C	C	C	C
MA	C	C	C	C	C
RI	C	C	C	C	C
CT	C	C	C	C	C
NY	C	C	C	C	C
NJ	C	C	C	C	C
PA	C	C	C	C	C
DE	C	C	C	C	C
MD	C	C	C	C	C
PRFC	C	C	C	C	C
DC	C	C	C	C	C
VA	C	C	C	C	C
NC	C	C	C	C	C
SC	C	C	C	C	C
GA	C	C	C	C	C
FL	C	C	C	C	C

NOTE ** C = IN COMPLIANCE, P = PARTIAL, N = NOT IN COMPLIANCE/NO REPORT SUBMITTED, NA = NOT APPLICABLE

[1]** **REQUIRED** Bycatch Monitoring may be implemented via law enforcement observations, fishery independent surveys, ACCSP and/or at-sea observer programs.

[2]** **RECOMMENDED** Monitoring Results should include:

a). Programmatic details of how juvenile abundance survey will be performed (recommended every 5 years)

b). Calculated CPUE estimates of juveniles (when survey is completed)

c). Report on juvenile tag and release programs

d). Assessment of spawning stock status including examination of sex ratio, size, and age structure by sex of the larger sub-adults and adults.

[3]** **RECOMMENDED** Habitat Monitoring reports should include:

a). Assessment of existing and historical sturgeon habitat/habitats of particular concern

b). Restoration programs

c). FERC relicensing evaluations

[4]** **RECOMMENDED** Aquaculture Operations monitoring reports should include:

a). Aquaculture research and development

b). Collection of brood stock and release of cultured progeny

c). Translocation of sturgeons and inadvertent spread of diseases

d). Introduction of non-native sturgeons for commercial aquaculture

e). Collection and archiving tissue samples for genetic analysis

f). Monitoring effectiveness of restoration programs

REQUIRED for states with private aquaculture exemptions to the harvest and possession moratorium

[5]** **REQUIRED** State moratorium on the harvest and possession of Atlantic Sturgeon currently applies throughout ASMFC jurisdictions

Table 2. Reported commercial bycatch and fishery independent collection of Atlantic sturgeon in ASMFC jurisdictions during 2004.

State	Location	Fisheries	Target species	Data Source	Type of Program	N-landed	Bycatch Number	Bycatch Dead	Gear Effort	Subsample or Total fishery??
ME	ocean	unspecified		port agent, LE	landed	0	-	-	-	subsample
NH	ocean	unspecified		LE	landed	0	-	-	-	subsample
	ocean	coastal netters		mandatory log books	reported	0	0	0	-	total
	ocean	unspecified		NMFS observer	observed	0	0	0	-	subsample
MA	ocean	unspecified		MA observer	observed	-	0	0	-	subsample
RI	ocean	trawl, A&D GN		NMFS observer	observed	-	29	-	-	subsample
CT	river	Drift GN	A.shad	logbooks	reported	-	74	-	-	total
	LI sound	-		-	-	-	-	-	-	
NY	river	A&D GN	A. shad	observer	observed	0	0	0	sq-yd hours	subsample
	river	A&D GN	A. shad	mandatory reports	reported	0	0	0	sq-yd hours	total
	ocean	unspecified		unspecified	-	-	-	-	-	-
NJ	bay	A&D GN		logbooks	reported	-	24	0	-	total
	ocean	A&D GN		logbooks	reported	-	123	0	-	total
DE	river	Drift GN		logbooks	reported	-	6	-	N-trips, fishers	subsample expanded to total??
	bay	A&D GN		logbooks	reported	-	216	-	N-trips, fishers	-
	ocean	A&D GN		logbooks	reported	-	52	-	N-trips, fishers	-
MD	bay	unspecified		-	-	-	-	-	-	-
	ocean	unspecified		-	-	-	-	-	-	-
PRFC	river	GN		logbooks	reported	-	-	-	-	-
VA	river	pound net		-	-	-	-	-	-	-
	bay	A,S&D GN, dredge		-	-	-	-	-	-	-
	ocean	GN		-	-	-	-	-	-	-
NC	river	Drift GN	A. shad	observer	observed	0	0	0	-	subsample
	sound	Sm. Mesh GN	Flounder	observer	observed	0	1	0	25 of x trips	subsample
	sound	Lg Mesh GN	Flounder	observer	observed	0	0	0	164 of x trips	subsample
	ocean	trawl	Shrimp	observer	observed	0	0	0	8 of 135 trips	subsample
	?	unspecified		logbooks	reported	0	0	0	-	-
SC	river	Drift GN	A. shad	logbooks	reported	-	11	-	-	total
	ocean	unspecified	-	-	-	-	-	-	-	-
GA	river	Drift GN	A. shad	replicate fishery	observed	-	2	0	19 d	no actual fishery data
	ocean	trawl	Shrimp & whelk	observer	observed	-	0	0	N-tows	subsample
FL	ocean	unspecified	-	-	-	-	0	-	-	-