

**ATLANTIC STATES MARINE FISHERIES COMMISSION**

**REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN**

**FOR ATLANTIC STURGEON**  
*(Acipenser oxyrinchus oxyrinchus)*

**2017 FISHING YEAR**



Prepared by the Plan Review Team

Approved by the Atlantic Sturgeon Management Board  
May 2019

**REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN FOR  
ATLANTIC STURGEON (*Acipenser oxyrinchus oxyrinchus*) FOR 2017**

**I. Status of the Fishery Management Plan**

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|--|---|
| <u>Date of FMP Approval:</u>                 | November 1990   |
| <u>Amendments:</u>                           | Amendment 1 (July 1998)   |
| <u>Addenda:</u>                              | Technical Addendum #1 (October 2000)<br>Addendum I (January 2001)<br>Addendum II (May 2005)<br>Addendum III (November 2006)<br>Addendum IV (September 2012) |
| <u>Management unit:</u>                      | Migratory stocks of Atlantic sturgeon from Maine through Florida  |
| <u>Jurisdictions with 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, Plan Development Team, Technical Committee, Stock Assessment Subcommittee, Culture and Stocking Committee      |

The Atlantic Sturgeon Fishery Management Plan (FMP) was approved by the Atlantic Sturgeon Management Board (Board) in 1990. By 1995, the member states and jurisdictions determined that the FMP was insufficient for conservation and restoration of Atlantic sturgeon stocks, and initiated development of Amendment 1, which was approved by ASMFC in June 1998. The goal of the Amendment is “to restore Atlantic sturgeon spawning stocks to population levels which will provide for sustainable fisheries, and ensure viable spawning populations” (ASMFC 1998a). Based on recommendations of the 1998 ASMFC Atlantic Sturgeon Stock Assessment, the specific objectives to achieve this goal include:

- Establish 20 protected year classes 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.

Under Amendment 1, states must maintain complete closure of any directed fishery for Atlantic sturgeon and prohibit landings from any fishery. Additionally, possession of Atlantic sturgeon,

or any parts thereof including eggs, is prohibited. Exemptions to the moratorium on possession for the purpose of scientific research or educational display are detailed in Technical Addendum 1. Applicants for exemption for the purpose of aquaculture and importation of non-indigenous Atlantic sturgeon (i.e., originating from outside U.S. jurisdiction) must adhere to the terms, limitations, enforcement and reporting requirements which were approved by the Commission in January 2001, and receive approval from the Board through the adaptive management process (e.g., see Addenda I-III detailed below).

Amendment 1 requires that, beginning in 1999, 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., including any additional reporting requirements outlined in the ASMFC Terms, Limitations, Enforcement and Reporting Requirements Document (2001).

Addendum I (2001) to the Atlantic Sturgeon FMP exempts Florida from the possession moratorium for the purposes of developing private aquaculture facilities for cultivation and propagation of the species. Addendum II (2005) exempts a private company in North Carolina from the moratorium on possession, propagation, and sale of Atlantic sturgeon meat and eggs, and allows a Canada-based exporter to export Atlantic sturgeon fry and fingerlings into North Carolina. Addendum III (2006) similarly allows a private company in North Carolina to import Atlantic sturgeon from a Canada-based exporter. Addendum IV (2012) updates habitat information for Atlantic sturgeon and identifies areas of concern and research needs.

The Atlantic sturgeon Advisory Panel (AP) was disbanded in August 2018. With Atlantic sturgeon listed under the ESA, and the 2017 benchmark assessment showing very little change in the resource's abundance since the 1998 assessment, it's unlikely that there will be any management activity for the foreseeable future. If the Board determines that it would benefit from the input of an AP down the road, staff will work with the states to re-establish an AP at that time.

## **II. Status of the Stock**

In 1998, a benchmark stock assessment conducted by the Commission concluded that Atlantic sturgeon populations throughout the species' range were either extirpated or considered to be at historically low abundances (ASMFC 1998b). Also in 1998, NOAA Fisheries evaluated the status of the species with regard to listing under the Endangered Species Act (ESA) and concluded that listing was not warranted at the time (NOAA 2007). In 2007, a Status Review Team (SRT) identified five Distinct Population Segments (DPS; discrete population units with

distinct physical, genetic, and physiological characteristics) along the Atlantic coast (NOAA 2007).

In 2009, and based on the recommendations from the 2007 Status Review, the National Resources Defense Council petitioned NOAA Fisheries to list Atlantic sturgeon under the provisions of the ESA. Following review, NOAA Fisheries published two proposed rules (75 FR 61872 and 75 FR 61904) in October 2010 to list each DPS under the provisions of the ESA. In April, 2012, NOAA Fisheries published two final rules (77 FR 5880 and 77 FR 5914) declaring the Gulf of Maine DPS as threatened and the remaining four DPSs as endangered. In 2013, in response to the ESA listing, the Board initiated the development of a coastwide benchmark stock assessment to evaluate stock status, stock delineation, and bycatch. The benchmark assessment was externally peer-reviewed in August 2017 by a panel of independent experts, and approved by the Board for management use in October.

The Stock Assessment Subcommittee (SAS) explored a number of different models and analyses to evaluate the status of Atlantic sturgeon, including trend analysis, data poor methods, genetic methods, per recruit models, and a multi-state Jolly-Seber tagging model based on telemetry records to estimate mortality. Unfortunately, efforts to assess the status of Atlantic sturgeon are hampered by a lack of data. Of the 50 fishery-independent surveys that were evaluated, only nine of the surveys met the criteria to be used as indices of relative abundance in the assessment. The accepted surveys ranged from Maine to South Carolina and mostly caught juveniles and sub-adults. The other surveys were not used because they rarely encountered sturgeon or because their methods were inconsistent throughout the time series.

The assessment based stock status on the results of the ARIMA (Auto-Regressive Integrated Moving Average) trend models and the tagging models. The ARIMA model uses fishery-independent indices of abundance to estimate how likely an index value is above or below a reference value. The tagging model estimated the survival rate of Atlantic sturgeon at the coastwide and DPS levels. An egg-per-recruit (EPR) model was used to compare recent total mortality ( $Z$ ) with a total mortality reference point that would result in 50% of the egg production of an unexploited population. This reference point ( $Z_{50\%EPR}$ ) was used in the 1998 benchmark assessment and continued in the 2017 assessment as an appropriate target to aid in stock recovery. The survival estimate from the tagging model was compared to  $Z_{50\%EPR}$  to determine if total mortality was too high.

According to the 2017 Atlantic Sturgeon Stock Assessment Report, Atlantic sturgeon populations remain depleted at the coastwide and DPS-levels relative to historical abundance (Table 1). The “depleted” determination was used instead of “overfished” because of the many factors that contribute to the low abundance of Atlantic sturgeon. On a coastwide basis, however, the population appears to be recovering slowly since 1998 (the year the moratorium was implemented). Despite the fishing moratorium, the population still experiences mortality from several sources, but the assessment indicates that total mortality is sustainable.

Impediments to recovery include directed and incidental fishing, habitat loss, ship strikes, and climate change. The 2017 report indicates that anthropogenic mortality is a leading cause of Atlantic sturgeon mortality. Despite there being no directed fisheries for Atlantic sturgeon for nearly two decades, sturgeon are caught as bycatch in fisheries for other species, predominantly in gillnets, and to a lesser extent trawls and pound nets. Other potential emerging threats include invasive species, such as blue (*Ictalurus furcatus*) and flathead (*Pylodictis olivaris*) catfishes. In regions where sturgeon from different DPS mix in coastal aggregations, threats to these aggregations (e.g., bycatch mortality and ship strikes) may have disproportionate population effects at the DPS-level. Poaching of Atlantic sturgeon, at an unknown level, also occurs.

Following review of the benchmark assessment results, the Board discussed the need to support management actions that have contributed to recovery seen to date (e.g., the moratorium, habitat restoration and protection, better bycatch monitoring), and acknowledged the need to improve data collection along the Atlantic coast to support future stock assessments and improve the current understanding of stock status.

### **III. Status of the Fishery**

#### Directed Harvest

Atlantic sturgeon have been harvested for their flesh and eggs (i.e., caviar) along the Atlantic coast since pre-colonial times. Commercial landings records for Atlantic sturgeon were first kept in 1880. At that time, landings were high and concentrated in the Delaware and Chesapeake systems, although commercial fisheries rapidly expanded to include most known spawning rivers. Reported landings of Atlantic sturgeon peaked in 1890 at 7.5 million pounds and declined precipitously thereafter. During the 1970s and early '80s, the bulk of fishing effort and landings shifted to North Carolina, South Carolina, and Georgia (ASMFC 1998a; ASMFC 1998b). As the 1980s progressed, landings from these states declined and coastwide landings shifted to New York and New Jersey.

By 1996, following approval of the 1990 Interstate FMP which suggested that the dramatic decline in landings was likely caused by overfishing, Atlantic sturgeon fishery closures were instituted in 10 states and jurisdictions along the Atlantic coast. Since 1997, all states have enacted bans on harvest and possession of Atlantic sturgeon and sturgeon parts. NOAA Fisheries enacted a ban on harvest and possession of Atlantic sturgeon in federal waters in 1998. Per Amendment 1, these moratoria will remain in effect until stocks exhibit a minimum of 20 protected year classes of spawning females and the FMP is modified to permit harvest and possession.

#### Bycatch

Since Atlantic sturgeon are an anadromous species spending portions of their lives in rivers, estuaries, and both nearshore and offshore ocean waters, they are vulnerable to incidental capture in many different fisheries conducted along the Atlantic coast. Accordingly, bycatch is one of the most significant threats to the viability of Atlantic sturgeon populations (ASMFC

2017). The Commission hosted several workshops between 2003 and 2007 that focused on collecting information on Atlantic sturgeon bycatch, identifying bycatch issues, estimating fishery-specific bycatch, and developing recommendations for dealing with Atlantic sturgeon bycatch in other directed fisheries.

The 2017 benchmark stock assessment was able to estimate bycatch from three different data sources; the Federal observer program, i.e., the Northeast Fisheries Observer Program (NEFOP) and the At-sea Monitoring Program (ASM), the North Carolina estuarine gill-net fishery observer program, and the South Carolina American shad fishery logbook program. However, it is hard to compare the estimates from the Federal and North Carolina observer programs to the estimates from the South Carolina logbook program due to the differences in how the data are collected. The South Carolina data are self-reported and are most likely an underestimate, since under-reporting is known to occur, while the Federal and North Carolina estimates are developed from a sample of fishing trips in these regions and have their own degree of uncertainty.

Estimates of total bycatch from the Federal observer programs (gillnets and trawls combined) were lower than estimates from the North Carolina observer programs, but estimates of dead discards were similar because the Federal observer program encountered a higher proportion of dead fish on gillnet hauls than North Carolina did. Estimates of bycatch from the Federal observer data averaged 1,139 Atlantic sturgeon caught per year with 295 dead in the gillnet fishery and 1,062 a year with 41 dead in the otter trawl fishery. Estimates of bycatch from the North Carolina gillnet fishery averaged 4,179 per year with 218 dead. The South Carolina American shad fishers reported an average of 4.3 Atlantic sturgeon caught per year in rivers in the South Atlantic DPS and 92.4 per year in waters in the Carolina DPS. Refer to ASMFC 2017 for more information regarding bycatch and bycatch mortality estimates.

Amendment 1 requires states and jurisdictions to report Atlantic sturgeon bycatch, although the quality of available data varies. Anecdotal evidence suggests that many Atlantic sturgeon bycatch encounters are unreported, indicating the need for reliable state-directed reporting programs. In 2017, 167 Atlantic sturgeon were reported as bycatch from state water fisheries (0-3 miles offshore, including inland rivers and estuaries), including 51 fish in the North Carolina gill-net fishery and 66 fish in the South Carolina American shad fishery. Connecticut (15), Maryland (1), Virginia (11), and Georgia (23) also reported bycatch of Atlantic sturgeon in 2017. Additionally, NEFOP fisheries observers reported 252 Atlantic sturgeon in 2017. However, the potential problem of misidentification should be noted as NEFOP observers also reported an additional 26 sturgeon coded as “unknown sturgeon” (meaning the observer was unable to distinguish between Atlantic or shortnose sturgeon).

#### Fishery-Independent Takes

Atlantic sturgeon are not often encountered by fishery-independent surveys; many river systems have few fish and particular stretches of rivers known to support sturgeon are often not easily sampled. However, several states have been conducting both long and short-term monitoring of Atlantic sturgeon through fishery-independent surveys, tagging programs, and

other research efforts. Refer to Table 2 for a list of takes from fishery-independent surveys and research programs by state.

### Aquaculture

A management objective of the 1990 FMP is to enhance and restore Atlantic sturgeon stocks. The use of aquaculture aims to achieve that objective by providing a unique opportunity to research conservation, restoration, and recovery techniques for wild-spawning Atlantic sturgeon.

The U.S. Fish and Wildlife Service (USFWS) maintains eight adult Atlantic sturgeon at the Bears Bluff National Fish Hatchery in South Carolina under Endangered Species Act (ESA) Section 10(a)(1)(A) Permit #17367-01 issued on March 14, 2013. These fish were collected from 2008 to 2010 from the Altamaha River. Fertilized eggs have been produced from at least one of these fish every year since 2011. The 2017 spawning effort yielded approximately 17,496 fertilized eggs and 4,142 fry hatched from those eggs. Groups of progeny from the successful spawning events are currently being reared for future research. In 2017, otoliths and approximately 20 captive propagated Atlantic sturgeon fingerlings were distributed to permitted partners including the U.S. Department of Energy's Oak Ridge Laboratory and the South Carolina Department of Natural Resources for research purposes. The USFWS's Welaka National Fish Hatchery in Florida also maintains 97 Atlantic sturgeon from three year classes. These fish were obtained from the Bears Bluff National Fish Hatchery for future research, and as a refugium for endangered species. The total number of Atlantic sturgeon kept at the hatchery was reduced due to space limitations and to allow for better conditions for the remaining fish. Lastly, the USFWS Northeast Fishery Center in Lamar, Pennsylvania terminated its captive spawning research program in 2017 and held no Atlantic sturgeon in captivity.

Maryland Department of Natural Resources' Sturgeon Conservation Partnership, in cooperation with GenOn Energy (formerly NRG Energy) and the University of Maryland's Aquaculture and Restoration Ecology Laboratory (AREL), is currently rearing an Atlantic sturgeon captive population under ESA Permit #21434 issued on February 8, 2018. This research was previously conducted under ESA Permit #17364 held by USFWS for its Northeast Fishery Center which was modified on January 6, 2016, to include facilities controlled by MD DNR. GenOn Energy's Chalk Point Generating Station houses 7 adult wild Atlantic sturgeon and approximately 359 Canadian hatchery origin Atlantic sturgeon. The University of Maryland's AREL at Horne Point houses 11 adult and sub-adult wild Atlantic sturgeon and 45 juvenile Canadian Atlantic sturgeon. The Cooperative Oxford Laboratory houses 52 individuals of various year classes.

In 2005, LaPaz LLC of Lenoir, North Carolina, received approval from the ASMFC and North Carolina Department of Marine Fisheries to commercially rear Atlantic sturgeon for the purpose of sale of meat and caviar (ASMFC 2005; ASMFC 2006). LaPaz imported 5,883 fertilized Atlantic sturgeon eggs from Canadian sources from 2006-2008. Shortly thereafter, LaPaz began shifting focus away from Atlantic sturgeon. From 2010-2012, LaPaz culled nearly all of the 2006 fish, and 435 fish from 2008 were transported from LaPaz to the West Virginia University (WVU) to be involved in a study evaluating aquaculture potential of reclaimed water from coal mining.

The fish were accompanied by proper tracking and documentation and WVU received permission from the West Virginia Fish and Game Division to possess the fish at their facility. Since West Virginia is not an ASMFC member state, the disposition of these fish is not well documented. Accordingly, the PRT expressed concerns regarding the transfer of Atlantic sturgeon to facilities outside of ASMFC jurisdiction and regarding the ability for facilities under import exemption to transfer live Atlantic sturgeon to research facilities that may not be held to the same Best Management Practices as the exempt facility. LaPaz then culled an additional 937 fish during 2013-2014 and later accepted an offer from Horse Creek Aquafarm in Arcadia, Florida to purchase the remaining fish.

Horse Creek Aquafarm, a commercial food farm, received 600 Atlantic sturgeon from LaPaz in February 2015. Unfortunately, several power outages resulted in mortalities and only 117 Atlantic sturgeon remain on the farm. The Horse Creek Aquafarm received a Division of Aquaculture certificate from the Florida Department of Agriculture and Consumer Services under the provisions of Addendum I to Amendment 1.

#### Endangered Species Act (ESA) Listing

##### *ESA Section 10 Incidental Take Permits*

Table 3 provides an overview of the status of ESA Section 10(a)(1)(b) Incidental Take Permits (ITPs) by state. The PRT recommends that states and jurisdictions coordinate with the ASMFC regarding the progress of ITP applications. For more information on the status of state ITPs, please consult the 2018 state compliance reports or contact the state's department directly.

##### *ESA Listing 5-Year Review and Recovery Plan*

NOAA Fisheries is developing a report with a 5-year review for each of the five distinct population segments of Atlantic sturgeon, a draft of which is expected in early 2019. The intent of the Review is to determine whether the species listing status should be changed (e.g., reclassified from endangered to threatened, or delisted). NOAA Fisheries will request members of the Commission's Atlantic Sturgeon Technical Committee to review the draft report. After publishing the final report, and if warranted, a separate rulemaking is required to make any changes to the species listing. The Recovery Plan is intended to identify measureable criteria which, when met, would result in a determination that the species be delisted. NOAA published a Recovery Plan Outline to provide interim strategies and goals for recovering the species, and further development of the Plan is expected once the 5-year review is completed.

#### **IV. 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, 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 1999, NMFS 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 exception. It is intended that each such addenda shall be developed by the Atlantic Sturgeon Plan Development Team (PDT), 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 and culture techniques, incorporation of shortnose sturgeon issues in Atlantic sturgeon research (and vice versa), stock identification, and habitat restoration.

## **V. Current State-by-State Implementation of FMP Compliance Requirements**

As described in *Sections 3.4* and *5.1.2* of Amendment 1, states and jurisdictions must report on monitoring programs and provide estimates of bycatch of Atlantic sturgeon in other fisheries under their jurisdiction. Reports on compliance are submitted by each jurisdiction, annually, by October 1, and are reviewed by the PRT. Compliance reports must cover the previous calendar year at a minimum and should include significant findings of the current year. Based on 2018 compliance reports, all states and jurisdictions met the requirements of Amendment 1 (and its four addenda) to the Atlantic sturgeon FMP in 2017. See Table 4 for a state-by-state summary of compliance in 2017.

## **VI. Research Needs**

The following research priorities and recommendations were identified through the 2017 benchmark stock assessment to support future stock assessments and interjurisdictional fisheries management for Atlantic sturgeon in state and federal waters (ASMFC 2017).

### **Future Research Priorities**

#### ***High***

- Identify spawning units along the Atlantic coast at the river or tributary and coastwide level.
- Expand and improve the genetic stock definitions of Atlantic sturgeon, including developing an updated genetic baseline sample collection at the coastwide, DPS, and river-specific level for Atlantic sturgeon, with the consideration of spawning season-specific data collection.
- Determine habitat use by life history stage including adult staging, spawning, and early juvenile residency.

- Expand the understanding of migratory ingress of spawning adults and egress of adults and juveniles along the coast.
- Identify Atlantic sturgeon spawning habit through the collection of eggs or larvae.
- Investigate the influence of warming water temperatures on Atlantic sturgeon, including the effects on movement, spawning, and survival.

### ***Moderate***

- Evaluate the effects of predation on Atlantic sturgeon by invasive species (e.g., blue and flathead catfishes).

## **Data Collection**

### ***High***

- Establish regional (river or DPS-specific) fishery-independent surveys to monitor Atlantic sturgeon abundance or expand existing regional surveys to include annual Atlantic sturgeon monitoring. Estimates of abundance should be for both spawning adults and early juveniles at age.
- Establish coastwide fishery-independent surveys to monitor Atlantic sturgeon mixed stock abundance or expand existing surveys to include annual Atlantic sturgeon monitoring.
- Continue to collect biological data, PIT tag information, and genetic samples from Atlantic sturgeon encountered on surveys that require it (e.g., NEAMAP). Consider including this level of data collection from surveys that do not require it.
- Encourage data sharing of acoustic tagged fish, particularly in underrepresented DPSs, and support programs that provide a data sharing platform such as The Atlantic Cooperative Telemetry Network. Data sharing would be accelerated if it was required or encouraged by funding agencies.
- Maintain and support current networks of acoustic receivers and acoustic tagging programs to improve the estimates of total mortality. Expand these programs in underrepresented DPSs.
- Collect DPS-specific age, growth, fecundity, and maturity information.
- Collect more information on regional vessel strike occurrences, including mortality estimates.
- Identify hot spots for vessel strikes and develop strategies to minimize impacts on Atlantic sturgeon.
- Monitor bycatch and bycatch mortality at the coastwide level, including international fisheries where appropriate (i.e., the Canadian weir fishery). Include data on fish size, health condition at capture, and number of fish captured.

## **Assessment Methodology**

### ***High***

- Establish recovery goals for Atlantic sturgeon to measure progress of and improvement in the population since the moratorium and ESA listing.

- Expand the acoustic tagging model to obtain abundance estimates and incorporate movement.

***Moderate***

- Evaluate methods of imputation to extend time series with missing values. ARIMA models were applied only to the contiguous years of surveys due to the sensitivity of model results to missing years observed during exploratory analyses.

**VII. Ongoing Research and Notable Comments Highlighted in 2018 Compliance Reports**

Several state and federal agencies, and academic institutions, are conducting research projects to further understand Atlantic sturgeon life history, genetics, behavior, and aquaculture. States and jurisdictions are encouraged to include such information in annual compliance reports. Accordingly, please see the 2018 state-specific compliance reports for details regarding ongoing research and other notable comments (ASMFC 2018a).

**VIII. Recommendations of Plan Review Team**

There are no new recommendations this year from the PRT. The following recommendations are the same as in past reports. The PRT recommends that states continue to coordinate with the ASMFC regarding the progress of incidental take permits under Section 10 of the ESA. The PRT also stresses the importance of mandatory reporting and/or observer coverage to effectively monitor Atlantic sturgeon bycatch in state fisheries.

## IX. Work Cited

- American Fisheries Society Symposium 56. 2007. Anadromous Sturgeons: Habitats, Threats, and Management. 420 pp. ISBN-13: 978-1-888569-91-9
- Atlantic States Marine Fisheries Commission (ASMFC). 2018a. Atlantic Sturgeon State Compliance Reports.
- ASMFC. 2017. Atlantic Sturgeon Benchmark Stock Assessment and Peer Review Report. Arlington, VA. National Oceanic and Atmospheric Administration Award No. NA15NMF4740069. p. 456
- ASMFC. 2013. Research Priorities and Recommendations to Support Interjurisdictional Fisheries Management. Special Report #89. Arlington, VA. p. 58
- ASMFC. 2006. Addendum III to Amendment 1 of the Interstate Fishery Management Plan for Atlantic Sturgeon. Fishery Management Report No. 31d. Washington, DC. p. 10
- ASMFC. 2005. Addendum II to Amendment 1 of the Interstate Fishery Management Plan for Atlantic Sturgeon. Fishery Management Report No. 31c. Washington, DC. p. 9
- ASMFC. 1998a. Amendment 1 to the Interstate Fishery Management Plan for Atlantic Sturgeon. Fishery Management Report No. 31. Washington, DC. p. 59
- ASMFC. 1998b. Atlantic Sturgeon Stock Assessment Peer Review. Washington D.C. National Oceanic and Atmospheric Administration Award No. NA87FGO 025. p. 33
- Environmental Research and Consulting, Inc. 2016. Report of Sturgeon Monitoring and Protection During Rock Removal for the Delaware River Main Channel Deepening Project, December 2015 – March 2015. Prepared for Great Lakes Dredge and Dock Co., LLC. April 26, 2016. p.56
- Melnychuk, M.C., K.J. Dunton, A.J. Jordaan, K.A. McKown, and M.G. Frisk. 2016. Informing conservation strategies for the endangered Atlantic sturgeon using acoustic telemetry and multi-state mark-recapture models. *Journal of Applied Ecology* doi:10.1111/1365-2664.12799.
- National Marine Fisheries Service: Status review of the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*). p.133.
- National Oceanic and Atmospheric Administration. 2007. National Marine Fisheries Service: Status review of the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*). p.188

**Table 1.** Stock status determination for the coastwide stock and DPSs based on mortality estimates and biomass/abundance status relative to historic levels, and the terminal year (i.e., the last year of available data) of indices relative to the start of the moratorium as determined by the ARIMA analysis. \*For indices that started after 1998, the first year of the index was used as the reference value. Source: ASMFC 2017.

| Population     | Mortality Status                       | Biomass/Abundance Status      |   |
|----------------|--|-------------------------------|---|
|                | Probability that $Z > Z_{50\%EPR}$ 80% | Relative to Historical Levels | Average probability of terminal year of indices > 1998* value |
| Coastwide      | 7%                                     | Depleted                      | 95%   |
| Gulf of Maine  | 74%                                    | Depleted                      | 51%   |
| New York Bight | 31%                                    | Depleted                      | 75%   |
| Chesapeake Bay | 30%                                    | Depleted                      | 36%   |
| Carolina       | 75%                                    | Depleted                      | 67%   |
| South Atlantic | 40%                                    | Depleted                      | Unknown (no suitable indices)                                 |

**Table 2. Atlantic sturgeon takes (number of fish) reported from fishery-independent data sources, 2016-2017.** Source: 2017 and 2018 ASMFC state compliance reports for Atlantic sturgeon.

| State    | Location               | Method                | Type of Survey or Research         | Data Source        | 2016 | 2017  | Comments   |
|----------|------------------------|-----------------------|------------------------------------|--------------------|------|-------|--|
| ME       | ocean                  | trawl                 | Groundfish                         | ME/NH joint survey | 1    | 0     | 61 captured from 2000-2017   |
| NH       | Estuarine              | NA                    | Acoustic Telemetry                 | USGS               | 1    | 14    | No known reproducing populations within NH waters.   |
| MA       | ocean                  | trawl                 | -                                  | DMF                | 0    | 0     | No known reproducing populations within MA waters.   |
| RI       | RI Sound               | trawl                 | Coastal Trawl Survey               | RI DFW             | 0    | 0     | Only 3 Atlantic Sturgeon since 1979 (1997, 2005, and 2014).  |
| CT       | Connecticut River      | unspecified           | Research                           | CT DEP             | 133  | 262   | Directed research; efforts and methods highly variable over time and should not be used as an index of abundance |
|          | Long Island Sound      | trawl                 | Survey                             | CT DEP             | 12   | 1     | Multi-species survey; unreliable for abundance trends  |
| NY       | Hudson R. Estuary      | anchored gillnet      | Atlantic sturgeon Survey           | NYSDEC-USFWS       | 362  | 336   | Juveniles and sub-adults; juvenile abundance sampling  |
| NJ       | Coastal ocean          | trawl                 | -                                  | NJ DEP-DFW         | 13   | 20    | Sandy Hook to Cape May; 0.17 mean tow per haul   |
|          | Delaware Bay           | gillnet               | Striped Bass & American Shad       | NJ DEP-DFW         | 2    | 0     | Striped bass tagging program   |
|          | State waters           | unspecified           | Voluntary reporting                | NJ DEP-DFW         | 21   | 15    | Online volunteer reporting for sturgeon interactions   |
| NJ/PA/DE | Delaware River         | Trawl                 | DRMCD Project.                     | ERC/USACE          | 575  | 1,889 | All sturgeon were relocated upriver of blasting area; two mortalities in 2016, zero in 2017.                     |
| DE       | Delaware River         | ship strike           | -                                  | DE DFW-Reporting   | 9    | 12    | Collaboration with DSU. Includes fish reported in PA's portion of Delaware Estuary.                              |
|          | Delaware River         | trawl                 | Juvenile abundance                 | DE DFW             | 3    | 8     | Two otter trawl surveys; large (30') and small (16')   |
|          | Delaware River and Bay | gill and trammel nets | Juvenile abundance                 | DE DFW             | 7    | 139   | 2"-3" mesh monofilament gillnets used; targeting early stage juveniles (age 0-2)                                 |
| MD       | Chesapeake Bay         | gill net              | Striped Bass spawning stock survey | MD DNR             | 1    | 0     |  |
|          | Nanticoke River System | gill net              | Adult Atlantic Sturgeon Tagging    | MD DNR             | 5    | 13    | Four of the 13 fish were new captures, 9 were recaptures.  |

**Table 2 continued.**

| State | Location                                     | Method              | Type of Survey or Research         | Data Source | 2016 | 2017 | Comments  |
|-------|--|---------------------|------------------------------------|-------------|------|------|---|
| VA    | Chesapeake Bay                               | trawl               | Juvenile fish and Blue Crab survey | VIMS        | 1    | 2    |   |
|       | James River                                  | gillnet             | Adult Atlantic Sturgeon Tagging    | VCU         | 52   | 180  |   |
|       | James, York & Rapp. Rivers                   | anchored gillnet    | American Shad monitoring           | VIMS        | 2    | 1    | Majority captured in the James River.                 |
| NC    | Albemarle Sound                              | gillnet             | Survey                             | NCDMF       | 124  | 173  | Mortalities: nine in 2016, 18 in 2017.                |
|       | Pamlico Sound and River, Pungo, Neuse Rivers | gillnet             | Survey                             | NCDMF       | 10   | 2    | Mortalities: two mortalities in 2016, zero in 2017.   |
|       | Cape Fear and New Rivers                     | gillnet             | Survey                             | NCDMF       | 5    | 3    | Mortalities: no mortalities in 2016 or 2017.          |
| SC    | Edisto River System                          | unspecified         | Juvenile Atlantic Sturgeon         | SCDNR       | 133  | 271  | 2017: 43 recaptures, 12 nominal age-1 fish.           |
|       | Freshwater and estuarine rivers              | gillnet             | Shortnose Sturgeon                 | SCDNR       | 117  | 182  | Freshwater Fisheries Section; designed for Shortnose. |
| GA    | Altamaha River                               | drift gillnet       | Adult shad                         | GADNR-WRD   | 0    | 0    | All measured and released alive.                      |
|       | ocean  | trawl               | Commercial crustaceans             | GADNR-CRD   | 10   | 3    | Released alive.                                       |
|       | Altamaha & Wassaw Sound                      | trammel & gill nets | Spotted Sea Trout & Red Drum       | GADNR-CRD   | 0    | 0    | Entanglement gear surveys.                            |
|       | Ogeechee, Satilla, and Altamaha              | trammel & gill nets | Research                           | UGA         | 580  | 432  |   |
|       | Savannah River                               | trammel & gill nets | Juvenile Sturgeon                  | UGA         | 501  | 409  | May-August, fresh/saltwater interface.                |
|       | St Mary's River                              | trammel & gill nets | Research                           | UGA         | 5    | 0    |   |
| FL    | St. John's River                             | gill net            | -                                  | FL FWC      | 0    | 0    |   |

**Table 3.** Status of Endangered Species Act Section 10(a)(1)(B) Incidental Take Permits (ITP) for Atlantic sturgeon by state. Source: Atlantic Sturgeon Board Administrative Commissioners and members of the Atlantic Sturgeon Technical Committee. N/A = not applicable.

| State | Status of ITP | Gear/Fishery                    | Status Rationale  |
|-------|---------------|---------------------------------|---|
| ME    | N/A           | N/A                             | Little to no interaction with Atlantic sturgeon in state fisheries.   |
| NH    | N/A           | N/A                             | One fishery interaction with Atlantic sturgeon since 1980s.   |
| MA    | N/A           | N/A                             | No problems with Atlantic sturgeon bycatch in state water fisheries.  |
| RI    | Developing    | Trawl, Gill Net                 | Joint ITP for sturgeon, sea turtles and whales. Analysis regarding spatio-temporal sturgeon distribution and bycatch estimates are being explored.  |
| CT    | N/A           | N/A                             | Atlantic sturgeon interactions reduced via implementation of gear restricted areas for otter trawls and sink gill net fisheries. Plans for an ITP are on hold given staffing levels and budgetary considerations. |
| NY    | Developing    | Trawl, Gill Net                 | Provided funding to expand observer coverage through NOAA and NEFOP for state-only permit holders to improve bycatch data.  |
| NJ    | Developing    |                                 | Applying for a renewal of the previous ITP. Will submit a final draft of Section 10 Plan once successfully calculate bycatch estimates.   |
| PA    | N/A           | N/A                             | No interactions with Atlantic sturgeon in state water fisheries.  |
| DE    | Developing    | Gill Net                        | Draft Atlantic sturgeon ITP is undergoing internal review.  |
| MD    | N/A           | Gill Net, Pound Net, Fyke, Pots | Working on a conservation plan for various fisheries, but have insufficient data and resources to complete an ITP application in the near-term.   |
| DC    | N/A           | N/A                             | No Atlantic sturgeon sightings in DC waters in over 30 years.   |
| PRFC  | N/A           | N/A                             |   |
| VA    | Pending       | Gill Net                        | Joint ITP for Atlantic sturgeon and sea turtles and including the implementation of an observer program to improve Atlantic sturgeon bycatch estimates.   |
| NC    | Received      | Anchored Gill Net               | 10-year permit expiring July 2024.  |
| SC    | Pending       | Shad Fishery                    | Application includes bycatch data demonstrating that changes in the shad fishery have reduced sturgeon bycatch.   |
| GA    | Received      | Shad Fishery                    |   |
| FL    | N/A           | N/A                             |   |



**Table 4. State-by-State compliance, 2017.** Note: C = In Compliance, P = Partial, N = Not in Compliance/No Report Submitted, NA = Not Applicable.

| State | Bycatch Monitoring <sup>1</sup> | Monitoring Results <sup>2</sup> | Habitat Status <sup>3</sup> | Aquaculture Operations <sup>4</sup> | Moratorium on Harvest and Possession <sup>5</sup> |
|-------|---------------------------------|---------------------------------|-----------------------------|-------------------------------------|---|
| ME    | C                               | C                               | NA                          | NA                                  | C   |
| NH    | C                               | NA                              | C                           | NA                                  | C   |
| MA    | C                               | C                               | C                           | NA                                  | C   |
| RI    | C                               | C                               | C                           | NA                                  | C   |
| CT    | C                               | C                               | C                           | NA                                  | C   |
| NY    | C                               | C                               | C                           | NA                                  | C   |
| NJ    | C                               | C                               | NA                          | NA                                  | C   |
| PA    | C                               | C                               | NA                          | NA                                  | C   |
| DE    | C                               | C                               | C                           | NA                                  | C   |
| MD    | C                               | C                               | C                           | C                                   | C   |
| PRFC  | C                               | NA                              | C                           | NA                                  | C   |
| DC    | NA                              | NA                              | NA                          | NA                                  | C   |
| VA    | C                               | C                               | NA                          | NA                                  | C   |
| NC    | C                               | C                               | C                           | NA                                  | C   |
| SC    | C                               | C                               | C                           | NA                                  | C   |
| GA    | C                               | C                               | C                           | NA                                  | C   |
| FL    | C                               | C                               | NA                          | C                                   | C   |

<sup>1</sup>**REQUIRED** Bycatch Monitoring may be implemented via law enforcement observations, FI surveys, ACCSP and/or at-sea observer programs.

<sup>2</sup>**RECOMMENDED** Monitoring Results should include: (a) details of how juvenile abundance survey will be performed (recommended every 5 years), (b) calculated CPUE estimates of juveniles, (c) reports on tag and release programs, and (d) assessment of spawning stock status including examination of sex ratio, size, and age structure by sex of the larger sub-adults and adults.

<sup>3</sup>**RECOMMENDED** Habitat Monitoring reports should include: (a) assessment of sturgeon habitats of particular concern, (b) restoration programs, and (c) FERC relicensing evaluations.

<sup>4</sup>**RECOMMENDED** Aquaculture 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, and (f) monitoring effectiveness of restoration programs.

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

<sup>5</sup>**REQUIRED** State moratorium on the harvest and possession of Atlantic sturgeon currently applies throughout ASMFC jurisdiction.