

Research Priorities and Recommendations to Support Interjurisdictional Fisheries Management

ATLANTIC STURGEON

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Benchmark Assessment Recommendations (TC/SAS)

Research recommendations have been categorized as future research, data collection, and assessment methodology and ranked as high or moderate priority. Recommendations with asterisks (**) indicate improvements that should be made before initiating another benchmark stock assessment.

Future Research

High Priority

- 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.
- Develop standardized methods that can be used to create reliable indices of abundance for adults and young juveniles (Age 1) to reflect the status of individual DPSs
 - The Review Panel recommended a workshop to assess the efficacy of existing 'sturgeon surveys' (e.g., those presently conducted in NY, SC) and new approaches

Moderate Priority

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

Data Collection

High Priority

- **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. See Table 8 in the Assessment Report for a list of surveys considered by the SAS.

- ****Establish coastwide fishery-independent surveys to monitor Atlantic sturgeon mixed stock abundance or expand existing surveys to include annual Atlantic sturgeon monitoring. See Table 8 in the Assessment Report for a list of surveys considered by the SAS.**
- ****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 Priority

- ****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 Priority

- 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.

Peer Review Recommendations (Review Panel)

In general, the Review Panel agrees with the research recommendations and priorities developed by the Atlantic sturgeon Technical Committee (see Assessment Report, Section 8, pp. 107-109). Currently there are severe data limitations restricting the type, scope, and usefulness of assessment methodologies that can be applied to Atlantic sturgeon. Most importantly, there is an incomplete accounting for temporal and spatial variability in life-history parameters, an imperfect understanding of the temporal and spatial organization of reproductively discrete spawning populations, and major uncertainties in the scope for direct harm arising from interaction with ongoing human activities (e.g., bycatch, ship strikes) to the

recovery of Atlantic sturgeon. To assist in identifying areas with significant data gaps, the Review Panel created a data gaps table (Table 3 in the Peer Review Report) based on the current Atlantic sturgeon assessment report.

The Review Panel provides the following suggested changes to existing research priorities, as well as a set of new research recommendations that are critical to advancing Atlantic sturgeon science, modeling, and future stock assessments.

Future Research

High Priority

- Develop standardized methods that can be used to create reliable indices of abundance for adults and young juveniles (Age 1) to reflect the status of individual DPSs
 - A workshop is recommended to assess the efficacy of existing ‘sturgeon surveys’ (e.g., those presently conducted in NY, SC) and new approaches
- Expand and improve the genetic stock definitions of Atlantic sturgeon, including the continued development of genetic baselines that can be applied coastwide, within- and among-DPS’s, and at the river-specific level. Consideration of spawning season-specific data collection will be required. Particular emphasis should be placed on collecting additional information from the Gulf of Maine and Carolina DPSs (Table 3).

Moderate Priority

- Determine a permitting process to enable authorizations to sample and collect biological materials from any dead Atlantic sturgeon encountered
 - Pectoral fin spines to support age determination are considered to be of high value
 - Additional materials could include gonad tissues to support development of maturation schedules for males and females and fecundity
- Evaluate potential reference point targets and their efficacy for Atlantic sturgeon. Options include (but are not limited too):
 - number of fish in spawning runs
 - number of rivers with sturgeon presence/absence (by DPS and coastwide)
 - frequency of catch in indices and/or observer sampling
 - evaluate rivers where you don’t have sturgeon, setting minimum bar
- Determine freshwater, estuarine, and ocean habitat use by life history stage including adult staging, spawning, small and large juvenile residency, and larvae
- Identify spawning units, using appropriate techniques (genetics, tagging, eDNA, collections of eggs or larvae, etc.), along the Atlantic coast that best characterize the meta-population structure of U.S. Atlantic sturgeon
 - Recent search efforts both in previously un-sampled rivers/tributaries and rivers thought to have lost their native populations have revealed evidence of spawning activity that results in the production of young juveniles. Such instances require particular attention to determine whether they are the result of reproduction by self-sustaining populations

- Investigate the influence of warming water temperatures on Atlantic sturgeon, including the effects on movement, spawning, and survival

Low Priority

- Evaluate incidence of and the effects of predation on Atlantic sturgeon

Data Collection

High Priority

- Establish centralized data management and data sharing protocols and policies to promote greater use of all available Atlantic sturgeon data. Priority data sets include (but are not limited to):
 - genetics/tissue samples
 - pectoral fin spines and associated age estimates
 - acoustic tagging and hydrophone metadata
 - external and PIT tag data

Emphasis should be placed on extracting all available data in underrepresented DPSs. Concurrently, continue to support programs that provide data sharing platforms such as the Atlantic Cooperative Telemetry Network. These initiatives will benefit from the support of federal funding agencies enforcing the requirement to make data collected via federal funds part of the public record within a reasonable period of time. If not a current requirement of funded Atlantic sturgeon research, this should become a requirement.

- Implement directed monitoring of Atlantic sturgeon that is designed to support assessments both coastwide and at the DPS level and/or expand existing regional surveys to include annual Atlantic sturgeon monitoring. Monitoring two or more reproductively discrete populations within each recognized DPS is suggested. Use of emergent technologies such as validated side scan sonar surveys and acoustic tracking may allow for more cost effective monitoring of river runs.
 - Monitoring protocols that enable data gathering for a number of species (e.g., Shortnose sturgeon) is encouraged
 - Development of adult, YOY (or Age 1), and juvenile indices are a high priority, and considerations should be made for the use of appropriate survey gears
 - Associated length and age composition information is needed so that relative abundance-at-age information can be obtained from the adult and juvenile indices
 - See Table 8 in the assessment report for a list of surveys considered by the SAS during the assessment
 - See Table 3 of the review report to see current data gaps identified by the Review Panel
- 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. Push

permitting agencies to allow sampling (to the extent possible) of all encountered Atlantic sturgeon via scientific research activities.

- 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, using a power analysis to define direction and magnitude of expansion, as required to support next assessment.
- Collect sub-population specific (river, tributary, or DPS level) life history information (e.g., age, growth, fecundity, maturity, spawning frequency). Where feasible, emphasis should be on collecting information by sex and for reproductive information by size/age. Particular focus should be on collecting information on Atlantic sturgeon from the South Atlantic DPS given less data and suspected regional life history differences (see Table 3).
- Improve monitoring of bycatch in other fisheries, gears, and locations (notably northern and southern range). When scaling up to unobserved trips, need better data/measures of effective effort that can be reasonably expected to encounter Atlantic sturgeon. This may include collection of more detailed information on type of gear deployed, locations of deployment, etc. To assess the potential for currently missing significant sources of Atlantic sturgeon bycatch, do a simple query of all observed fisheries to see if Atlantic sturgeon are encountered in other gears beyond gillnet and trawl (e.g., scallop dredges)
- Investigate and account for extra-jurisdictional sources of mortality. Include data on fish size, health condition, and number of fish affected.

Moderate Priority

- 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.
- Promote greater Canadian-US Atlantic sturgeon data sharing, cooperative research, and monitoring. Exploring interactions between Canadian and US Atlantic sturgeon may more fully explain mortality trends, particularly with regards to the Gulf of Maine DPS.

Assessment Methodology

High Priority

- Establish recovery goals and risk tolerance for Atlantic sturgeon to measure progress of and improvement in the population since the moratorium and ESA listing
- Expand the acoustic tagging model to incorporate movement
- Conduct a power analysis to determine sufficient acoustic tagging sampling sizes by DPS

Moderate Priority

- 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.
- Explore feasibility of combining telemetry tagging and sonar/acoustics monitoring to generate abundance estimate