



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

Supplemental Environmental Assessment (SEA)

On the Issuance of a Modified Scientific Research Permit (File No. 16482-01) to the Warnell School of Forest Resources, Fisheries Division, to Conduct Scientific Research on Endangered Shortnose and Atlantic sturgeon in Georgia and Florida Waters.

[April 2014]

A Supplement to the 2012 EA entitled “*Environmental Assessment for the Issuance of 12 Scientific Research Permits for Research on Atlantic Sturgeon*”

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Abstract: In response to the receipt of an application for a permit modification from Warnell School of Forest Resources, Fisheries Division [hereinafter, Permit Holder, and Douglas Peterson, PhD, Responsible Party (RP)/Principal Investigator (PI)], University of Georgia, Athens, Georgia 30602], NMFS, Office of Protected Resources (PR) proposes to modify Permit No. 16482 to include additional “takes” of shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) pursuant to the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.).

The permit holder proposes to continue studying the population dynamics and seasonal habitat use of Atlantic sturgeon in the rivers and estuaries as currently authorized in Permit 16482 in the Savannah (GA/SC), Ogeechee (GA), Altamaha (GA), Satilla (GA), and Saint Marys Rivers (GA/FL). The Permit Holder is authorized to capture Atlantic sturgeon with gill nets and trammel nets and also measure, weigh, genetic tissue sample, PIT tag and Floy tag, acoustic tag, laparoscope, biopsy, anesthetize, gastric lavage, fin ray clip, acoustic tag and to collect early life stages. However, the permit holder now proposes to combine takes of shortnose sturgeon, which were previously authorized under separate permits while fishing concurrently for Atlantic sturgeon. One existing shortnose sturgeon permit in Georgia waters would be terminated when the modification is issued, while other expired shortnose sturgeon permits would be reapplied for as previously authorized. The permit holder also requests taking 100 blood samples from both species captured from the Altamaha River. Further, the modification expands the project area to include northeast Florida’s Nassau and St. Johns rivers and adjoining waterways, as well as to authorize the take of shortnose and Atlantic sturgeon. The modification would be valid through the expiration date of the original permit on April 5, 2017.



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CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 DESCRIPTION OF ACTION

The National Marine Fisheries Service (NMFS), Office of Protected Resources (NMFS PR) proposes to issue Permit Modification No. 16482-01 to the Warnell School of Forest Resources, Fisheries Division [hereinafter, Permit Holder, and Douglas Peterson, PhD, Responsible Party (RP)/Principal Investigator (PI)], University of Georgia, Athens, Georgia 30602, to consolidate new “takes” of shortnose and Atlantic sturgeon under Section 10(a)(1)(A) of the Endangered Species Act (ESA) of 1973 as amended (16 U.S.C. 1531 *et seq.*), and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR 222-226). This modification would be valid through April 5, 2017.

1.1.1. BACKGROUND:

In response to the receipt of an application (File No. 16482-01) to modify the existing scientific research permit from the Warnell School of Forest Resources, Fisheries Division, NMFS PR proposes to issue the proposed permit modification. The modification would consolidate all the researcher’s shortnose sturgeon and Atlantic sturgeon research in Georgia waters, as well as providing for some additional takes of shortnose and Atlantic sturgeon in Georgia and Florida waters to meet further scientific research objectives. Once the modification is issued, the shortnose sturgeon Permit No. 14394 (Altamaha River, GA) would be terminated.

This analysis facilitates a cumulative assessment of the potential impacts added from the proposed modifications on the human environment, including both of the targeted endangered species. This SEA supplements the 2012 EA (NMFS 2012a) entitled “*Environmental Assessment for the Issuance of 12 Scientific Research Permits for Research on Atlantic Sturgeon.*”

1.1.2 PURPOSE AND NEED:

The primary purpose of the permit modification would be to provide an exemption from the ESA prohibitions allowing for the proposed changes in the amendment for “takes” of endangered species in the amendment for bona fide scientific research. The need for issuance of the permit is related to NMFS’s mandates under the ESA, specifically, the responsibility to protect, conserve, and recover threatened and endangered species under its jurisdiction. The ESA prohibits takes of threatened and endangered species with only a few very specific exceptions, including for scientific research and enhancement purposes. Permit issuance criteria require research activities are consistent with the purposes and policies of this federal law and will not have a significant adverse impact on the species. NMFS reviewed the proposed action to ensure all the proposed activities fulfill these permit issuance criteria.

1.1.3 OBJECTIVES OF THE RESEARCH:

The main objectives of the proposed modification are identical to those of the original individual permit, which, when issued, would continue to update information on the abundance, population dynamics, seasonal movements, diet, general ecology, and

environmental tolerance of both Atlantic sturgeon and shortnose sturgeon in the Savannah, Ogeechee, Altamaha, Satilla, and Saint Marys Rivers in Georgia waters, and in the Nassau and Saint Johns Rivers in Florida waters, to facilitate recovery of both species.

1.2 OTHER EAs/EISs INFLUENCING THE SCOPE OF THIS SEA

A 2012 EA (NMFS 2012a) entitled “*Environmental Assessment for the Issuance of 12 Scientific Research Permits for Research on Atlantic Sturgeon.*” was prepared to evaluate the environmental impacts resulting from the issuance of 12 scientific research permits issued to researchers studying Atlantic sturgeon in East Coast rivers. The original Permit No. 16482 was one of these permits issued to the Warnell School of Forest Resources, Fisheries Division to study Atlantic sturgeon in Georgia Rivers. The environmental impacts in the proposed study were evaluated in the 2012 EA, including those resulting in the Savannah, Ogeechee, Altamaha, Satilla, and Saint Marys River in Georgia waters, and the Nassau and St. Johns Rivers in Florida waters. The EA resulted in a FONSI concluding that the issuance of each of the permits would not result in significant cumulative impacts to any portion of the human environment in the locations where permitted.

Other EAs produced for this applicant’s shortnose sturgeon research in the same proposed action area affect the scope of this EA. These include the EAs prepared supporting the applicant’s recently expired shortnose sturgeon Permit No. 10037 (NMFS 2008a) and Permit No. 10115 (NMFS 2008b) in the Ogeechee and Satilla-Saint Marys Rivers, respectively. A 2009 EA was also prepared for the issuance of currently active Permit No. 14394 (NMFS 2009) evaluating the environmental impacts of shortnose sturgeon research on the Altamaha River (Georgia). Each of these actions resulted in independent Findings of No Significant Impact (FONSI). These analyses influenced the scope of the current action, limiting our analyses to the effects on the target animals because as conditioned, the action shows no potential impacts on other parts of the environment.

1.3 SCOPING SUMMARY

The Council on Environmental Quality’s (CEQ) regulations implementing the National Environmental Policy Act of 1969 (NEPA; 40 CFR 1502.9) require supplemental analysis when (1) substantial changes in proposed action that are relevant to environmental concerns; or (2) there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. With respect to the proposed action, the modification proposes significant changes in the permitted authority to take shortnose and Atlantic sturgeon. Both species will be studied under one permit across state waters and additional takes are proposed in a larger action area.

Consultation under section 7 of the ESA is required because Section 7 of the ESA requires consultation with the appropriate federal agency (either NMFS or the U.S. Fish and Wildlife Service, (USFWS)) for federal actions that —may affect a listed species (USFWS 2009) or adversely modify critical habitat. NMFS’ issuance of the current permit modification is a federal action subject to these section 7 consultation requirements.

In identifying public concerns as a part of the scope of this federal action, a Notice of Receipt of the application was published in the *Federal Register*, announcing the availability of the

permit modification and related documents for public comment (File Nos. 16482-01; November 7, 2013; 78 FR 66901). However, no comments were received from the public regarding this application. Comments from NMFS Southeast Regional Office were also solicited and appropriately addressed in the decision memos.

1.4 APPLICABLE LAWS AND NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

This applicable laws and necessary federal permits, licenses and entitlements have not changed from those described for the Permit Holder's permits in File 16482 in the 2012 EA (NMFS 2012a), and in the File Nos. 10037 (NMFS 2008a), 14394 (NMFS 2009) and 10115 (NMFS 2008b) in the Ogeechee, Altamaha and Satilla-Saint Marys Rivers, respectively. Applicable laws in this SEA include those for NEPA, ESA, and MMPA, and as applied in consultation with other appropriate federal and state agencies.

CHAPTER 2: ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. ALTERNATIVE 1 – NO ACTION ALTERNATIVE

Under the No Action alternative., the existing permit would remain in effect through expiration, allowing research to continue as originally authorized. Permit No. 16482 currently authorizes the Permit Holder to capture Atlantic sturgeon life stages in the Savannah, Ogeechee, Altamaha, Satilla, and Saint Marys Rivers in Georgia waters using gill nets and trammel nets, to then be measured, weighed, photographed, PIT and Floy tagged, tissue sampled; subsets would be anesthetized, fin ray sectioned, undergo laparoscopy, and implanted with an internal acoustic tag. The applicant also is permitted to lethally sample early life stages (ELS) in suspected spawning areas using egg mats. This research takes place concurrently with the Permit Holder's authorized shortnose sturgeon research in the Altamaha River in current Permit No. 14394. (See Table 1 for a summary of currently authorized take of listed sturgeon in the action area).

2.2 ALTERNATIVE 2 – PROPOSED ACTION

Under the Proposed Action alternative, the permit modification No. 16482-01 would be issued, exempting the applicant from ESA take prohibitions during conduct of the current and newly proposed research activities, respectively, on Atlantic sturgeon and shortnose sturgeon in the Savannah, Ogeechee, Altamaha, Satilla, and Saint Marys Rivers in Georgia waters, and in the Nassau and St. Johns River in Florida waters (See Section 2.2.1.2. and Appendix 1, Table 1 for a description of the proposed take in the modification). The permit would be valid until April 5, 2017, and would contain identical terms and conditions issued by NMFS in the original action.

2.2.1. DESCRIPTION OF THE PROPOSED ACTION

2.2.1.1. BOUNDARIES OF ACTION AREA:

The action area is defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The action area includes the areas where fish would be sampled as well as the areas transited by project vessels.

Concurrent sampling of Atlantic and shortnose sturgeon with gill and trammel nets would occur in each of the rivers in the action area. In the Savannah River, netting would take place from the mouth to the Augusta diversion dam. Sampling in the Ogeechee River would occur from the mouth to river mile 150, as well as on the Canoochee River, a tributary of the Ogeechee River, from its confluence with the Ogeechee to river mile 50. Sampling would occur in the entire length of Altamaha River (to river mile 215) and its tributaries, the Oconee River (from the confluence to the Sinclair Dam) and in the Ocmulgee River. The Satilla River would be sampled along its entire length from the mouth upstream to river mile 150. Sampling in the St Marys River would take place from Kings Bay at the mouth to river mile 125. New sampling, the subject of the consultation, is also requested in the Nassau River from the mouth to river mile 40 and St. Johns Rivers to Palatka at Highway 100 bridge; and also the interconnecting waterways (See map of action area provided below). (See map of action area online highlighting locational limits of research at the following link. <https://maps.google.com/maps/ms?msid=208477877533156509610.0004eb10d85582dca68cf&msa=0&ll=31.17286,-82.482605&spn=1.811781,3.56781>

2.2.1.2. PROPOSED TAKE

➤ **Proposed Takes in the Permit Modification No. 16482-01:** The Permit Holder's modification proposes four separate actions affecting the environment differently: (1) Consolidating currently authorized take of shortnose and Atlantic sturgeon permitted for concurrent Atlantic and shortnose sturgeon sampling in the Altamaha River (GA) and subsequently terminating the Permit Holder's Permit No. 14394, authorizing shortnose sturgeon permit in the Altamaha River; (2) Adding a new procedure authorizing blood sampling on Atlantic and shortnose sturgeon captured in the Altamaha River; (3) Adding newly proposed takes of shortnose sturgeon with that already authorized for Atlantic sturgeon in Permit No. 16482 in the Savannah River (GA/SC); Ogeechee River (GA); Satilla River (GA); and Saint Marys River (GA/FL); and (4) Adding concurrent sampling of shortnose and Atlantic sturgeon in an expanded action area including two new river systems in the Nassau and St. Johns Rivers (FL) and adjoining waters. (See also Table 1 below for a summary of proposed take of listed sturgeon in the modification).

• **Summary of the Proposed Take in Permit Modification No. 16482-01:**

Savannah River (GA/SC): (Note: Take of Shortnose sturgeon in the Savannah River is newly proposed by the Permit Holder. No new takes of Atlantic sturgeon is proposed):
Shortnose Sturgeon Takes

- 20 adult/juveniles (capture/handle/release for biotelemetry) — anesthetize, internal acoustic transmitter, laparoscopic sex determination, PIT tag, measure, weigh, tissue sample from dorsal fin clip, and photograph.
- 200 adult/juveniles/year (capture/handle/release for population estimates) — PIT tag, measure, weigh, tissue sample from dorsal fin clip, and photograph.
- 50 adult/juveniles year (capture/handle/release for age estimates) — fin spine, PIT tagging, measure, weigh, tissue sample from dorsal fin clip, and photograph.
- 50 Eggs/Larvae/year (sample early life stages to confirm spawning incidence).

Ogeechee River (GA): *(Note: Take of Shortnose sturgeon in the Ogeechee River is newly proposed by the Permit Holder): The prior shortnose sturgeon permit in the Ogeechee River was Permit No. 10037 which expired on April 30, 2013. The proposed take in the current action is more conservative than the prior permit where a total of 150 shortnose sturgeon were previously authorized to be captured and 15 of telemetry tagged. There were also 40 early life stages authorized to be taken and lethally preserved in the prior permit).*

Shortnose Sturgeon Takes

- 10/year adult/juveniles/year (capture/handle/release for biotelemetry) – anesthetize, internal acoustic tags, laparoscopic sex determination, PIT tag, measure, weigh, genetic tissue sample, and photograph.
- 100 adult/juveniles/year (capture/handle/release for population estimates) – PIT tag, measure, weigh, genetic tissue sample, and photograph.
- 50 Eggs/Larvae/year (sample early life stages with egg mats and/or D-nets to confirm spawning incidence).

Altamaha River (GA):

Shortnose Sturgeon Takes: *(The proposed take activities by the Permit Holder of shortnose sturgeon in the Altamaha River is similar to his current Permit No. 14394, with exception of adding blood sampling requested on 100 animals in one year. Upon issuance of Permit Modification 16482-01, Permit 14394 would be revoked):*

- 10/year adult/juveniles/year (capture/handle/release for biotelemetry) – anesthetize, internal acoustic tags, laparoscopic sex determination, PIT tag, measure, weigh, genetic tissue sample, and photograph.
- 290 adult/juveniles/year (capture/handle/release for population estimates) – PIT tag, measure, weigh, genetic tissue sample, and photograph.
- 100 adult/juveniles /1-yr (capture/handle/release for hormone sex determination) – PIT tag, measure, weigh, blood sample, genetic tissue sample, and photograph.
- 50 adult/juvenile/year (capture/handle/release for age analysis) – fin spine, PIT tagging, measure, weigh, genetic tissue sample, and photograph.
- 20 adult/juvenile/year (capture/handle/release for diet study)– gastric lavage, PIT tagging, measure, weigh, genetic tissue sample, and photograph.
- 50 Eggs/Larvae/year – (sample early life stages with egg mats and/or D-nets to confirm spawning incidence).

Atlantic Sturgeon Takes: *This procedure is an additional procedure requested by the Permit Holder; but the total number authorized captured would not be changed).*

- 100 adult/juveniles /1- yr (capture/handle/release for blood hormone sex determination) – PIT tag, measure, weigh, blood sample, genetic tissue sample, and photograph. (Note: The total Atlantic sturgeon captured would not exceed the numbers currently authorized in Permit 16482.)

Satilla River (GA) and Saint Marys River (GA/FL):

(Note: Take of Shortnose sturgeon in the Satilla and St Marys Rivers are newly proposed): The Permit Holder's prior shortnose sturgeon permit in these rivers was Permit No. 10115, which expired on August 31, 2013. The proposed take in the current modification is more conservative than Permit No. 10115 where a total of 85 fish were authorized annually captured from both the Satilla and Saint Marys Rivers. There were also 40 early life stages authorized to be sampled and lethally preserved from each river in Permit 10115.)

- 10/year adult/juveniles/year (capture/handle/release for biotelemetry) – anesthetize, internal acoustic tags, laparoscopic sex determination, PIT tag, measure, weigh, genetic tissue sample, and photograph.
- 20 adult/juveniles/year (capture/handle/release for documenting presence/absence of shortnose sturgeon)—PIT tag, measure, weigh, genetic tissue sample, and photograph.
- 50 Eggs/Larvae/year (sample early life stages with egg mats and/or D-nets to confirm spawning incidence).

St. Johns & Nassau River, (FL): *(Note: Shortnose sturgeon and Atlantic sturgeon research would be conducted in a new action area in both the Nassau and St. Johns River):*
Shortnose Sturgeon Takes (in each river system)

- 10 adult/juveniles/year (capture/handle/release for biotelemetry of shortnose sturgeon) – anesthetize, internal acoustic tags, laparoscopic sex determination, PIT tag, measure, weigh, genetic tissue sample, and photograph.
- 20 adult/juveniles/year (capture/handle/release for documenting presence/absence of shortnose sturgeon) – PIT tag, measure, weigh, genetic tissue sample, and photograph.
- 50 Eggs/Larvae/year (sample early life stages with egg mats and/or D-nets to confirm spawning incidence).

Atlantic Sturgeon Takes (in each river system)

- 10 adult/sub-adults/year (capture/handle/release for biotelemetry) – anesthetize, internal acoustic tags, laparoscopic sex determination, PIT tag, measure, weigh, genetic tissue sample, and photograph.
- 20 adult/sub-adults/year (capture/handle/release for documenting presence/absence) – PIT tag, measure, weigh, genetic tissue sample, and photograph.
- 50 Eggs/Larvae/year (sample early life stages with egg mats and/or D-nets to confirm spawning incidence).

All GA & FL Rivers Combined (Note: unintentional mortality due to research impacts)
Shortnose Sturgeon Incidental Lethal Takes:

- 2 Adults and juvenile/year requested for all rivers combined annually.

Table 1. Current and Proposed Take of of Shortnose and Atlantic Sturgeon in Modification 16482-01

River System	Shortnose Sturgeon		Atlantic Sturgeon	
	Current Take	Proposed Take	Current Take	Proposed Take
Savannah River (SC/GA)	NONE	20 Adt/sub acoustic tag 200=cap/recap pop est; 50= fin ray aging; 50= ELS	40=Adlt/SubA Pop Est; 20=Adlt/SubA Fin-ray; 20=Adlt/SubA Acoustic; 20=Adlt/SubA Lavage 910=Juv Pop Est 20=JuvAcoustic; 20=Juv Lavage 50=Juv Fin-ray; 50 ELS	NO CHANGE
Ogeechee River (GA)	NONE	10 Adlt/juv acoustic tag 100= cap/recap pop est; 50= ELS	40=Adlt/SubA Pop Est; 20=Adlt/SubA Fin-ray; 20=Adlt/SubA Acoustic; 60=Juv Pop Est 20=Juv Fin-ray; 20=Juv Acoustic; 20=Juv Lavage 50 ELS	NO CHANGE
Altamaha River (GA)	10 Adt/juv acoustic 390 cap/recap pop; 50= fin spine aging; 50= gastric lavage 20= ELS <u>Permit # 14394 ends at issuance of Permit Mod 16482-01</u>	10 Adlt/juv acoustic tag 290 cap/recap pop. est; 100 adlt/juv blood hormone * 50= fin spine aging; 20 = Gastric Lavage 50= ELS	60=Adlt/SubA Pop Est; 20=Adlt/SubA Fin-ray; 20=Adlt/SubA Acoustic; 20=Adlt/SubA Lavage 1910=Juv Pop Est 50=Juv Fin-ray; 20=JuvAcoustic; 20=Juv Lavage 50 =ELS	MINOR CHANGE* Add 100 Adlt/Sub-adlt/juv blood samples for hormone test
Satilla River (GA)	NONE	10 Adt/juv acoustic tag; 20 Pres/abs pop est; 50= ELS	20=Adlt/SubA Fin-ray; 10=Adlt/SubA Acoustic; 60=Juv Pop Est 20=Juv Fin-ray; 10=JuvAcoustic; 50=ELS	NO CHANGE
St. Marys River (GA/FL)	NONE	10 Adt/juv acoustic tag; 20 Pres/abs pop est; 50= ELS	20=Adlt/SubA Fin-ray; 10=Adlt/SubA Acoustic; 60=Juv Pop Est 20=Juv Fin-ray; 20=Juv Acoustic; 50=ELS	NO CHANGE
Nassau River (FL)	NONE	10 Adt/juv acoustic tag; 20 Pres/abs pop est; 50= ELS	NONE	10 Adt/juv acoustic; 20 pres /abs pop est; 50= ELS
St. Johns River (FL)	NONE	10 Adt/juv acoustic tag; 20 Pres/abs pop est; 50= ELS	NONE	10 Adt/juv acoustic; 20 pres /abs pop est; 50= ELS

* Noted change = 100 samples of blood taken from Adult/Sub-Adlt/Juv ATS & SNS for hormone testing

CHAPTER 3: AFFECTED ENVIRONMENT

The 2012 EA described the affected environment in research proposed for Atlantic sturgeon. This SEA considers additional environmental areas affected but not considered in prior EAs, including the social and economic resources, physical, and biological affects relevant to the permit modification's issuance (e.g., Florida waters of the Nassau and St. Johns Rivers). Where overlapping, the affected environment considered in prior EAs or SEAs or biological opinions produced for issuance of prior permits, are incorporated by reference in the current modification and are available upon request.

3.1 SOCIAL AND ECONOMIC RESOURCES

The proposed action does not affect distribution of environmental burdens, access to natural or depletable resources or other social or economic concerns. Nor does it affect traffic and transportation patterns, risk exposure to hazardous materials or wastes, risk contracting disease, damages from natural disasters, food safety, or other aspects of public health and safety. Thus, effects on such resources will not be considered further.

3.2 PHYSICAL ENVIRONMENT

The following topics of discussion referenced in the 2012 EA (NMFS 2012a) document the physical environment, including ocean and coastal habitats, marine protected areas, critical habitat, essential fish habitat, historic places, and also cultural or scientific resources.

3.2.1. OCEAN AND COASTAL HABITATS

The proposed action directed at the targeted shortnose and Atlantic sturgeon and would not affect ocean and coastal habitats. As noted in the EAs and SEAs for the applicant's previous actions, the anchored or drifted gill nets, trammel nets, and ELS sampling gear would have little to no impact to the sediment, critical habitat for Northern right whale or West Indian manatee in the action area of research, or other bottom habitat (NMFS 2012a). Furthermore, as noted in discussion of critical habitat for manatee below, research vessels would avoid sensitive habitat areas such as sea grass beds; and researchers would take precautions to avoid netting over these areas. Based on the proposed research methods and mitigating conditions of the permit, the proposed action does not involve substantive alteration of substrate, movement of water or air masses, or other interactions with physical features of ocean and coastal habitat.

3.2.1.1. CRITICAL HABITAT FOR WEST INDIAN MANATEE

The designation of critical habitat for manatee has not changed from the prior 2012 EA (NMFS 2012) and conclusions made about impacts of sturgeon research in Georgia and Florida waters are still consistent with the proposed changes in the modification. However, with the increased activity of research proposed in Florida waters, the U. S. Fish and Wildlife Service requested to be informally consulted on the activities in the modification with respect to the current critical habitat designation for the West Indian manatee.

Research described in Florida waters in File 16482-01 could occur in critical habitat for manatee existing in the St. Johns, Nassau, and St. Marys waterways, and in inter-coastal waters. This critical habitat is published in the Federal Register at 41 FR 41914; September 24, 1976 and is highlighted below at:

http://www.saj.usace.army.mil/Portals/44/docs/regulatory/sourcebook/endangered_species/Manatee/Manateecrithabitat.png

To avoid impacting the critical habitat of manatee, researchers would continue avoiding conducting research over, on, or immediately adjacent to any sea grass species. If these species cannot be avoided, then minimization measures suggested by the USFWS would be implemented. Based on the nature of the research and the way it would be conditioned; critical habitat would not be adversely affected by the researcher's activities.

In informal discussions with the USFWS (Jim Valade; Manatee Program Coordinator; USFWS, North Florida Ecological Services Field Office; Jacksonville, FL), the agency concurred with NMFS by email (December 13, 2013) that the modification as conditioned would not impact the manatee's critical habitat. Therefore, no further consultation was necessary for impacts on the critical habitat of manatee and will not be further addressed in this analysis.

3.2.2. *SCIENTIFIC, CULTURAL, AND HISTORICAL RESOURCES*

There are no districts, sites, highways or structures listed in or eligible for listing in the National Register of Historic Places in the action area. The proposed action represents the use of shortnose and Atlantic sturgeon life stages for scientific research purposes and does not preclude their availability for other scientific, cultural, or historic uses. Thus, effects on such resources will not be considered further.

3.2.3. *UNIQUE AREAS*

The action would not take place at any sanctuaries, reserves and conservation areas. No other park lands, prime farmlands, wetlands, or wild and scenic rivers are found within the action area. The proposed action is directed at shortnose and Atlantic sturgeon and would not alter unique areas, including any components of essential fish habitat. Protected areas and EFH was also noted not likely to be significantly impacted by the proposed action was in the 2012 EAs (NMFS 2012a) for the applicant's previous action for shortnose sturgeon and Atlantic sturgeon. Thus, effects on such unique areas will not be considered further.

3.3 BIOLOGICAL ENVIRONMENT

3.3.1. *BIOLOGICAL DIVERSITY AND ECOSYSTEM FUNCTION*

The proposed action is directed at targeting the shortnose and Atlantic sturgeon in the same action and does not interfere with benthic productivity, predator-prey interactions or other biodiversity or ecosystem functions. The permit provides for the same level of incidental lethal takes or injuries of juvenile or adult sturgeon as the prior permit due to research effects, as well as a limited number of ELS directed mortality in order to verify spawning success. However, the sturgeon targeted will typically not be removed from the ecosystem or be displaced from habitat; nor will the action affect their diet or foraging patterns. Further, the proposed action does not involve activities known or likely to result in the introduction or spread of non-indigenous species, such as ballast water exchange.

3.3.2 *ESA TARGET SPECIES*

The biological environment for the proposed research modification has changed from that evaluated in the 2012 EA (NMFS 2012a), primarily where new takes of Atlantic and shortnose sturgeon are requested to be authorized in the Proposed Action.

ESA Endangered: Shortnose sturgeon (*Acipenser brevirostrum*)
ESA Endangered Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*)

3.3.2.1. STATUS OF THE TARGET SPECIES:

The 2012 EA (NMFS 2012a) prepared for the issuance of the original Permit No. 16482 for Atlantic sturgeon, as well as the prior EAs completed for the applicant's shortnose sturgeon Permits Nos. 10037 (NMFS 2008a), 14394 (NMFS 2009) and 10115 (NMFS 2008b) authorized for the Ogeechee, Altamaha and Satilla-Saint Marys Rivers, respectively, document the prior status and occurrence information of targeted shortnose and Atlantic sturgeon range-wide and in the action areas of the affected rivers in the current proposed modification. These documents are incorporated by reference; and with the inclusion of the following sections and the white paper submitted in Appendix 2, these update the status of the target species.

3.3.2.2. LATEST POPULATION ASSESSMENTS OF SHORTNOSE AND ATLANTIC STURGEON IN GEORGIA AND FLORIDA WATERS:

Georgia Rivers: Beginning in 2002, the UGA sturgeon research program began population assessments for both Atlantic sturgeon and shortnose sturgeon on the Altamaha River, GA. Although the objectives of this NMFS-funded project sought to quantify population assessments (abundance, age, growth, recruitment) of both species, the methods developed for the Altamaha were adopted for similar assessments on other GA coast rivers. For SNS, which typically congregate at the fresh-saltwater interface during summer months, this process proved to be relatively straightforward for those populations that were sufficiently robust (>500 individuals) for population estimation. For ATS, however, the migratory behavior and protracted spawning periodicity of adults has, so far, precluded any quantified estimate of the adult populations, except for the Altamaha (Peterson et al. 2008). Consequently the UGA research group has focused on estimating annual cohorts of age-1 river-resident juveniles as a quantified measure of annual recruitment (Schueller and Peterson 2010). When conducted over several years, these annual recruitment estimates not only provide a current snapshot of juvenile abundance but more importantly, they depict a "forward looking" trend for the entire population. In some instances, they may also provide additional information regarding genetic diversity (Wirgin et al. 2010, Moyer et al. 2012), juvenile growth rates, and potentially, juvenile carrying capacity.

At present, long-term population studies of both SNS and ATS are on-going in several GA rivers (e.g. the Savannah), but the general status assessments for both species (based on total abundance, annual recruitment, age structure, etc.) have been completed by UGA on most GA rivers (See Appendix 2 for an assessment of both shortnose and Atlantic sturgeon populations in the St. Marys, Satilla, Altamaha, Ogeechee, and Savannah river systems of coastal Georgia (D. Peterson, pers. comm. October 2013).

Florida Waters: In recent years, only two reports of Atlantic sturgeon in the St. Johns River, Florida or St. Marys River, Florida/Georgia have been confirmed. However, in January 2010, shrimp trawl-nets in 15 meter depths were used for chase-trawling chilled sea turtles during Kings Bay Trident submarine channel maintenance. During this exercise, a trawler netted and released 21 sub-adult (~1 meter) Atlantic sturgeon in the St. Marys estuary (J. Wilcox, Pers. Comm. 2010). Dr. Doug Peterson's University of Georgia sampling study

also captured nine sub-adult (~1 meter). Atlantic sturgeon in the tidally-influenced St. Marys, ranging through summer, fall, and winter captures during 2010 (Peterson, Pers. Comm. 2010). In February of 2011, two year-one/year-two juvenile (~40 centimeter) Atlantic sturgeon were caught on hook and line, from the shore, in the St. Johns River (J. Wilcox., Pers. Comm. 2011). This could suggest that the nearby Atlantic sturgeon populations are increasing sufficiently to re-establish resident juvenile populations in the St. Marys and St. Johns Rivers. This is the first step which necessarily precedes the St. Marys River and St. Johns River regaining their own breeding populations as the resident juveniles mature (ASSRT 2007). So, the status of Atlantic sturgeon is still considered by NMFS to be extirpated or nearly extirpated in northeast Florida waters, but migrants are beginning to occupy these rivers.

The shortnose sturgeon historically occurred in the St. Johns River (Gilbert, 1989); however, this species has experienced significant declines within its southern geographic range (Rogers and Weber, 1994; Kahnle et al., 1998; Collins et al., 2000). Beginning in the spring of 2001, the Florida Fish and Wildlife Research Institute (FFWRI) and U.S. Fish and Wildlife Service began research on the population status and distribution of the species in the St. Johns River. During approximately 4,500 hours of gill-net sampling in the St. Johns River from January through August of 2002 and 2003, only one shortnose sturgeon was captured in 2002 (see <http://myfwc.com/research/saltwater/sturgeon/research/population-evaluation/>).

3.3.3. NON-TARGET LISTED SPECIES AFFECTED UNDER NMFS AND USFWS JURISDICTION

Impacts on the following non-target ESA listed species in Table 3, under both USFWS and NMFS jurisdiction, were discussed in prior NEPA documents (NMFS 2012a) and Biological Opinion (NMFS 2012b) and in the current Biological Opinion (NMFS 2014). Because the research methods and conditions protective of the non-target listed animals would not change from those in the original permit, NMFS PR concludes the research would not likely affect them. Thus, these species are not considered further in this SEA. However, in the case of West Indian Manatee, the USFWS service requested to review the modification desiring to understand the potential impacts of the action on manatee in the expanded research area.

Table 2. Listed Non-target Species that May Occur Within the Study Area

Species	State Listing*	Federal Listing*	Federal Agency
West Indian (Florida) Manatee	LE	LE	FWS
Wood Stork	LE	LE	FWS
Loggerhead Sea Turtle	LT	LT	FWS/NMFS ⁺
Green Sea Turtle	LE	LE	FWS/NMFS ⁺
Leatherback Sea Turtle	LE	LE	FWS/NMFS ⁺
Kemp's Ridley Sea Turtle	LE	LE	FWS/NMFS ⁺
Smalltooth Sawfish	LE	LE	NMFS
Northern Right Whale	LE	LE	NMFS

*LE=Endangered, LT=Threatened

+ Joint Jurisdiction of sea turtles by the USFWS having jurisdiction on land and NMFS having jurisdiction in marine environments

3.3.3.1. WEST INDIAN MANATEE:

Although the mitigations protective of West Indian manatee contained in the proposed modification would be similar to the existing permit, because the USFWS wished to update their protective measures and contact information for manatee in the action area in Florida waters, NMFS PR again informally consulted with the USFWS.

The West Indian Manatee is listed as endangered under the ESA under the USFWS's jurisdiction and is also protected under the MMPA. Florida manatees are found in freshwater, brackish, and marine environments. Typical habitats include coastal tidal rivers and streams, mangrove swamps, salt marshes, and freshwater springs. It inhabits both marine and fresh water of sufficient depth (1.5 meters to 6 meters) throughout their southeastern Atlantic range in coastal states of Florida, Georgia, South Carolina and North Carolina. In Georgia, South Carolina and North Carolina, manatee are commonly regarded as intermittent, seasonal inhabitants due to cold intolerance in winter months; however, sightings and numbers of this species in these waters has been increasing over the past several years (Nicole Adimey; USFWS; pers. comm. 2011). In coastal Georgia and northeastern Florida, manatees feed in salt marshes on smooth cordgrass (*Spartina alterniflora*) by timing feeding periods with high tides.

NMFS informal consultation with the USFWS, Northern Florida Ecological Services Field Office (sent November 7, 2013) asked for concurrence that the research in File 16482-01 would continue not to adversely impact the animals. The USFWS again determined the measures it had provided in the past (updated in the permit with new contact information and other minor changes to the conditions sent by email 12/16/2013), would be sufficient to minimize interactions or harm to the species or to its critical habitat. These changes were incorporated into the modified permit; and thus, the species is no longer considered in this SEA.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

This chapter represents the scientific and analytical basis for comparison of the direct, indirect, and cumulative effects of the alternatives of permit issuance. Regulations for implementing the provisions of NEPA require consideration of both the context and intensity of a proposed action (40 CFR Parts 1500-1508).

4.1 NO ACTION ALTERNATIVE

Under this No Action alternative, the take activities would continue as currently authorized under the existing Permit No. 16482. Based on the analyses in the 2012 EA (NMFS 2012a), NMFS determined that issuance of the permit would not likely jeopardize the continued existence of Atlantic sturgeon. However, this alternative would not provide exemptions to the ESA Section 9 for incidental takes of shortnose sturgeon likely to be captured during Atlantic sturgeon research in the same action area. This alternative would thus result in discontinuing research efforts in rivers where ESA regulatory authority lapses for either species.

4.2 PROPOSED ALTERNATIVE: CONSOLIDATING EXISTING AND PROPOSING NEW TAKE OF BOTH ATLANTIC AND SHORTNOSE STURGEON UNDER A MODIFIED PERMIT 16482-01

Under this Proposed Alternative, authorized consolidated take for shortnose and Atlantic sturgeon would be authorized in Permit No. 16482-01. Specifically, the anticipated impacts are summarized as: (1) Consolidating currently authorized take in the Altamaha River for shortnose sturgeon (Permit No. 14394) and Atlantic sturgeon (Permit No. 16482), and subsequently terminating Permit No. 14394 when the modification is issued; (2) Adding a new procedure authorizing Non-Lethal Blood Sampling of Atlantic and shortnose sturgeon captured in the Altamaha River; (3) Consolidating and authorizing new takes of shortnose sturgeon with those already authorized for Atlantic sturgeon in Permit No. 16482 in the Savannah River (GA/SC); Ogeechee River (GA); Satilla River (GA); and Saint Marys River (GA/FL); and (4) Adding concurrent sampling of shortnose and Atlantic sturgeon in an expanded action area in Florida waters, including two new river systems in the Nassau and St. Johns Rivers (FL) and adjoining waters. Any impacts to the human environment of the Proposed Action alternative would primarily affect the target species, Atlantic sturgeon and shortnose sturgeon.

4.3.1. CONSOLIDATING CURRENTLY AUTHORIZED TAKE OF SHORTNOSE STURGEON IN THE ALTAMAHA RIVER (GA)

NMFS considered the impacts of consolidating the takes of shortnose sturgeon previously authorized separately in the Altamaha River (GA) in Permit No. 14394 with those authorized for Atlantic sturgeon in the same river system in Permit 16482. However, because Permit No. 14394 is scheduled to expire on September 30, 2014, by consolidating the current takes of shortnose sturgeon with Permit No. 16482 (expiring on April 5, 2017), the modification would effectively extend the take of shortnose sturgeon in Permit 14394 in the river for an additional 29 months (see Table 1). NMFS concludes, however, that this net extension of the authorized take would have a negligible impact on the shortnose sturgeon population.

4.3.2. ADDING NON-LETHAL BLOOD SAMPLING OF SHORTNOSE AND ATLANTIC STURGEON IN THE ALTAMAHA RIVER (GA)

Blood sampling would allow researchers to analyze blood serum levels of a hormone identified as “LP9,” which has recently been determined to be a marker of the sex of sturgeon at an early age. The proposed modification requests a total of 100 of each species over the term of the permit captured from the Altamaha River be included in this analysis. These data would also be comparable (and complementary) to those being collected from other sturgeon populations in other river systems in the United States.

Effects of drawing blood samples with syringes from the caudal vein could include pain, handling discomfort, possible hemorrhage at the site, risk of infection, or mortality (although highly unlikely). NMFS believes that the potential for injury or mortality is not associated with blood collection itself, of which they have not had any problems with to date with over 10 years of sampling. Any individual who is to be collecting blood from sturgeon will have proper training prior to conducting this activity. The site of collection would be swabbed with buffered iodine prior to insertion of the hypodermic needle, and the needle itself would also be sanitized to reduce the risk of infection. A sample of 3-5 ml blood

would be withdrawn from the caudal artery using small needle/syringe. This method has been reviewed and approved by the University of Florida, in addition to being consistent with the NOAA Technical Memorandum: “A Protocol for Use of Shortnose, Atlantic, Gulf, and Green Sturgeons (Kahn and Mohead 2010).” NMFS thus expects any harassment due to such research activities to be minimal and short-term.

4.3.3. *CONSOLIDATING AND AUTHORIZING NEW TAKES OF SHORTNOSE AND ATLANTIC STURGEON WITH THOSE ALREADY AUTHORIZED IN PERMIT NO 16482 IN THE SAVANNAH (GA/SC); OGEECHEE (GA); SATILLA (GA); AND ST. MARYS (GA/FL) RIVERS*

• ***Impacts of Consolidating Takes of Both Species in Georgia Waters:*** Separate research permits have been issued to the applicant in individual Georgia rivers for shortnose sturgeon for the last ten years to the current applicant. Research on Atlantic sturgeon was performed without an ESA permit required while the species remained a “species of concern” status; however, the research was concurrent with that directed toward shortnose sturgeon using identical methods. On April 5, 2012 the applicant was issued ESA Permit No. 16482 authorizing scientific research on Atlantic sturgeon in all Georgia rivers. To conduct sturgeon research for both species in all Georgia Rivers, concurrent research is now requested under a unified modified permit Modification No. 16482-01. The following Table 3 illustrates the timeline for past concurrent research for both species in Georgia River systems under separate permits.

Table 3: Timeline of past sturgeon research authorized in Georgia river systems

River System	<u>Shortnose Sturgeon</u>		<u>Atlantic Sturgeon</u>	
	Years	Permit No.	Years*	Permit No.
Savannah River	2013-2014	15677	2013-2014	16482
Ogeechee River	2006-2013	1489; 10037	2007- 2014	16482
Altamaha River	2004-2014	1420; 14394	2004-2014	16482
Saltilla River	2009-2013	10115	2009-2014	16482
St Marys River	2009-2013	10115	2009-2014	16482

*Research on Atlantic sturgeon prior to April 5, 2012 did not require an ESA permit.

Kahn and Mohead (NMFS 2010) documented research impacts to develop consistent research protocols for researchers when studying shortnose, Atlantic, Gulf and green sturgeon. Atlantic and shortnose sturgeon were found to be comparable species reacting similarly to common stresses and threats from research methods; thus, when taken in the same action, the impacts from research on each species are measured identically.

Consequently, the cumulative impacts on these species in the modified study would be measured through the same permitting process; and the biological opinions measuring the cumulative impacts on either species would be accounted for in directed research on each species independently, but within the same action. Hence, NMFS believes there would be no increased impacts from concurrent research on both species. When existing permitted limits of shortnose sturgeon or Atlantic sturgeon are met, researchers would be required to cease studies on both species until either in the river, either modifying the permit to increase take or restarting annual research at the next anniversary of permit issuance.

• ***Impacts of Authorizing Increased Take of Shortnose Sturgeon in Georgia Waters:*** The applicant has also requested adding new takes of shortnose sturgeon from Georgia waters from the Savannah River (GA/SC); Ogeechee River (GA); Satilla River (GA); and Saint Marys River (GA/FL) to replace past permit authority recently expired. Of these (see Proposed Take summary and timeline in Table 1 and 3), the numbers requested from the Savannah River would be newly permitted takes; while the take from the Ogeechee, Saltilla, and St. Marys Rivers, would be identical to those authorized in previous expired permits in 2013. The applicant has recently developed a population estimate for Atlantic sturgeon in the Savannah River and is asked by NMFS PR to continue funded research in the river for both shortnose and Atlantic sturgeon. Consequently, the applicant requires regulatory authority to take both species of animals since these species occur together and are taken in the river concurrently. In order to establish population estimates of both species in these rivers, the applicant justified appropriate numbers of takes in the application.

As indicated, the past level of take of both species in the action area rivers has not led to a case of mortality or serious injury of Atlantic or shortnose sturgeon as a result of research activities. No increase in mortality has been requested in the modification. The researchers would still be bound to conduct their research activities in accordance with the mitigating conditions in their original permit which would reduce the likelihood of serious injury or mortality occurring. However, the potential still exists for injury and mortality due to the increased levels of research activities; thus, the applicant has requested a low level of mortality and/or serious injury annually.

Based on analysis in the original EA and Biological Opinion, NMFS expects harassment due to capture and other research activities requested in these Northeast Florida river systems and estuaries to be minimal and short-term. In general, takes, such as those described in the current modification using the proposed methodologies as modified by permit conditions, have not been shown to result in long-term or permanent adverse effects on individuals regardless of the number of times the harassment occurs. The frequency and duration of the disturbance from capture and other procedures under the proposed permit would allow adequate time for animals to recover from adverse effects such that additive or cumulative effects of the action on its own are not expected. For these reasons, NMFS does not expect that increasing the numbers of take of the target shortnose or Atlantic sturgeon to significantly impact individual animals or populations in any of the rivers authorized.

4.3.4. *ADDING CONCURRENT SAMPLING OF SHORTNOSE AND ATLANTIC STURGEON IN AN EXPANDED ACTION AREA OF THE NASSAU AND ST JOHNS RIVERS (FL) AND ADJOINING WATERS*

The applicant in the current proposal is requesting to modify Permit No. 16482 by expanding research efforts in the St. Johns and Nassau River in Florida waters to: (1) measure, weigh, photograph, genetic tissue sample, anesthetize, laparoscopy, biopsy up to 20 Atlantic and shortnose sturgeon per year; (2) acoustic tag an additional 10 of each species per year; and (3) sample 20 early life stages of each species annually in each river system.

As discussed earlier, while NMFS considers Atlantic and shortnose sturgeon to be extirpated or nearly extirpated in the northeast Florida waters of the St. Johns and Nassau Rivers, recent

anecdotal data and bycatch data have shown that both species are migrants in these rivers and are beginning to occupy these rivers (Jeff Wilcox, pers. comm. January 2014). Between 2010 and 2014, three sub-adult Atlantic sturgeon were caught on recreational hook and line and numerous animals have also been salvaged as mortality. In 2010, approximately 20 miles north of the mouth of the St Johns River, a NMFS lead trawl captured 21 sub-adult Atlantic sturgeon over a period of three days.

The original EA and Biological Opinion, analyzing the impacts on the environment from the only other sturgeon research authorized in Northeast Florida, Permit No. 16508, concluded that its activities would have minimal and short-term effects while issuing capturing and tagging of 20 adult/sub-adult/juvenile Atlantic sturgeon and incidentally capturing up to a single shortnose sturgeon in the St. Marys, Nassau and St. Johns Rivers. Also, the applicant proposed to use side scan sonar first to locate specimens to then deploy gill nets to capture sturgeon. However, since April 2012, no netting activity that was originally authorized in Permit No. 16508 has been undertaken, only exploratory boating using the side-scan sonar. Additionally, the researcher (PI/Responsible Party; Ken Sulak, pers. comm., 2013) has informed NMFS PR that the proposed efforts to capture sturgeon in the original permit would be postponed due to his soon retirement with the U.S.G.S. (Permit Holder).

Based on the analysis in the original EA (NMFS 2012a) and the current Biological Opinion (NMFS 2014) prepared for this action, NMFS expects any harassment due to the new research activities proposed by the applicant in these Northeast Florida river systems and estuaries would be minimal and short-term.

Hence NMFS does not expect that authorizing the take requested would result in the significant loss of individual animals from this population or reduced reproductive success of the species as a whole. The researchers would still be bound to conduct their research activities in accordance with the mitigating conditions in their original permit which would minimize the likelihood of any serious injury or mortality occurring.

4.4. CUMULATIVE IMPACTS ON THE TARGET SPECIES

4.4.1. *EFFECTS OF OTHER STURGEON RESEARCH PERMITS*

The potential exists for both shortnose and Atlantic sturgeon authorized as takes in the current proposal to be taken from adjacent river systems. Though the shortnose sturgeon is sympatric with the Atlantic sturgeon throughout much of its range, the shortnose sturgeon spends more time in freshwater where Atlantic sturgeon occupies more of its life cycle in the open ocean. In recent years, however, telemetry data and genetic analyses of shortnose sturgeon have demonstrated coastal migrations of the species between adjacent rivers may be relatively common in some areas (S. Fenandes, T. Squiers-Maine Rivers; & D. Peterson, -S.E. Rivers, pers. comm., 2009). Nevertheless, even if the proposed permit is able to target the same animals coming from different river systems or are taken by the same or other Permit Holders in the region, NMFS would not expect cumulative impacts since effects of permitted takes would dissipate within a day, as was previously discussed in the 2012 EA for the original action. Further, as described in Kahn and Mohead (NMFS 2010), reactions of Atlantic and shortnose sturgeon to common methods of research were documented to be comparable, with each species reacting similarly to stresses and threats. Thus NMFS

believes that the impacts to either species from the activities of researchers, which would be mitigated with appropriate permit conditions, would not produce cumulative impacts.

Scientific research conducted on shortnose and Atlantic sturgeon has been evaluated during numerous ESA section 10(a)(1)(A) consultations for issuing scientific research permits authorized by NMFS. Currently, there are 23 active scientific research permits: 12 targeting wild Atlantic sturgeon and 11 targeting shortnose sturgeon populations with similar objectives as proposed by the applicant (See Appendix 3; Table 1 and 2). These actions also include Permit No. 15677 and Permit No. 16442, a shortnose and an Atlantic sturgeon permit authorized in the bordering state of South Carolina; and also Permit No. 16508, an Atlantic sturgeon permit within the proposed action area in Florida. The Biological Opinion issued for each of these the permits included the requirement for consideration of cumulative effects on the species. For each permit, the Biological Opinion concluded that its issuance, as conditioned, was not likely to produce cumulative impacts or jeopardize the continued existence of either species, individually or cumulatively.

4.4.2. SUMMARY OF OTHER ACTIONS:

According to NEPA (CEQ, Section 1508.7 Cumulative Impact) "Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. As discussed in the 2012 EA for the original action (NMFS 2012a), the target sturgeon populations may be exposed to other human activities, including by-catch in fishing gear, poaching, ship strikes, water quality and habitat alteration, dams, existing NMFS research permits and other activities. These activities and threats have not changed since the 2012 and are expected to continue into the future. For a summary of the effects of past and ongoing human and natural factors occurring in or near the action area, and general threats facing shortnose sturgeon range-wide contributing to the current status of the species, please refer to the baseline section of the attached biological opinion done for the ESA Section 7 Consultation for this permit.

4.5. CONCLUSIONS:

This SEA analysis appropriately focuses on the effects on individuals, populations, and species, from the action of consolidating and increasing takes in the action area by adding past and current takes of shortnose sturgeon to the existing and proposed takes of Atlantic sturgeon in the same river systems in Georgia and Florida. It also considers the potential for cumulative impacts on the species from the total amount of research permits issued and the impacts of other actions on the species.

By consolidating the takes of either species on the same permit modification, the modification would offer conservation measures to the recovery of the species and offer less duplication of research effort as wells as more efficient reporting when documenting the takes and impacts of research. Although authorization is needed to target both species either concurrently or independently, as both species occupy the same habitat, since both species have similar responses to research threats, the cumulative impacts on either species are also similar. Hence NMFS finds no evidence that targeting both species in the same action would increase individual, population, species or cumulative impacts on the listed sturgeon.

The proposed action is directed at shortnose and Atlantic sturgeon life stages, including directed lethal take of ELS, as well as increase in the level of take proposed. There thus exists the potential for adverse effects arising from increased research activity in Georgia and Florida waters requested on shortnose sturgeon and Atlantic sturgeon. However, as indicated, these animals have been exposed to capture and research procedures concurrently by the applicant for nearly 10 years in Georgia waters. Since being listed in 2012, the Atlantic sturgeon has also been the subject of more intensive research. For example, in 2012 and 2013, shortnose sturgeon research was conducted on separate permits (since expired) concurrently with Atlantic sturgeon in the Ogeechee, Satilla and St. Marys Rivers (GA). These studies however, have documented no mortality or serious injury during the two year period while the level of research has been greater than that requested in the current modification in these rivers. Likewise, no mortality or serious injury has been reported in the Savannah River for shortnose and Atlantic sturgeon, where multiple permits were issued to both the South Carolina DNR and the University of Georgia. Further, some individual sturgeon have been recaptured more than once and have shown no evidence of permanent or long term impacts (chronic or sub-lethal) in their behavior, condition, or health as a result of research activities.

NMFS therefore believes that the proposed modifications as discussed in the Alternative 2: Proposed Action would not have a significant cumulative impact on either the human or marine environment; nor would it likely jeopardize the continued existence of endangered shortnose or Atlantic sturgeon. And, as modified, NMFS believes the research would also not have a significant cumulative impact on non-target species encountered or on the physical environment in the proposed action area. There is no critical habitat designated for either target species; and should critical habitat be designated prior to the expiration of either permitted action, permitted activity affecting the habitat would be halted until Section 7 interagency consultation were re-initiated to determine potential impacts. Further, as mitigated in the 2012 EA, and updated in this SEA, none of the other listed species, (e.g., West Indian manatee) or critical habitat would be adversely affected.

Overall, the proposed action would not be expected to have more than short-term effects on endangered shortnose and Atlantic sturgeon, with exception of the lethal research authorized for ELS or the incidental lethal mortality potentially experienced. However, the incremental impacts of the action, when added to other past, present, and reasonably foreseeable future actions discussed here, would be minimal and not significant. The data generated by the research activities associated with the proposed action would help determine the movement, habitat use, and life history characteristics of shortnose and Atlantic sturgeon found in the waters of Georgia. And, particularly, in Florida waters, the activities would be directed at determining the presence of sturgeon and the origin of the animals determined genetically. Thus, the research would provide information helpful to managing and recovering the endangered species and would outweigh any adverse impacts that may occur. In conclusion, the proposed action would not be expected to have any more than short-term effects on marine populations or species or other portions of the environment and would not result in any cumulatively significant effects.

CHAPTER 5 LIST OF PREPARERS AND AGENCIES CONSULTED

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Formal Consultations on the Effects
on ESA Target Species (shortnose
sturgeon and Atlantic sturgeon)

U.S. Fish and Wildlife Service
North Florida Ecological Services Field Office;
Jacksonville, FL

Informal Consultations on the effects of
sturgeon research on endangered West
Indies manatee and critical habitat

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Appendix 1

Table 1. Annual Take Authorized for Permit Modification No. 16482-01 (**Bold font represents a modification in the permit**).

Species	Life Stage	Annual Take	Observe/Collect Method	Proposed Take Activities	Location
Atlantic Sturgeon	Adult/sub-adult	40 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample	Savannah River South Atlantic DPS
Atlantic Sturgeon	Adult/sub-adult	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Fin ray clip	Savannah River South Atlantic DPS
Atlantic Sturgeon	Adult/sub-adult	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Laparoscopy; Internal acoustic tag	Savannah River South Atlantic DPS
Atlantic Sturgeon	Adult/sub-adult	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Anesthetize; Lavage	Savannah River South Atlantic DPS
Atlantic Sturgeon	Juvenile	910 Total of 2,750/5yrs	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue	Savannah River South Atlantic DPS
Atlantic Sturgeon	Juvenile	20	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Lavage	Savannah River South Atlantic DPS
Atlantic Sturgeon	Juvenile	20	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue; Anesthetize; Internal/External tag	Savannah River South Atlantic DPS
Atlantic Sturgeon	Juvenile	50	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue; Anesthetize; Fin ray clip	Savannah River South Atlantic DPS

Atlantic Sturgeon	Early Life Stage (Eggs/Larvae)	50	Egg Mat, D-Net	Intentional (Directed) Mortality	Savannah River South Atlantic DPS
Shortnose Sturgeon	Adult/Juv	20 Total of 60/5yr	Gill Net, Trammel	Measure; Weigh; Photograph; PIT tag; Genetic tissue sample; Anesthetize; Laparoscopy; Internal acoustic tag	Savannah River
Shortnose Sturgeon	Adult/Juv	200 Total of 600/5yr	Gill Net, Trammel	Measure; Weigh; Photograph; PIT tag; Genetic tissue sample	Savannah River
Shortnose Sturgeon	Adult/Juv	50 Total of 150/5yr	Gill Net, Trammel	Measure; Weigh; Photograph; PIT tag; Genetic tissue sample; Fin Ray Sample	Savannah River
Shortnose Sturgeon	Adult/Juv	50	Egg Mat; D-net	Directed lethal take	Savannah River
Atlantic Sturgeon	Adult/sub-adult	40 Total of 120/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue	Ogeechee River South Atlantic DPS
Atlantic Sturgeon	Adult/sub-adult	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Fin ray clip	Ogeechee River South Atlantic DPS
Atlantic Sturgeon	Adult/sub-adult	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue; Anesthetize; Internal acoustic tag Laparoscopy; Gonad biopsy	Ogeechee River South Atlantic DPS
Atlantic Sturgeon	Juvenile	60 Total of 180/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample	Ogeechee River South Atlantic DPS
Atlantic Sturgeon	Juvenile	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Fin ray	Ogeechee River South Atlantic DPS
Atlantic Sturgeon	Juvenile	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Internal/External acoustic tag	Ogeechee River South Atlantic DPS

Atlantic Sturgeon	Juvenile	20	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize, Gastric Lavage	Ogeechee River South Atlantic DPS
Atlantic Sturgeon	Early Life Stage (Eggs/Larvae)	50	Egg Mat, D-Net	Directed Mortality	Ogeechee River South Atlantic DPS
Shortnose Sturgeon	Adult/Sub-adult	10 Total of 30/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Genetic tissue; Anesthetize; Internal acoustic tag	Ogeechee River
Shortnose Sturgeon	Adult/Juv	100 Total of 300/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Genetic tissue;	Ogeechee River
Shortnose Sturgeon	Eggs/Larvae	50	Egg Mat; D-net	Directed Mortality	Ogeechee River
Atlantic Sturgeon	Adult/sub-adult	60 Total of 180/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample;	Altamaha River South Atlantic DPS
Atlantic Sturgeon	Adult/sub-adult	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue Anesthetize; Fin ray,	Altamaha River South Atlantic DPS
Atlantic Sturgeon	Adult/sub-adult & juv	100	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Blood sample*	Altamaha River South Atlantic DPS
Atlantic Sturgeon	Adult/sub-adult	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue; Gonad biopsy; Anesthetize; Laparoscopy; Internal acoustic tag,	Altamaha River South Atlantic DPS
Atlantic Sturgeon	Adult/sub-adult	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue Anesthetize; Lavage	Altamaha River South Atlantic DPS
Atlantic Sturgeon	Juvenile	1910	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample,	Altamaha River South Atlantic DPS

Atlantic Sturgeon	Juvenile	50	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Fin ray clip,	Altamaha River South Atlantic DPS
Atlantic Sturgeon	Juvenile	20	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Internal/External acoustic ,	Altamaha River South Atlantic DPS
Atlantic Sturgeon	Juvenile	20	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Lavage,	Altamaha River South Atlantic DPS
Atlantic Sturgeon	Early Life Stages (Eggs/Larvae)	50	Egg Mat, D-Net	Intentional (Directed) Mortality	Altamaha River South Atlantic DPS

Note: *May not exceed 100 blood samples over the life of the permit from Adult/Sub-adlt &Juv

Shortnose Sturgeon	Adult/Sub-adult	10 Total of 30/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Genetic tissue; Anesthetize; Internal acoustic tag	Altamaha River
Shortnose Sturgeon	Adult/Juv	290 Total of 1,170/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Genetic tissue	Altamaha River
Shortnose Sturgeon	Adult/Juv	100*	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Genetic tissue; Blood sample*	Altamaha River
Shortnose Sturgeon	Adult/Juv	50	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Fin ray	Altamaha River
Shortnose Sturgeon	Adult/Juv	20	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Gastric Lavage	Altamaha River
Shortnose Sturgeon	Eggs/Larvae	50	Egg Mat; D-net	Directed Mortality	Altamaha River

***Note: May not exceed 100 blood samples over the life of the permit**

Atlantic Sturgeon	Adult/sub-adult	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Fin ray	Satilla River South Atlantic
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Atlantic Sturgeon	Adult/sub-adult	10 Total of 30/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue ; Anesthetize; Gonad biopsy; Laparoscopy; Internal acoustic tag	Satilla River South Atlantic DPS
Atlantic Sturgeon	Juvenile	60 Total of 180/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue	Satilla River South Atlantic DPS
Atlantic Sturgeon	Juvenile	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Fin ray	Satilla River South Atlantic DPS
Atlantic Sturgeon	Juvenile	10 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue Anesthetize; Internal/External acoustic	Satilla River South Atlantic DPS
Atlantic Sturgeon	Early Life Stage (Eggs/Larvae)	50	Egg Mat, D-Net	Directed Mortality	Satilla River South Atlantic DPS
Shortnose Sturgeon	Adult/Sub-adult	10	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Genetic tissue; Anesthetize; Laparoscopy; Gonad biopsy; Internal acoustic tag	Satilla River
Shortnose Sturgeon	Adult/Juv	20	Gill Net, Trammel Net	Mark, PIT tag, Measure, Photograph, Genetic tissue	Satilla River
Shortnose Sturgeon	Early Life Stage (Eggs/Larvae)	50	Egg Mat; D-net	Directed Lethal Take	Satilla River
Atlantic Sturgeon	Adult/sub-adult	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Fin ray	St. Marys River South Atlantic DPS
Atlantic Sturgeon	Adult/sub-adult	10 Total of 30/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue; Gonad sample; Anesthetize; Laparoscopy; Internal acoustic	St. Marys River South Atlantic DPS
Atlantic Sturgeon	Juvenile	60 Total of 180/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy tag; Genetic tissue sample	St. Marys River South Atlantic DPS

Atlantic Sturgeon	Juvenile	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy tag; Genetic tissue sample; Anesthetize; Fin ray clip	St. Marys River South Atlantic DPS
Atlantic Sturgeon	Juvenile	20 Total of 60/5yr	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Floy/T-bar tag; Genetic tissue sample; Anesthetize; Internal/External acoustic	St. Marys River South Atlantic DPS
Atlantic Sturgeon	Early Life Stage (Eggs/Larvae)	50	Egg Mat, D-Net	Directed Mortality	St. Marys River South Atlantic DPS
Shortnose Sturgeon	Adult/Sub-adult	10	Gill Net, Trammel Net	Measure; Weigh; Photograph; PIT tag; Genetic tissue; Anesthetize; Laparoscopy; Gonad biopsy; Internal acoustic tag	St. Marys River
Shortnose Sturgeon	Adult/Juv	20	Gill Net, Trammel Net	Mark, PIT tag, Measure, Photograph, Genetic tissue	St. Marys River
Shortnose Sturgeon	Early Life Stage (Eggs/Larvae)	50	Egg Mat; D-net	Directed Lethal Take	St. Marys River
Atlantic Sturgeon	Adult/Sub-adult	10 Total 30/5yr	Gill Trammel Net	Measure; Weigh; Photograph; PIT tag; Genetic tissue; Anesthetize; Laparoscopy; Gonad biopsy; Acoustic tag	<u>In Each</u> Nassau River and Saint Johns River
Atlantic Sturgeon	Adult/Juv	20 Total of 60/5yr	Gill Trammel net	Measure; Weigh; Photograph; PIT tag; Genetic tissue	<u>In Each</u> Nassau River and Saint Johns River
Atlantic Sturgeon	Early Life Stages (ELS)	50	Egg Mat; D-net	Directed Lethal Take	<u>In Each</u> Nassau River and Saint Johns River

Shortnose Sturgeon	Adult/Sub-adult	10	Gill Trammel net	Measure, Weigh; PIT tag; Photograph, Tissue sample, Anesthetize, Laparoscopy, Acoustic tag	In Each Nassau River and Saint Johns River
Shortnose Sturgeon	Adult/Juv	20	Gill Trammel net	Mark, PIT tag, Measure, Weigh, Photograph, Genetic tissue	In Each Nassau River and Saint Johns River
Shortnose Sturgeon	Early Life Stages (ELS)	50	Egg Mat; D-net	Directed Lethal Take	In Each Nassau River and Saint Johns River

Table 1b. Annual unintentional mortality in all rivers in action area

Atlantic Sturgeon	Juvenile	5*	Gill Net, Trammel Net	Unintentional Mortality	All Rivers South Atlantic DPS
	Adult/sub-adult	1			
Shortnose Sturgeon	Adult/Juv	2	Gill net, Trammel Net	Unintentional Mortality	All Rivers

*Unintentional mortality or serious injury cannot exceed 5 juvenile annually or 1 adult Atlantic sturgeon in all rivers annually; Also, up to 2 shortnose sturgeon in all rivers annually; and only up to 2 shortnose sturgeon in killed or harmed from the Satilla, St. Marys, Nassau or St. Johns Rivers totaled.

Table 1c. Authorized annual Incidental Take Statement resulting in short-term harassment and or minimal injury of sea turtles written by the NMFS Biological Opinion for Issuance of Permit Number 16482-01.

Species	Life Stage	Sex	Take No.	Take Action**	Location	Time Period
<u>Loggerhead sea turtle</u> (<i>Caretta caretta</i>) <u>Green sea turtle</u> (<i>Chelonia mydas</i>) <u>Leatherback sea turtle</u> (<i>Dermochelys coriacea</i>) <u>Hawksbill sea turtle</u> (<i>Eretmochelys imbricata</i>) <u>Kemp's ridley sea turtle</u> (<i>Lepidochelys kempii</i>)	Juvenile, subadult or adult	M/F	2*	Incidental Take by drift net or gillnet, or trawl	Georgia rivers	Year-round

*=Includes responses ranging from very mild short-term stress to short term minimal injury from net gear capture. Up to 2 total takes annually, including: 2 loggerheads, or 1 loggerhead PLUS 1 green, OR 1 leatherback, OR 1 hawksbill, OR 1 Kemp's ridley, over the course of the permit. Takes do not include mortality.

**=Sea turtles must be removed from nets immediately and released. In addition, capture gear shall not be placed in the water, or will be removed, if any of these animals are known to be present in the immediate area.

Appendix 2:

Assessment of shortnose and Atlantic sturgeon in Georgia waters. (Dr. Douglas Peterson; University of Georgia, Athens.)

Introduction

Beginning in 2002, the UGA sturgeon research program initiated long-term population assessments for both Atlantic sturgeon (ATS) and shortnose sturgeon (SNS) on the Altamaha River, Georgia. Although the initial objectives of this NMFS-funded project were to provide quantitative population assessments (abundance, age, growth, recruitment) of both species, the assessment methods developed for the Altamaha were quickly adopted for similar assessments on other GA coast river systems. For SNS, which typically congregate near just above the fresh-saltwater interface during the summer months, this process proved to be relatively straightforward for those populations that were sufficiently robust (>500 individuals) for population estimation. For ATS, however, the migratory behavior and protracted spawning periodicity of adults has, so far, precluded any quantified estimate of the adult populations, except for the Altamaha (Peterson et al. 2008). Consequently the UGA research group has focused on estimating annual cohorts of age-1 river-resident juveniles as a quantified measure of annual recruitment (Schueller and Peterson 2010). When conducted over several consecutive years, these annual recruitment estimates not only provide a current snapshot of juvenile abundance but more importantly, they depict a “forward looking” trend for the entire population. In some instances, they may also provide additional information regarding genetic diversity (Wirgin et al. 2005, Moyer et al. 2012), juvenile growth rates, and potentially, juvenile carrying capacity.

At present, long-term population studies of both SNS and ATS are on-going in several GA rivers (e.g. the Savannah), but general status assessments for both species (based on total abundance, annual recruitment, age structure, etc.) have been completed by UGA on most GA rivers. The purpose of this document is to provide an overview of the current stock status for both shortnose and Atlantic sturgeon populations in the St. Marys, Satilla, Altamaha, Ogeechee, and Savannah river systems of coastal Georgia.

Methods

Field Methods

The basic methodology used by UGA for sturgeon stock assessment has focused on a spatially and temporally intensive mark-recapture field sampling effort conducted during the early summer months when SNS (age-1 and older) and age-1 juvenile ATS are confined (by their physiological temperature and salinity tolerances) to the tidally influenced oligohaline habitats of their natal estuaries. The basic sampling design used by UGA has relied on the use of entanglement gear, deployed for 30-120 minutes in main channel habitats of the estuaries of each river system. Both SNS and age-1 juvenile ATS are captured simultaneously, using a combination of anchored monofilament gill nets and trammel nets constructed of variable mesh sizes from 3” – 12” (stretch measure). Depending on water

temperatures and dissolved oxygen levels, the nets are typically fished for at least 30 min, but no more than 120 minutes just prior to, during, and immediately after slack tide. As the nets are pulled, captured sturgeons are immediately disentangled and placed in a floating net pen where they are allowed to recover until all nets have been retrieved. Immediately thereafter, each fish is measured, weighed, and PIT tagged. In most rivers subsamples of sturgeon are randomly selected for the acquisition of fin spine or fin tissue biopsies used in subsequent age estimation or genetic analyses.

Data Analyses:

Typically, mark-recapture data collected for both SNS and Juvenile ATS have been analyzed using a Huggins closed capture model to estimate capture and recapture probabilities and, subsequently, abundance (Huggins 1989). For SNS, all fish are typically included in this analyses; however, separate abundance estimates are calculated for adults, juveniles, and the total population whenever possible. For Atlantic sturgeon, age-1 juveniles are first identified using a simple length-frequency histogram (Figure 1). Fin ray cross sections from a random subset of juveniles are typically used to corroborate age-estimates derived from the histogram (Schueller and Peterson 2006). Abundance of the age-1 cohort (i.e. annual recruitment) is then estimated in a similar manner as that described above for SNS. To calculate these estimates, the researchers first compile individual capture histories for each fish using a predetermined sampling period (typically 1 day or 1 week, depending on capture frequencies, dispersion of sampling sites, and other sampling variables). Individuals that are recaptured during the same period in which they are initially captured are excluded from the population estimate. The team then constructs a set of candidate models with differing combinations of parameters for capture and recapture probabilities to quantify influences of environmental predictor variables. Typically, sampling effort and water temperature during the sampling period are included as covariates. Capture and recapture probabilities are then modeled as constants, time varying, or functions of these covariates. Program MARK is then used to evaluate the relative weight of each candidate model and subsequently, to estimate annual abundance.

Results & Discussion

Savannah River – ATS

During summer of 2013, the UGA team conducted a total of 218 individual net sets, yielding a total of 174 net-hours of sampling effort in the lower Savannah River estuary. The team captured a total of 569 individual Atlantic sturgeon with an additional 99 recaptures. A simple length-frequency histogram (Figure 1) revealed that 210 of these fish were age-1 juveniles, 35 of which were recaptured, yielding a cohort estimate of 526 with and 95% CL of 398-727. Because this is the first quantified estimate of juvenile ATS abundance on the Savannah, additional estimates in subsequent years will be needed to evaluate recruitment trends in this system. However, similar estimate conducted in recent years on other GA rivers, suggest that the Savannah currently contains the 2nd largest (next to the Altamaha) ATS population in GA waters.

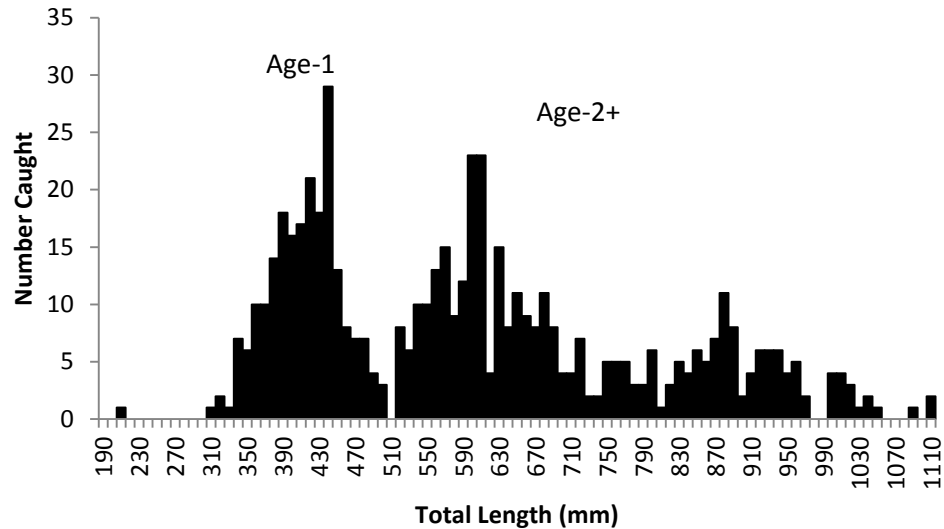


Figure 1. Total length (mm) frequency histogram of all juvenile Atlantic sturgeon captured in the Savannah River during summer 2013.

Savannah River – SNS

Because of ESA permitting constraints, UGA has not yet attempted a mark-recapture estimate of the SNS population on the Savannah River. However, preliminary sampling during 1 week in mid May, 2011, yielded a total of 11 individual SNS (adults and juveniles) in a total of 20 individual net sets (~ 15 net hours), yielding a CPUE of ~ 0.75 sns/net-hour. Although direct comparison of CPUE data across river systems is not appropriate without sufficient data to calibration the index in each river system, catch rates of sns on the Savannah are comparable (within an order of magnitude) to those obtained over the past 7 years on the Altamaha River. This “crude” comparison suggests that the Savannah SNS population is likely to contain 1000 - 2000 individuals; however, a directed population assessment is needed to accurately quantify the population and to assess current abundance trends. The UGA data also suggest that such an assessment is quite feasible provided a similar level of sampling effort can be maintained for at least 4-6 weeks during late spring and early summer.

Ogeechee River - ATS

During the summers (May- Aug) of 2007-2010, the UGA team conducted intensive population assessments of both ATS and SNS using the methods described previously. During these three summers the team expended a total of 1126.26 net-hours and captured a total of 1194 Atlantic Sturgeon. Total annual catches of ATS juveniles were sufficient for a meaningful estimate only in 2007. Using the same estimate procedure described previously the UGA team estimated that total juvenile abundance (including all juvenile cohorts) was 450 fish with a 95% CL of 203-1125. Using length-frequency histograms and fin-spine cross-sections from subsamples of the catch, the team determined that 24% of the juvenile population was comprised of age-1 juveniles. Although the resulting cohort size of 108 is much smaller than age-1 cohorts evaluated on the Savannah and Altamaha River, age-1 fish were present in all 3 years of the study suggesting that the Ogeechee River does support a

small (<1000), but steadily reproducing population. Future assessments should be considered a high-priority as they should document the current population trend and will provide new information about the age structure of the adult stock.

Farrae, D.J., P.M. Schueller, and D. Peterson. 2009. Abundance of juvenile Atlantic Sturgeon in the Ogeechee River, Georgia. *Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies* 63:172–176

Ogeechee River – SNS

During the same study described above to ATS, the UGA team estimated the population of SNS in the Ogeechee River in three consecutive years from 2007-2009. Although the estimates suggest that the population has remained stationary since similar abundance estimates were conducted during the early 2000s (Fleming et al 2003), the UGA team documented repeated movements of fish between the Ogeechee and Altamaha populations. Based on these and subsequent genetic analyses (Wirgin et al. 2010) the team concluded that the Ogeechee population of SNS is not actually a discrete population, but rather, a metapopulation of the Altamaha River.

Table 1. A summary of catch statistics and catch-per-unit-effort (CPUE; fish per net-hour) of shortnose sturgeon captured in the Ogeechee River from June – August, 2007 – 2009.

Year	Total Catch	Recaptures	Unique Individuals	Net Hours	CPUE	Pop Estimate	95% CL
2007	101	12	89	270	0.374	404	175-633
2008	86	12	61	170	0.506	264	126-402
2009	32	2	18	220	0.145	203	32-446

For more information, see:

Douglas L. Peterson & Daniel J. Farrae (2011): Evidence of metapopulation dynamics in Shortnose Sturgeon in the southern part of their range. *Transactions of the American Fisheries Society*. 140:6, 1540-1546

Farrae, D., S. Albeke, K. Pacifici, N. Nibbelink, and D. Peterson. Movements of the Shortnose Sturgeon relative to habitat in the Ogeechee River, Georgia. *Environmental Biology of Fishes*. DOI 10.1007/s10641-013-0170-2

Wirgin, I., C. Grunwald, J. Stabile, and J. R. Waldman. 2010. Delineation of discrete population segments of shortnose sturgeon *Acipenser brevirostrum* based on mitochondrial DNA control region sequence analysis. *Conservation Genetics* 11:689–708

Altamaha River – ATS

The Altamaha population of ATS is the most well studied population of the species within the southern DPS, and possibly within the entire range of the species. During spring 2004 and 2005, the UGA team conducted an intensive mark-recapture sampling effort to estimate the size of the annual adult runs using a combination of large-mesh (8”–16” stretch measure), multifilament gill nets (Table 2).

Table 2. Catch and effort of adult Atlantic sturgeon on the Altamaha River.

Year	# of Net Days	# Captured	# Recaptured
2004	47	67	7
2005	62	93	11
2006	70	84	15
2007	64	76	17

In 2004 the team captured 74 adults of which 7 were recaptured, yielding a run estimate of 324 with a 95% CL of 143-667. In 2005 they tagged 104 adults and recaptured 11, yielding a run estimate of 366 with a 95% CL of 216-787. Age-frequency of adults captured in each year illustrated a young adult population (expanding) with maximum age of only 17 yrs. Limited sex data from the catch suggest that mean age of maturation for adult males and females was approximately age 9 and 12, respectively. Annual mortality estimates from catch curve analysis of the adults captured in both years were 17.3% and 21.3% in 2004 and 2005 respectively. Population should be reassessed within 5 years to evaluate changes in age-structure that indicate trends in spawner abundance that could have major a impact on recruitment, and hence, population trend.

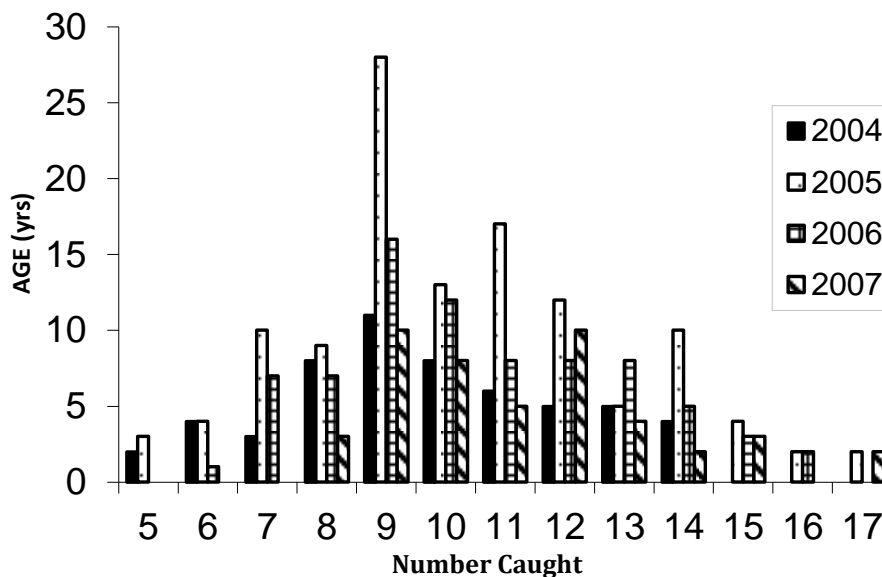


Figure 2. Age-Frequency distribution of adult Atlantic sturgeon captured in the Altamaha, 2004-2007

Assessment of juvenile abundance has been conducted annually in the Altamaha from 2004-2010 (Table 3). During the 7 years of this annual assessment, the UGA team captured and PIT-tagged a total of 3,827 juvenile ATS (ages 1-3) of which 2,046 were age-1 juveniles. Mark-recapture data from these age-1 fish were used to estimate cohort size (with 95% confidence limits) in each year of the study. Point estimates of cohort abundances from these data showed that ATS recruitment steadily increased during the first 6 years of the

study from a low of 483 in 2004, to a high of 6225 in 2010 (Figure 3). Although age-1 abundance declined in 2011, abundance estimates for older juveniles (ages 2-3) were the highest documented during the entire study.

Table 3. Annual catch and effort of age-1 Atlantic sturgeon cohorts in the Altamaha River, 2004-2011.

Year	# Marked	# Recaptured	Effort
2004	79	4	93
2005	226	24	98
2006	52	2	90
2007	220	14	118
2008	131	10	161
2009	316	10	218
2010	1020	67	344
2011	79	2	192
Total	2046	131	1122

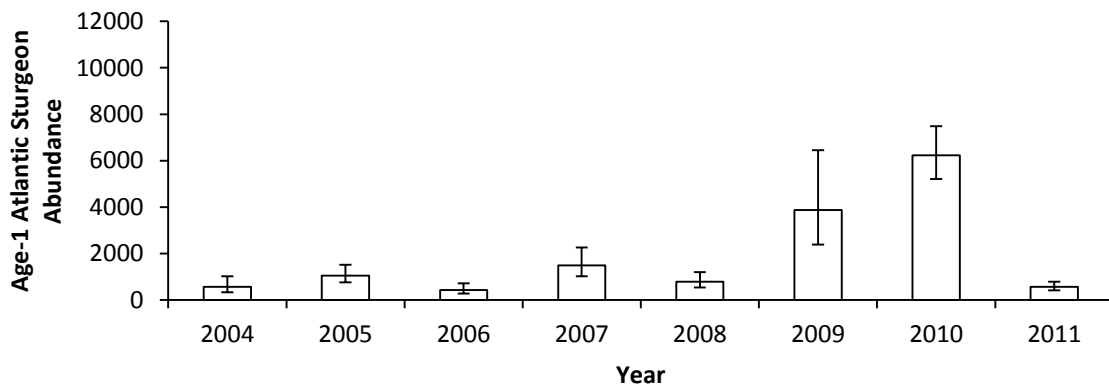


Figure 3. Annual mark-recapture estimates of age-1 Atlantic sturgeon cohorts in the Altamaha River, 2004-2011



Figure 4. Annual abundance of juvenile ATS year classes in the Altamaha River, GA.

To estimate what a “recovered” ATS population might look like, the team used their results on adult and juveniles to construct a simply population model which included the following parameters:

- Max annual recruitment: 6000
- Max longevity: 30 years
- Age at Maturity: 9 years
- Annual Survival after age-1: .81 (Schueller and Peterson 2008)

The results of this modeling exercise showed that a recovered population should contain a total of approximately 4,000 spawning adults. Given the 2005 adult run was estimated to contain approximately 350 fish, the modeling results suggest that the population is currently in the early-mid stages of recovery to pre-fishing levels.

For more information, see:

- Moyer G., J. Sweka, and D. Peterson. 2012. Past and present processes influencing a natural population of Atlantic Sturgeon, *Acipenser oxyrinchus oxyrinchus*. Transactions of the American Fisheries Society 141:56-67
- Peterson, D., P. Schueller, R. Devries, J. Fleming, I. Wirgin, and C. Grunwald. 2008. Annual Run Size and Genetic Characteristics of Atlantic Sturgeon in the Altamaha River, Georgia. Transactions of the American Fisheries Society 137:393–401
- Schueller, P., and D. Peterson, 2010. Abundance and recruitment of juvenile Atlantic sturgeon in the Altamaha River, Georgia. Transactions of the American Fisheries Society 139:1526-1535.

Altamaha River – SNS

The UGA team has also conducted concurrent studies (2004-2010) of SNS on the Altamaha River. During this period, the team has tagged more than 1700 individual sns in a total of 1017.5 net hours (854 net sets) (Table 4). Although point estimates of total abundance were quite variable, ranging from a low of 1206 (95% C.I. 566-2,759) in 2009 to a high of 5,551 (95% C.I. 2,804-11,304) in 2006, adult abundance was much more stable at about 1500-2000 in each year of the study (Figure 5).

Table 4. Mark-recapture data for SNS in the Altamaha River, GA, 2004-2010.

Year	# Marked	#Recaptured	Effort (net-hrs)	Point Estimate For total Population
2004	411	12	89.1	4846
2005	218	8	144.8	2700
2006	295	5	104.0	5551
2007	177	5	123.6	2776
2008	207	10	140.7	1578
2009	117	3	160.1	1206

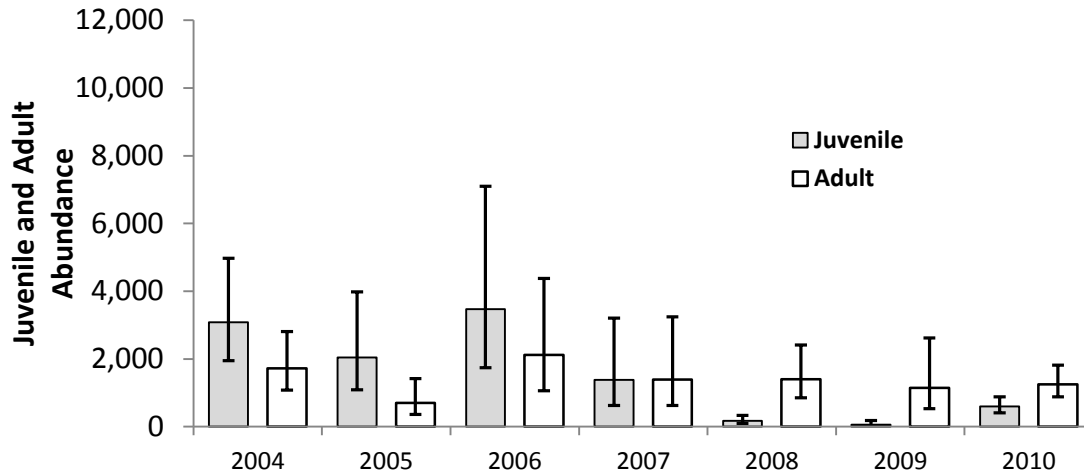


Figure 5. Annual abundance of juvenile (<500 mm TL) and adult (>500 mm TL) SNS in the Altamaha River, GA, 2004-2010.

Results of these data suggest that although the Altamaha population exhibits a much more rapid turnover rate than those in the northern portion of the range, the adult population is stable and reproducing sufficiently to maintain the population.

For more information, see:

Bednarski, M., and D. Peterson Abundance and size structure of Shortnose Sturgeon *Acipenser brevirostrum* in the Altamaha River, Georgia. 2013. Transactions of the American Fisheries Society. DOI:10.1080/00028487.2013.802254

Satilla River - ATS

From fall 2008 through Fall 2010, UGA conducted an intensive stock assessment for both ATS and SNS in the Satilla River. Over the 2.5 years of the study, we conducted a total of 683 net sets (1341 net-hr) yielding a total of 230 Atlantic sturgeon, of which 190 were age-1 juveniles (Table 5). Of these, 17 individuals were recaptured at least once during 2010 yielding a cohort estimate of 154 in that year. These data suggest that the Satilla contains an extant, but small (<1000) population that is currently reproducing only in some years. Genetic analyses (King and Wirgin, unpublished) suggest that the population is genetically distinct from the Altamaha, but that a high percentage of the age-juveniles captured with full or half siblings, suggesting that they were progeny from a single (or very few) females. Further studies are needed to better understand population trend, limiting factors, and the genetic structure of what appears to be a remnant population.

Table 5. Mark-recapture data for age-1 ATS in the Satilla River, GA, 2008-2010.

Year	Net Sets	Effort (net-hrs)	# Age-1 Caught	#Age-1 Recaptured	Age-1 Estimate (95% CL)
2008	69	58	8	0	--

2009	256	778	28	3	--
2010	359	511	154	17	154 (108-231)

Satilla River – SNS

No shortnose sturgeon were captured in 2008 or 2009, but during summer of 2010, a total of 11 shortnose sturgeon were captured, tagged, and released (Table 6). None of these tagged individuals were subsequently recaptured, precluding any possible abundance estimate; however, the capture of several juveniles (<500 mm TL), indicates that Satilla River still contains a small (< 500 individuals), but successfully reproducing population. Tissue samples collected from captured sns during the UGA study have not yet been analyzed but these data will be critical in evaluating the genetic contribution of the Satilla population to the overall genetic diversity of the SE dps. Future assessment of this population should be considered a high-priority for determining population trend and long-term viability.

Table 6. Total catch of SNS in the Satilla River, GA, 2004-2010.

Capture Date	Capture Location (rkm)	TL (mm)	Wt. (g)	Life Stage
27-Jan-10	21	751	2100	Adult
27-Jan-10	21	791	2250	Adult
7-Apr-10	26	427	325	Juvenile
7-Apr-10	26	410	350	Juvenile
21-Apr-10	31	734	2050	Adult
27-May-10	35	838	3400	Adult
2-Jun-10	37	965	5300	Adult
2-Jun-10	37	424	360	Juvenile
2-Jun-10	39	738	2350	Adult
2-Jun-10	39	685	2550	Adult
29-Jun-10	47	967	4650	Adult

St. Marys River GA – SNS and ATS

From 2008-2010, UGA conducted a population status assessment for both Atlantic sturgeon and Shortnose sturgeon in the St. Marys River Estuary as part of the same population status evaluation described previously for the Satilla River.

In nearly two years of sampling, a total of 612 individual net sets yielded a sampling effort of 1504 net-hrs (or 150,400 net-meter-hrs). In 2008, no sturgeons of either species were captured in a total of 73 net-hrs of sampling. In 2009, one adult shortnose sturgeon (933 mm TL, 4000 g) was captured in 877 net-hrs of effort. In 2010, a total of nine Atlantic sturgeon were captured in total of 533 net-hrs of sampling. All Atlantic sturgeon captured during in 2009 and 2010 were large (migratory) juveniles, ranging from 592-1081 mm (mean TL = 740.4 mm; SD = 145.4 mm) (Table 7).

Despite the lack of river-resident juveniles of either species captured during our 2.5 year study, migratory juvenile ATS in both 2009 and 2010. Given the current abundance of

both species in the nearby Altamaha River (Peterson et al. 2008; Schueller and Peterson 2010) re-colonization from the Altamaha may be plausible given time and further reductions of pervasive hypoxia throughout the Saint Marys River. Our current assessment is that both species may be extirpated, but that migratory individuals of both species (adults sns; subadult ATS) are still present in the St. Marys, suggesting that re-colonization is likely provided water quality and other habitat variables are not further degraded.

Table 7. Total catch of SNS and ATS in 1504 gillnet-hours of sampling in the St Marys River, GA, from Sept, 2008 to Aug, 2010.

Species	Capture Date	Capture Location (rkm)	TL (mm)	Wt (g)	Life Stage
<i>SNS</i>	27-Oct-2009	39	933	4000	Adult
<i>ATS</i>	10-Mar-2010	16	764	1750	Subadult
<i>ATS</i>	3-Jun-2010	34	729	2050	Subadult
<i>ATS</i>	3-Jun-2010	34	712	1850	Subadult
<i>ATS</i>	3-Jun-2010	34	822	3100	Subadult
<i>ATS</i>	7-Jun-2010	33	637	1200	Subadult
<i>ATS</i>	7-Jun-2010	33	676	1650	Subadult
<i>ATS</i>	7-Jun-2010	33	651	1600	Subadult
<i>ATS</i>	7-Jun-2010	33	1081	7250	Subadult
<i>ATS</i>	7-Jun-2010	33	592	1000	Subadult

APPENDIX No. 3

Table 1: Listing of similar shortnose sturgeon ESA permits range-wide affecting the scope of the Proposed Action

<u>10115*</u> Expired: 8/3/2013	Saltilla & Saint Marys Rivers, GA & FL	85 adult/juv 20 ELS	Capture, handle, measure, weigh, PIT tag, tissue sample, collect ELS
<u>14394</u> Expires: 9/30/14	Altamaha River and Estuary, GA	500 adult/juv. (1 lethal), 100 ELS	Capture, handle, weigh, measure, PIT tag, transmitter tag, tissue sample, anesthetize, laparoscopy, blood collection, fin ray section, collect ELS
<u>10037*</u> Expired: 4/30/2013	Ogeechee River and Estuary, GA	150 adult/juv. (2 lethal), 40 ELS	Capture, handle, measure, weigh, PIT tag, tissue sample, fin-ray section, anesthetize, laparoscopy, blood collection, radio tag, collect ELS
<u>15677</u> Expires: 5/31/2016	S. Carolina Rivers and Estuaries	154 adult/juv 100 ELS	Capture with gill & trammel net or trawl, measure, weigh, photograph/video, dart tag, PIT tag, genetic tissue sample, anesthetize, laparoscopy, gonadal biopsy, blood sample; collect ELS
<u>14759</u> Expires: 8/19/2015	North Carolina Rivers	70 adult/juv.	Capture, handle, weigh measure, Floy tag, PIT tag, genetic tissue sample; anesthetize acoustic tag
<u>14176</u> Expires: 9/30/2015	Potomac River	30 adult/juv. 20 ELS	Capture, handle, weigh, measure, Floy PIT tag, genetic tissue sample; anesthetize w/ electronarcosis; & internal acoustic tag
<u>14604</u> Expires: 4/19/2015	Delaware River and Estuary NJ & DE	1,000 adult/juv. (1 lethal), 300 ELS	Capture, handle, measure, weigh, Floy tag, PIT tag, tissue sample, anesthetize, ultrasonic tag, laparoscopy, blood collection, collect ELS
<u>14396</u> Expires: 12/31/2014	Delaware River and Estuary NJ & DE	100 adult/juv	Capture, handle, measure, weigh, Floy tag, PIT tag, genetic tissue sample, anesthetize, and sonic tag
<u>16439</u> Expires:10/31/2016	Hudson River (NYSDEC),	240 and 2,340 shortnose sturgeon in year 1-3 and year 4-5,	Capture, handle, weigh, measure, PIT & Carlin tag, genetic tissue sample, and gastric lavage
<u>17095-01</u>	Hudson River (Utility Trawl)	82- SNS adult/juv 40 SNS ELS	Non-lethal capture, handle, measure, weigh, scan for tags, PIT tag, Dart tag, photograph, tissue sample, and release
		200 ATS adult/juv 40 ATS ELS	
<u>15614</u> Expires: 5/23/2016	Lower Conn. River & Estuary,	500 adult/juv (2 lethal); 300 ELS	Capture, handle, measure, weigh, PIT & Floy tag acoustic tag, gastric lavage, fin ray section, collect ELS
<u>16549</u> Expires 4/1/2018	Upper Conn & GOM Rivers	300 adult/juv 150 ELS	Capture, handle, measure, weigh, PIT tag, genetic tissue sample, boroscope, anesthetize, and externally sonic tag
<u>16306</u> Expires: 5/21/2017	Gulf of Maine, ME, & MA	500 adult/juv.; 30 ELS	Capture, handle, measure, weigh, tissue sample, PIT tag, acoustic tag, lavage, anesthetize, collect ELS

Note: Highlighted rows in darker blue designate rivers within or bordering the Proposed Action

* Expired permit within the action area

Table 2: Listing of similar Atlantic sturgeon ESA permits range-wide affecting the scope of the Proposed Action

Permit Number	Location	Authorized Take	Research Activity
<u>16526</u> Expires: 4/6/2017	Gulf of Maine Rivers and coastal areas	875 adult/juv, 300 ELS, 3 morts	Capture, handle, measure, weigh, PIT tag, foy/T-bar tag, tissue sample, internal tag, external tag, collect ELS, blood sample, apical spine sample, fin ray sample, anesthetize, boroscope, lavage.
<u>16323</u> Expires: 4/6/2017	Connecticut River and Long Island Sound	200 adult/sub-adult	Capture, handle, weigh, measure, PIT tag, floy/T-bar tag, transmitter tag, tissue sample, anesthetize, fin ray section
<u>16422</u> Expires: 4/6/2017	Coastal water between Long Island Sound and Delaware River	325 adult/sub-adult	Capture, handle, measure, weigh, PIT tag, dart tag, tissue sample, fin-ray section, anesthetize, blood collection, gill biopsy, external/PSAT tag, body tissue biopsy
<u>16436</u> Expires: 4/6/2017	Hudson River and estuary	1550 adult/juv 2 morts	Capture, handle, measure, weigh, dart tag, PIT tag, genetic tissue sample, anesthetize, gastric lavage, internal tag, external tag
<u>16507</u> Expires: 4/6/2017	Delaware River and coastal waters	510 juv., 350 ELS	Capture, handle, weigh, measure, Floy tag, PIT tag, genetic tissue sample; anesthetize, fin ray section, gonad tissue sample, internal sonic tag, external satellite tag,
<u>16431</u> Expires: 4/6/2017	Delaware River estuary	240 juv., 1 mort	Capture, handle, weigh, measure, Floy tag, PIT tag, genetic tissue sample, anesthetize, internal acoustic tag, gastric lavage, fin ray section
<u>16438</u> Expires: 4/6/2017	Delaware River Estuary	284 juv., 50 ELS, 1 mort	Capture, handle, measure, weigh, Floy tag, PIT tag, tissue sample, anesthetize, internal sonic tag, laparoscopy, blood collection, gastric lavage, collect ELS
<u>16547</u> Expires: 4/6/2017	Chesapeake Bay and its Tributaries, MD and VA	600 adult/juv., 25 ELS, 3 morts	Capture, handle, measure, weigh, Floy tag, PIT tag, genetic tissue sample, anesthetize, external sonic tag, internal sonic tag, fin ray section
<u>16375</u> Expires: 4/6/2017	North Carolina Rivers and Albemarle Sound	200 adult/juv.	Capture, handle, weigh, measure, PIT tag, floy tag, genetic tissue sample, anesthetize, internal tag,
<u>16442</u> Expires: 4/6/2017	South Carolina Rivers	400 adult/juv 50 ELS	Capture, handle, measure, weigh, PIT tag, dart tag, genetic tissue sample, anesthetize, internal acoustic tag, gonad biopsy, collect ELS
<u>16482</u> Expires: 4/6/2017	Georgia Rivers and coastal waters	204 adult/sub-adt, 3270 juv., 250 ELS, 6 morts.	Capture, handle, measure, weigh, tissue sample, PIT tag, floy tag, anesthetize, internal/external acoustic tag, fin ray section, laparoscopy, internal acoustic tag, gonad biopsy, collect ELS
<u>16508</u> Expires: 4/6/2017	Florida/Georgia Rivers	20 ATS St. Marys 20 ATS Nassau 20 ATS St. Johns	Capture, handle, measure, weigh, tissue sample, PIT tag, floy tag, external sonic tag

Note: Highlighted rows in dark blue designate rivers within or bordering the Proposed Action, including the original permit