UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

NOV 23 2011

To All Interested Government Agencies and Public Groups:

Under the National Environmental Policy Act (NEPA), an environmental review has been performed on the following action.

TITLE: *Environmental Assessment on the Effects of the Issuance of a Scientific Research Permit (File No. 16439) to Conduct Scientific Research on Shortnose Sturgeon in the Hudson River*

LOCATION: Netting would take place within the Hudson River Estuary from New York Harbor to Troy Dam.

SUMMARY: The current Environmental Assessment (EA) analyzed the effects of shortnose sturgeon research on the environment within the Hudson River Estuary. Specifically, the applicant is seeking a five-year scientific research permit characterizing habitat use, population abundance, reproduction, juvenile recruitment, age and growth, temporal and spatial distributions, diet selectivity, and contaminant load of shortnose sturgeon captured from the Hudson River Estuary from New York Harbor to Troy Dam. The applicant would use anchored and drift gill nets and trawls capturing up to 240 and 2,340 shortnose sturgeon during year 1-3 and year 4-5, respectively. Research activities would also include: measuring, weighing; tagging unmarked individuals with passive integrated transponder and Floy tags; and sampling tissue for genetic analysis. A first subset of fish would be anesthetized and tagged with acoustic transmitters; a second subset would have fin rays sampled for ageing; and a third subset of fish would have gastric contents lavaged for diet analysis, as well as have blood samples taken for contaminant testing. A total of four unintended mortalities are requested over the life of the permit.

The proposed action analyzed in the EA would not have significant environmental effects on the target or non-target species; public health and safety would not affected; no unique geographic area would be affected; and the effects of this study would not be highly uncertain, nor would they involve unique or unknown risks. Issuance of this permit would not set a precedent for future actions with significant effects, nor would it represent a decision in principle about a future consideration. There would not be individually insignificant but cumulatively significant impacts associated with the proposed action, and there would not be adverse effects on historic resources. The permit would contain mitigating measures to avoid unnecessary stress to the subject animals.

RESPONSIBLE
OFFICIAL: James H. Lecky
Director, Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910
(301) 713-2332

The environmental review process led us to conclude this action will not have a significant effect on the human environment. Therefore, an environmental impact statement will not be prepared. A copy of the finding of no significant impact (FONSI) including the supporting EA is enclosed for your information.

Although NOAA is not soliciting comments on this completed EA/FONSI, we will consider any comments submitted assisting us to prepare future NEPA documents. Please submit any written comments to the responsible official named above.

Sincerely,

Paul N. Doremus, Ph.D.
NOAA NEPA Coordinator

Enclosure

ENVIRONMENTAL ASSESSMENT (EA)
ON THE EFFECTS OF THE ISSUANCE OF A SCIENTIFIC RESEARCH PERMIT (File No. 16439) TO CONDUCT SCIENTIFIC RESEARCH ON SHORTNOSE STURGEON IN THE HUDSON RIVER

Lead Agency:	USDC, National Oceanic and Atmospheric Administration National Marine Fisheries Service, Office of Protected Resources
Responsible Official:	James H. Lecky, Director, Office of Protected Resources
For Further Information Contact:	Office of Protected Resources National Marine Fisheries Service 1315 East West Highway Silver Spring, MD 20910 (301) 713-2289
Location:	Hudson River Estuary: New York Harbor to Troy NY

Abstract: The National Marine Fisheries Service (NMFS) proposes to issue a scientific research permit to New York State Department of Environmental Conservation (NYSDEC) 21 South Putt Corners Rd., New Paltz, NY 12561 (Kathryn Hattala, Responsible Party), for takes of shortnose sturgeon (*Acipenser brevirostrum*) in the wild, pursuant to the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.*).

The applicant is seeking a five-year scientific research permit to characterize habitat use, population abundance, reproduction, juvenile recruitment, age and growth, temporal and spatial distributions, diet selectivity, and contaminant load of shortnose sturgeon captured from the Hudson River Estuary from New York Harbor to Troy Dam. The applicant proposes using anchored and drift gill nets and trawls capturing up to 240 and 2,340 shortnose sturgeon during year 1-3 and year 4-5, respectively. Research activities would also include: measuring, weighing; tagging unmarked individuals with passive integrated transponder and Floy tags; and sampling tissue for genetic analysis. A first subset of fish would be anesthetized and tagged with acoustic transmitters; a second subset would have fin rays sampled for ageing; and a third subset of fish would have gastric contents lavaged for diet analysis, as well as have blood samples taken for contaminant testing. A total of four unintended mortalities are requested over the life of the permit.

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CHAPTER 1 PURPOSE AND NEED FOR ACTION

1.1 DESCRIPTION OF ACTION

In response to a request from the New York State Department of Environmental Conservation (NYSDEC) 21 South Putt Corners Rd., New Paltz, NY 12561 (Kathryn Hattala, Responsible Party) (File No. 16439), the National Marine Fisheries Service Office of Protected Resources (NMFS-PR) proposes to issue a scientific research permit. The permit would authorize "takes"[1] of shortnose sturgeon (*Acipenser brevirostrum*) in the Hudson River Estuary pursuant to the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq*.) and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226).

1.1.1 *Purpose and Need*:

The purpose of the aforementioned scientific research would be to gather information used to help inform conservation management decisions to recover shortnose sturgeon in the wild. Section 10(a)(1)(A) of the ESA allows NMFS to issue permits and permit modifications to take ESA-listed shortnose sturgeon. The applicant requires a permit to conduct the proposed research.

The primary purpose of the permit, therefore, is to provide an exemption from the take prohibitions under the ESA to allow "takes" of shortnose sturgeon for bona fide scientific research. The need for issuance of the permit is related to NMFS's mandates under the ESA. Specifically, NMFS has a responsibility to implement the ESA to protect, conserve, and recover threatened and endangered species under its jurisdiction. The ESA prohibits takes of threatened and endangered species, respectively, with only a few very specific exceptions, including for scientific research and enhancement purposes. Permit issuance criteria require that research activities are consistent with the purposes and policies of these federal laws and will not have a significant adverse impact on the species.

1.1.2 *Objectives of the research*:

The applicant is seeking a five-year scientific research permit to characterize habitat use, population abundance, reproduction, juvenile recruitment, age and growth, temporal and spatial distributions, diet and contaminant analysis of the shortnose sturgeon population in the Hudson River Estuary from the New York Harbor to Troy Dam.

1.2 OTHER EAs/SEAs INFLUENCING THE SCOPE OF THIS EA

A number of EAs have been prepared on the effects of similar research techniques related to the proposed action. Appendix 1 lists recently issued NMFS permits or permit modifications for shortnose sturgeon for which EAs or SEAs were prepared. Each EA resulted in a Finding of No Significant Impact (FONSI) determination and has not been controversial.

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1 The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The term "harm" is further defined by regulations (50 CFR §222.102) as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns including breeding, spawning, rearing, migrating, feeding, or sheltering."

If the applicant's current application (File 16439) results in a permit being issued, the permit would replace an existing permit (NMFS Permit 1547-02, expiring October 31, 2011) utilizing similar research methods and take authorizations studying shortnose sturgeon in the Hudson River.

The original EA for File No. 1547 was prepared by NMFS PR in October 2006 entitled "*Environmental Assessment of Issuance of a Scientific Research Permit to New York State Department of Environmental Conservation (File No. 1547*)." This EA evaluated the effects for non-lethal research capturing up to 500 adult and juvenile shortnose sturgeon annually with gill nets, measuring, weighing, scanning for tags, PIT and Carlin tagged (if untagged), and releasing. No lethal take of shortnose sturgeon was authorized. The activities were not expected to significantly affect the environment.

The first of two additional Supplemental Environmental Assessments (SEA) was entitled "*Supplemental Environmental Assessment (SEA) of the Issuance of a Scientific Research Permit Modification (File No. 1547-01) to New York State Department of Environmental Conservation for Conducting Research on Endangered Shortnose Sturgeon*." The SEA [File 1547-01] finalized March 22, 2007, supplemented the analysis specific to the additional effects associated with the proposed genetic tissue sampling. The new activity was not expected to significantly affect the environment.

The second SEA prepared entitled "*Supplemental Environmental Assessment (SEA) of the Issuance of a Scientific Research Permit Modification (File No. 1547-02) to New York State Department of Environmental Conservation for Conducting Research on Endangered Shortnose Sturgeon*," was finalized March 19, 2009. This SEA supplemented the analysis specific to potential additional effects associated with the proposed gastric lavage. The new activity was not expected to significantly affect the environment.

1.3 SCOPING SUMMARY

The purpose of scoping is identifying the issues to be addressed and the significant issues related to the proposed action, as well as identifying and eliminating from detailed study of the issues not significant or those previously covered by prior environmental review. An additional purpose of the scoping process is identifying the concerns of the affected public and Federal agencies, states, and Indian tribes. CEQ regulations implementing the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) do not require a draft EA be made available for public comment as part of the scoping process.

A Notice of Receipt of the application was published in the Federal Register (June 9, 2011; 76 FR 33703) announcing the availability of the application for permit and related documents for public comments (File No 16439). However, no comments were received from the public regarding this application. Comments from NMFS Northeast Regional Office were also solicited and were appropriately addressed within the EA and decision memos with respect to how the permit would authorize standard, well known and non-controversial research techniques.

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

This section summarizes federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the proposed action, as well as who is responsible for obtaining them. Even when it is the applicant's responsibility to obtain such permissions, NMFS is obligated under NEPA to ascertain whether the applicant is seeking other federal, state, or local approvals for their action.

1.4.1 *National Environmental Policy Act*:

The National Environmental Policy Act (NEPA) was enacted in 1969 and is applicable to all "major" federal actions significantly affecting the quality of the human environment. A major federal action is an activity fully or partially funded, regulated, conducted, or approved by a federal agency. NMFS issuance of permits for research represents approval and regulation of activities. While NEPA does not dictate substantive requirements for permits, licenses, etc., it requires consideration of environmental issues in federal agency planning and decision making. The procedural provisions outlining federal agency responsibilities under NEPA are provided in the Council on Environmental Quality's implementing regulations (40 CFR Parts 1500-1508).

NMFS, through NOAA Administrative Order (NAO) 216-6, follows agency procedures for complying with NEPA and the implementing regulations issued by the Council on Environmental Quality. NAO 216-6 specifies issuing scientific research permits under the MMPA and ESA is among a category of actions generally exempted (categorically excluded) from further environmental review, except under extraordinary circumstances. When a proposed action, otherwise categorically excluded, is (1) the subject of public controversy based on potential environmental consequences; (2) has uncertain environmental impacts or unknown risks; (3) establishes a precedent or decision in principle about future proposals, may result in cumulatively significant impacts; or (4) may have an adverse effect upon endangered or threatened species or their habitats, preparation of an Environmental Assessment (EA) or Environmental Impact Statement (EIS) is required.

While issuance of scientific research permits is typically subject to a categorical exclusion, as described in NAO 216-6, NMFS is preparing an EA for this action providing a more detailed analysis of effects to ESA-listed species. This EA therefore is prepared in accordance with NEPA, its implementing regulations, and NAO 216-6.

1.4.2 *Endangered Species Act*:

Section 9 of the ESA, as amended, and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption such as by a permit. Permits to take ESA-listed species for scientific purposes, or for the purpose of enhancing the propagation or survival of the species, may be granted pursuant to section 10(a)(1)(A) of the ESA.

NMFS has promulgated regulations to implement the permit provisions of the ESA (50 CFR Part 222) and has produced OMB-approved application instructions prescribing the procedures necessary to apply for permits. All applicants must comply with these regulations and application instructions in addition to the provisions of the ESA.

Section 10(d) of the ESA stipulates for NMFS to issue permits under section 10(a)(1)(A) of the ESA, the Agency must find that the permit: was applied for in good faith; if granted and exercised will not operate to the disadvantage of the species; and will be consistent with the purposes and policy set forth in section 2 of the ESA.

Section 2 of the ESA sets forth the purposes and policy of the Act. The purposes of the ESA are to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in section 2(a) of the ESA. It is the policy of the ESA that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of the ESA. In consideration of the ESA's definition of conserve, which indicates an ultimate goal of bringing a species to the point where listing under the ESA is no longer necessary for its continued existence (i.e., the species is recovered), exemption permits issued pursuant to section 10 of the ESA are for activities that are likely to further the conservation of the affected species.

Section 7 of the ESA also 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 a permit affecting ESA-listed species or designated critical habitat, directly or indirectly, is a federal action subject to these section 7 consultation requirements. Section 7 requires federal agencies to use their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of endangered and threatened species. NMFS is further required to ensure any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of habitat for such species. Regulations specify the procedural requirements for these consultations (50 Part CFR 402).

1.4.3 *Magnuson-Stevens Fishery Conservation and Management Act*

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) requires NMFS to complete an Essential Fish Habitat (EFH) consultation for any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by the agency that may adversely affect EFH.

CHAPTER 2: ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes the range of potential actions (alternatives) determined reasonable with respect to achieving the stated objectives. The expected outputs and any related mitigation of each alternative is also included. Alternative Number 1 is the "No Action" alternative where the proposed permit would not be issued. The No Action alternative is the baseline for the rest of the analyses. Alternative No. 2 is the "Proposed Action" alternative representing the research proposed in the submitted application for a permit, with standard permit terms and conditions specified by NMFS.

2.1 ALTERNATIVE No. 1: NO ACTION

Under this alternative, the No Action alternative, the scientific research permit (File No. 16439) authorizing capturing shortnose sturgeon with gill and trawls nets; measuring, weighing, tagging with PIT tags, Floy tags and sonic tags, anesthetizing, sampling genetic tissues, fin rays, blood work, gastric lavage, and lethal incidental take would not be issued at this time.

Under the No Action alternative, no permit would be issued for the activities proposed by the applicant. This alternative would eliminate any potential risk to the environment from the proposed research activities. However, it would not allow the research to be conducted, and the opportunity would be lost to collect information that would contribute to better understanding shortnose sturgeon populations and provide basic information that is necessary for NMFS to make important management decisions concerning these species and their habitat.

2.2 ALTERNATIVE No. 2: PROPOSED ACTION –ISSUANCE OF PERMIT WITH STANDARD CONDITIONS

Under this alternative, the Proposed Action alternative, a permit would be issued for proposed research activities, the permit terms and conditions standard to such permits as issued by NMFS. The permit would be valid for five years authorizing year round sampling methods on adult, sub-adult and juvenile shortnose sturgeon. Research activities would include: capturing via gill nets and trawl nets; measuring and weighing; tagging with PIT and Floy tags; and sampling tissue for genetic analysis. A subset of adults and sub-adults would annually be anesthetized and acoustic transmitters implanted. Another subset adults, sub-adults, and juveniles would be fin ray sampled for age and growth analysis. Another subset of adults, sub-adults and juveniles would have stomach contents lavaged for diet analysis and blood samples taken for contaminant analysis on these fish. Finally, up to two annual unintended mortalities or serious harm resulting from research would be authorized during years four and five of the permit.

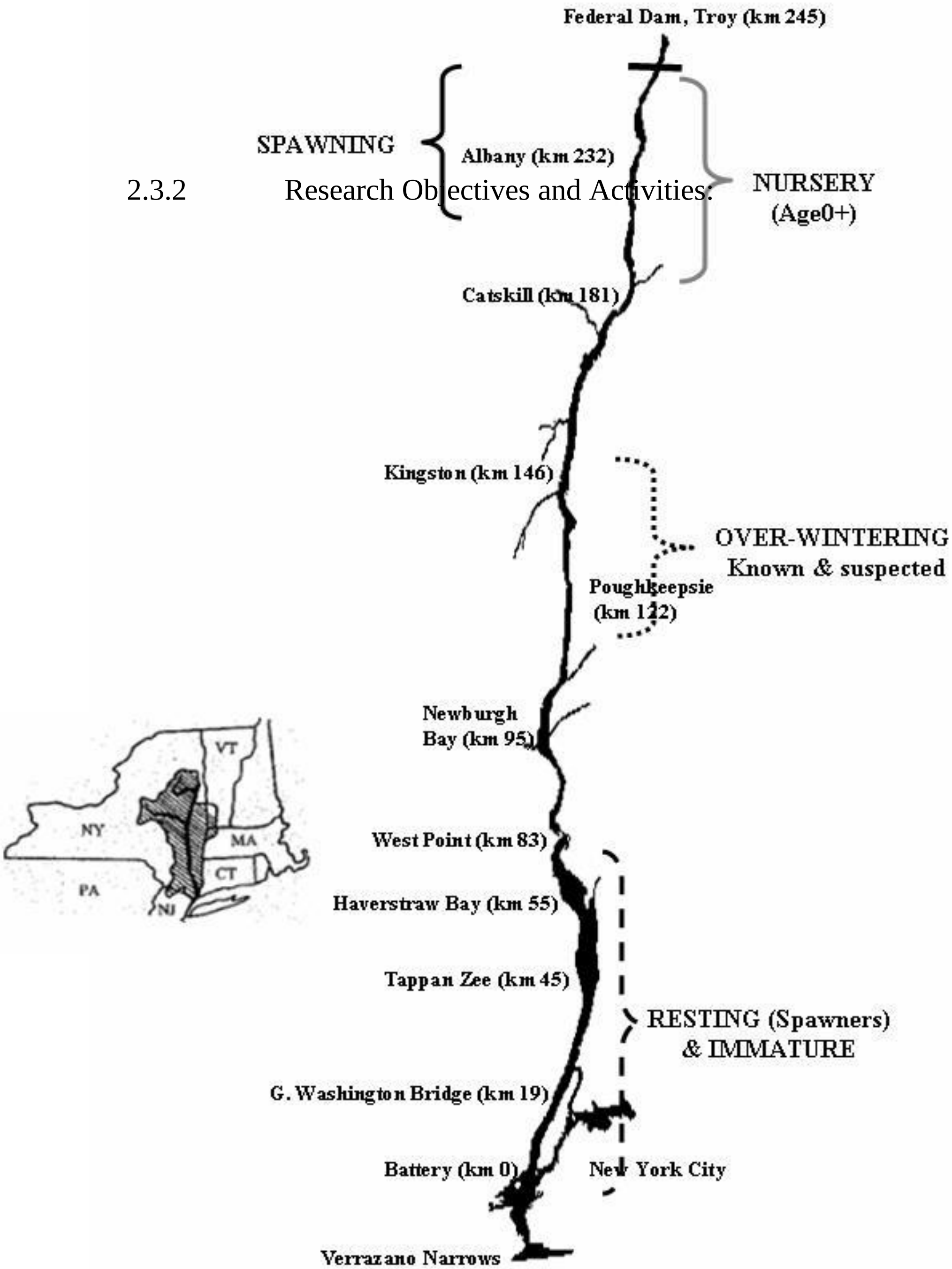
2.3 DESCRIPTION OF THE PROPOSED ACTION

2.3.1 *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 proposed action area consists of the Hudson Estuary, from New York Harbor to the Troy Dam.

The proposed action area consists of the Hudson River Estuary, tidal along its entire 245 km length from New York Harbor to the Federal Dam at Troy, NY (Figure 1). The upper two-thirds of the river is freshwater with saltwater intrusion in the lower third occurring as far north as West Point (km 83) in the late spring. During the summer months it can move as far north as Poughkeepsie (km 122). The river is classified as a ‘drowned’ river valley, straight and fairly deep in some sections, especially in the Hudson Highlands near West Point, where the river is greater than 60 m in depth. In the lower 70 km, the river opens into two large wide, shallow “bays”, Haverstraw Bay and the Tappan Zee, before narrowing down to a deep section just above New York harbor.

Figure 1. Map of Hudson River Estuary and locations of key critical habitat



2.3.2 Research Objectives and Activities:

2.3.2 *Research Activities*:

2.3.2.1 *Summary of Proposed Take*:

	Table 1. Activities proposed under Permit No. 16439, years 1-5				
	Life stage/sex*	Take number	Purpose	Procedures	Study period
1)	Adult, sub-adult and juvenile (Acoustic Tagging and Tracking Study-Habitat)	Up to 100 annually (50 adult, 30 sub-adult & 20 juveniles)	Monitor SNS acoustically habitat usage and movement	Capture, measure, weigh, scan for tag, PIT and Floy tag if untagged, genetic tissue sample, anesthesia, and **internal sonic tagging and tracking**	Years: 1-3
2)	Juvenile (Abundance Survey)	Up to 100 annually	Monitor SNS co-occurring with Atlantic sturgeon	Capture, measure, weigh, scan for tag, PIT and Floy tag if untagged, genetic and tissue sample	Years 1-5
	Adult, sub-adult (Gastric Lavage and Contaminant)	Up to 40 annually	Monitor SNS co-occurring with Atlantic sturgeon	Capture, measure, weigh, scan for tag, PIT and Floy tag if untagged, **tissue sample**, **blood sample** (for contaminant and genetic analysis), anesthesia, and **gastric lavage**	Years: 1-5
3)	Adult, sub-adult or juvenile (Aging Study)	Up to 200 annually	Age and growth analysis	Capture, measure, weigh, scan for tag, PIT and Floy tag if untagged, genetic tissue sample, anesthesia, and **fin ray sample**	Years: 4-5
	Adult, sub-adult, or juvenile (Population Est.)	Up to 2,000 annually	Mark-recapture population estimate	**Capture**, measure, weigh, scan for tag, PIT and Floy tag if untagged, genetic tissue sample	Years: 4-5
4)	Adult, sub-adult, or Juvenile (Lethal take)	Yr 1,2,3= 0 Yr 4, 5 = 4	Incidental mortality	**Lethal take**	Years: 1-5

*Adult (≥ 550mm), Sub-adult (400-550mm) and Juvenile (< 400mm), sexes combined

2.3.2.2 *Summary of Proposed Research Methods*:

The applicant's proposed research methods are described in the following narrative.

Year 1-3: {Acoustic Tagging and Tracking Study}: For the first three years of the permit, a stratified sampling and telemetry study would characterize the distribution and movement of adult and sub-adult shortnose sturgeon within the Hudson River Estuary. One field crew would focus on capturing and tagging up to 100 adult, sub-adult and juvenile shortnose sturgeon while a second crew would concentrate on tracking and maintaining stationary receivers deployed along the expanse of the Hudson River Estuary. Fish would be captured by multi-mesh experimental gill nets and trawls fished every weekday throughout the estuary during the ice-free period of the year. Fish would be processed (e.g., measured, PIT-tagged, sampled, etc.) following standard protocols (Moser et al. 2000; Kahn & Mohead 2010). Only sturgeon in good condition would be anesthetized and surgically fitted with internal Lotek Wireless, Inc. acoustic tags (Dual mode MAP/r-code, specifications located at: http://www.lotek.com/ma-coded-acoustic-transmitters.htm) having a transmitter detection range of 0.6 -3.2 km depending on hydrological conditions.

Year 1-5: {Juvenile Abundance Survey}: During each year of the study from March through April, up to 100 shortnose sturgeon juveniles would be captured by gill net in the Haverstraw Bay of the Hudson River, handled, and marked with Floy and Passive Integrated Transponder (PIT) tags. Based on previous study, fish caught are anticipated to range from non-spawning adults, pre-spawn adult and large juveniles ranging in length from 404-773mm FL (Annual reports, permits #1226 and 1547) with the majority of shortnose sturgeon collected ranging from 500-700mm FL.

Netting efforts would be distributed across four different bottom habitat types (soft deep, soft shallow, hard deep, hard shallow) in the Haverstraw Bay where Atlantic sturgeon juveniles also co-occur. The researcher's largest annual catch of shortnose sturgeon in previous annual reports to NMFS has been 88 individuals; hence, over the five year permit period 100 individuals are requested annually.

{Gastric Lavage Study}: A diet selectivity study is also proposed using gastric lavage to sample the gut contents of up to 40 additional sub-adult fish or juvenile shortnose sturgeon annually in the juvenile survey. Once the results from the diet selectivity study are analyzed, samples would be compared with those obtained from co-occurring Atlantic sturgeon encountered. Additionally, concurrent sampling would take place measuring the availability of benthic food organisms with grab-samples of benthic organisms taken at random capture locations. These samples would be compared with extensive benthic habitat database gathered in the Hudson River Estuary over the last fifteen years.

{Contaminant Study}: The next proposed study in year one through five would address the effects of contaminant loading and uptake of various toxins in sturgeon, the levels of which are currently unknown. Forty blood samples would be collected from those sampled in the above gastric lavage study and would be included in the contaminant study. Genetic tissue samples would also be collected for the same purpose.

Year 4-5: {Age/Growth Study}: During years one through five, research activities would include an age and growth study, taking fin-ray samples from up to 200 adult, sub-adult and juvenile shortnose sturgeon. These fish would also be measured weighed, PIT tagged and Floy tagged if untagged, genetic tissue sampled, and anesthetized.

{Mark-recapture Population Estimate}: During the fourth and fifth years of the study, the applicant proposes to capture up to 2,000 shortnose sturgeon adult and sub-adults included in a mark–recapture tagging study in order to develop an accurate population estimate of the shortnose sturgeon adult and sub-adult segment in the Hudson River. The population model assumptions would be developed during years 1-3 based on the seasonal distribution of shortnose sturgeon found in the acoustic survey. All sturgeon in the mark-recapture study would be weighed, measured, PIT and external Floy tagged (if untagged), and genetic tissue sampled.

- ***Capturing*:**

Adult, sub-adult and juvenile shortnose sturgeon would be captured using a standardized netting protocol (anchored and drift gill net sets and trawls) throughout the duration of the study.

Anchored Gill Netting: Sturgeon will be captured by multi-mesh experimental gill nets fished every weekday throughout the estuary during the ice-free period of the year. Additional sampling will occur at known or suspected shortnose sturgeon aggregation areas in late winter and spring to obtain fish for tagging. Gill nets will consist of monofilament nets varying between 5 cm (2-inch) and 18 cm (7-inch) stretched mesh, 61 m long by 2.4 m deep sampling for adult and sub-adult shortnose sturgeon. Anchored gill nets would be set parallel to the river flow to fish the bottom 1.8 m of the water column throughout the river. Net would be set for 30 minutes to 4 hours per site, the duration of sets being dependant on location, time of year, temperature and dissolved oxygen (D.O.) regimes.

The net-set protocol summarized in Table 2below would be adhered to. Gill nets would be set in waters having minimum D.O. concentrations of 4.5 mg/L. Further, no netting activity would take place below 0°C or above 28°C; and no surgical procedures would take place below 7°C or above 27°C. If water temperature is outside of these limits, sturgeon would only be measured, weighed, photographed, PIT and Floy tagged and genetic tissue sampled before being recovered and released as soon as possible. The maximum net set duration would be 4 hours with nets tended during daylight hours. Other durations are also limited by water temperature ranges as indicated below.

Table 2: Summary of general netting conditions (all net sets must be attended in daylight)

Water Temperature (ºC)	Minimum D.O. Level (mg/L)	Maximum Net Set Duration (hr)
0 ≤ 15	4.5	4
15 ≤ 25	4.5	2
25 ≤ 27	4.5	1.0
27≤ 28*	4.5	0.5
>28	N.A.	Cease Netting

*Sturgeon must be released within 30 minutes of removal from capture net; only minimal procedures (e.g., PIT/Floy tagging, tissue sample, measuring, weighing) would be performed.

Drift Gill Netting: The applicant proposes to use drift gill nets drifting on the rising tide or in slack tide until just after high tide for durations of approximately thirty minutes to approximately two hours, depending on the location and swiftness of the tide. Water quality conditions for drift netting would be the same as for anchored gillnetting. Similarly, all drift net sets would be continuously tended because of the risk of gear entanglement or loss of gear resulting in ghost nets. Drift netting gear would be pulled immediately if it is obvious a sturgeon has been captured.

Drift gill nets would be set and marked with GPS coordinates beginning at early stage flood tide (slack) perpendicular to the prevailing tidal currents and tended closely by researchers until high tide. To maximize chances of catching sturgeon, nets would be configured to make contact with the bottom and would have smaller mesh on the bottom two meters (McCord et al. 2007). Flat bottom locations free of snags near the freshwater-brackish water interface would be preferred location for each drift set.

<u>Trawling</u>: Dovel and Berggren (1983) found small trawls effective while collecting juvenile shortnose sturgeon in the Hudson River. Therefore, when the river is clear of ice, subject to environmental tolerances in Table 1, trawling would be performed year round. Specifications for proposed trawling gear in the Hudson River are provided in Table 3 below.

Table 3: Description of proposed trawling gear

Trawl Dimension	*8 m Otter Trawl*	*9 m Otter Trawl*
Headrope (m)	7.93	9.14
Footrope (m)	7.93	9.14
Net body mesh (mm)	2.5 x 76.2	3 x 76.2
Codend mesh (mm)	2.5 x 76.2	3 x 76.2
Innerliner mesh (mm)	6	6

Trawls would be towed at a maximum speed of approximately 2.5 to 3.0 knots between 5 to 10 minutes. To lessen benthic disturbances, a GPS would be used to direct trawls so nets would not be towed over the same exact location more than once in a 24-hour period. Further, researchers would not attempt trawling areas with hard bottoms, vegetation, organic material, or woody debris to avoid snagging equipment. If a trawl were snagged on bottom substrate, researchers would attempt to untangle it immediately to reduce stress on captured animals. Further, if larger numbers of sturgeon were captured in a single trawl, researchers would take special precautions not to stress animals when transferring them onto the vessel by removing them from the cod end of the net.

- ***<u>General Handling (e.g., Holding, Measuring, and Weighing etc.)</u>*:**

After removed from capture gear, sturgeon would be recovered in multiple boat-side net pens measuring approximately 100 cm long x 150 cm wide x 100 cm deep or in the live-well of the research vessel.

When moved to onboard holding tanks, sturgeon would be immersed in a continuous stream of water supplied by a pump-hose assembly mounted over the side of the research vessel. Dissolved oxygen would be supplemented with compressed oxygen if necessary to ensure the concentration does not fall below 4.5mg/L. When readied for processing, sturgeon would initially be weighed, measured, fin clipped, scanned for PIT tags, tagged, and photographed. To minimize handling stress of sturgeon and removal their of protective slime coat, researchers would use latex gloves. Sturgeon would be weighed on a platform scale fitted with a small waterproof cushion attached to the surface of weighing platform. The sturgeon's total length would be measured on a standard measuring board and mouth width and interorbital width would be measured using calipers to confirm species (Kahn and Mohead 2010). The time required to complete routine, non-invasive methods would typically be less than one minute per fish.

- ***<u>Genetic Tissue Sampling</u>***:

Genetic information would be obtained from tissue samples of sturgeon to help characterize the genetic "uniqueness" of the Hudson River. A small (1.0 cm^2) soft tissue sample would be collected from the trailing margin of soft tissue of one of the pectoral fins using sharp sterilized scissors. Tissue samples would be preserved in individually labeled vials containing 95% ethanol. The researcher has agreed to provide the genetic tissue samples for archival purposes to the NOAA/NOS tissue archive in Charleston, South Carolina, or to Co-investigators (CIs) identified in the permit.

Proper certification, identity, chain of custody and shipping of samples would be maintained with tissue samples. Some of the genetic tissue samples would also be retained by the applicant for the proposed contaminant sampling.

- ***PIT Tagging***:

Prior to PIT tagging, the entire dorsal surface of captured sturgeon would be scanned using a PIT tag reader to detect PIT tags of previously captured fish. All unmarked shortnose sturgeon (≥300 mm TL) would be tagged using 11.9 mm x 2.1 mm PIT tags injected using a 12 gauge needle at an angle of 60 to 80° in the dorsal musculature (left and just anterior to the dorsal fin). No fish would be double-tagged with PIT tags. The last step after injecting PIT tags would be to verify and record the PIT tag code with a tag reader. During the study, the rate of PIT tag retention would be documented and reported to NMFS in annual reports.

- ***Floy Tagging***:

The applicant proposes to tag shortnose sturgeon with Floy tags (an external identifier tag) to document incidental recaptures by commercial or recreational fishermen and other researchers allowing collection of additional information useful for the assessment of the sturgeon population. In all captured shortnose sturgeon, Floy tags would be anchored in the dorsal fin musculature base and inserted forwardly and slightly downward from the left side to the right through the dorsal pterygiophores. After removing the injecting needle, the tag would be spun between the fingers and gently tugged to be certain it is locked in place. During the study, the rate of Floy tag retention would be documented and reported to NMFS in annual reports.

- ***Acoustic Transmitters***:

The applicant has proposed during the first three years of the study to surgically implant Lotek acoustic tags in a maximum of 100 fish (50 adult:≥ 550 mm; 30 sub-adult: 400-600mm and 20 juvenile :<400 mm) shortnose sturgeon. The Lotek acoustic tags would be Dual mode MAP/r-code tags having a transmitter detection range of 0.6 -3.2 km depending on hydrological conditions. Specifications of acoustic devices are located at: http://www.lotek.com/ma-coded-acoustic-transmitters.htm. The total weight of tags would not exceed 2 percent of the fish's total body weight of sturgeon determined to be in good condition.

Active tracking would take place on a research vessel fitted with a sonic receiver (Model 600 RT) and a laptop equipped with all necessary software, and dual hydrophones mounted to the stern. The applicant indicated researchers would track tagged fish constantly until dark during their first day at large. Subsequent manual tracking would occur weekly throughout the range of estuary inhabited by the tagged fish. When located, researchers would pinpoint a fish's exact location using the dual hydrophone array, recording GPS locations. Based on experience with tracking juvenile and adult Atlantic sturgeon in the estuary, the applicant estimated it would require 5-6 days to cover the expected in-river range of tagged fish each week. Additional deployment of 13 remote receivers at regular intervals throughout the estuary would passively track acoustically tagged sturgeon.

Anesthesia for Implanting Acoustic Tags:

Each sturgeon prepared for surgery would be anaesthetized using a solution of up to 150 mg/L of tricaine methane sulfonate (MS-222) buffered to neutral pH with sodium bicarbonate. A low volume pump would deliver the anesthetic over the fish's gills through a tube placed within the sturgeon's mouth until reaching proper state of anesthesia (i.e., loss of equilibrium, some reaction to touch stimuli, opercula movement). The anesthetic's induction and recovery time would vary between 5 and 9 minutes, but would be appropriate for shortnose sturgeon under the specific water temperature and oxygen conditions present (Fox et al. 2000; Kahn and Mohead 2010).

Surgery for Implanting Acoustic Tags:
Just prior to a planned three minute surgical procedure, the tube supplying the anesthetic would be removed and the sturgeon would be placed on a moist surgery rack where respiration would be maintained by directing fresh ambient water pumped across the gills through the irrigation tube. The incision site for implanting the tag (located 40 to 60 mm anterior to the pelvic fins, although the specific location would vary with fish size) would be disinfected with povidone iodine (10 percent solution). A sterile surgical packet containing all surgical instruments and supplies would be used to make a 10 mm incision through which a sterilized transmitter would be inserted and the incision closed with interrupted sutures of 3-0 polydioxanone (PDS). The suture site would be treated with povidone iodine to prevent infection. Post-surgery fish would be held in a net pen and observed during recovery. Any fish not responding readily would be recovered further until showing signs of being able to swim away strongly. The fish would be released and a spotter would watch to make sure the fish remains down and fully recovered.

- ***Blood Collection*:**

Blood would be drawn from the caudal veins of 40 shortnose sturgeon annually for five years in an ongoing study determining PCB contaminant loads in the Hudson River shortnose sturgeon population. To draw blood, a hypodermic needle would be inserted perpendicular to the ventral midline at a point immediately caudal to the anal fin and the needle would then be slowly advanced while applying gentle negative pressure with the syringe until blood freely flows into the syringe. Once a blood sample is collected, direct pressure would be applied to the site of to ensure clotting and prevent further blood loss (Stoskopf 1993). Needle and syringe size, as well as blood volume collected, would be dependent on the fish size, as presented in Table 4 below.

Table 4: Needle and Syringe Sizes Proposed Based on Fish Weight

Weight (gr)	Sample Size (ml.)	Needle Size (Gauge x Length)	Syringe Size (ml.)
≤ 1000	2	22g x 5/8"	3
1000 - 2000	3	22g x 5/8"	3
> 2000	6	20g x 1"	6

- ***Gastric Lavage***:

Annually for five years, a diet study would be conducted using gastric lavage sampling sample gut contents on up to 40 fish. Once the results from the diet selectivity are analyzed, samples would be compared with those obtained from co-occurring Atlantic sturgeon encountered during this study (to be covered under a separate permit application if the species is listed). Additionally, the current availability of benthic food organisms would also be surveyed with grab samples taken at random capture locations. Benthic data obtained would be compared with extensive habitat information already gathered for the Hudson River Estuary.

The method adapted by the applicant (Collins et al. 2008) would be used to lavage the sturgeon under a low dosage (50mg/L) of MS-222 anesthetic. The modified procedure delivers water to the fish's gut flexible tube. Once sturgeon are captured, they would be placed in a tricaine methanesulfonate solution (MS 222; 150 mg/L), remaining in solution for three to five minutes the total time dictated by body weight of the individual. The fish will then be removed from solution and placed dorsally in a water soaked sling. A tube (polypropylene; 3.2 mm outside diameter, 2.4 mm inside diameter) connected to a garden sprayer will be inserted down the esophagus, past the pneumatic duct, through the alimentary canal and into the fish's stomach. This tubing diameter is recommended for sturgeons with total lengths of 350 to 1250 mm. The fish will then be held ventrally and water from a garden sprayer (3.8 L) will flush the fish's stomach into a 0.5 mm mesh sieve. Diet samples would be taken from two out of every five fish caught and would be preserved in 95% ethyl alcohol. The entire process, including anesthetizing, would take from seven to eleven minutes (Collins et al 2008). The applicant would then allow fish to recover within a floating net pen alongside the boat prior to releasing them to the river.

- ***Fin Ray Collection***:

Under light anesthesia, a 200 shortnose sturgeon would be collected for age and growth analyses in year four and five of the study. A small section (~1 cm^2 notch), of the leading pectoral fin ray would be collected on sampled fish using a hacksaw or bonesaw to make two parallel cuts across the leading pectoral fin-ray approximately 1cm deep and 1cm wide. The blade of the first cut is positioned no closer than 0.5cm from the point of articulation of the flexible pectoral base to avoid an artery at this location (Rien and Beamesderfer 1994, Rossiter et al. 1995, Collins 1995, Collins and Smith 1996). The second cut is made approximately 1cm distally (Everett et al. 2003, Fleming et al. 2003, Hurley et al. 2004, Hughes et al. 2005), where a pair of pliers is then used to remove the fin ray section. The ray section is placed in an envelope and allowed to air-dry for several days or weeks and later it is cut into thin slices (usually about 0.5 to 2mm thickness) typically using a jeweler's saw or a double bladed saw (Stevenson and Secor 1999, Everett et al. 2003, Fleming et al. 2003, Hurley et al. 2004, Hughes et al. 2005, Johnson et al. 2005, Collins et al. 2008). The sections are then mounted using any number of materials including clear glue, fingernail polish, cytosel, or thermoplastic cement. The annuli are then read using stereoscopic readers. The researcher would perform no other invasive procedure requiring anesthesia when sampling fin rays.

- ***Unintentional Mortality or Harm of Shortnose Sturgeon***:

The researcher has requested up to four total unintended mortality or serious harm resulting from research, two incidences occurring in year 4 and 5 of the five year study. This request was based on the cumulative stress anticipated from the volume of research activity during last two years required to sample sturgeon and meet the researcher's objectives. If a greater incidence of mortality or serious injury should occur, research would cease and NMFS-OPR would need to be consulted to determine the cause of mortality and to discuss any remedial changes in research methods before a decision could be made to resume research. The Permits Division could grant authorization to resume permitted activities based on review of the incident depending on the circumstances, or else suspend activities.

CHAPTER 3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

This EA evaluates the potential impacts to the human environment from issuance of the proposed permit and the potential impacts on the social, economic, physical, and biological environment (*i.e.*, targeted shortnose sturgeon), specifically those that may result from the proposed research activities requested.

3.1 SOCIAL AND ECONOMIC ENVIRONMENT

Although economic and social factors are listed in the definition of effects in the NEPA regulations, the definition of human environment states that "economic and social effects are not intended by themselves to require preparation of an EIS." However, an EIS or EA must include a discussion of a proposed action's economic and social effects when these effects are related to effects on the natural or physical environment. The social and economic effects of the proposed action mainly involve the effects on the people involved in the research, as well as any industries that support the research, such as suppliers of equipment needed to accomplish the research. There are no significant social or economic impacts of the proposed action interrelated with significant natural or physical environmental effects. Thus, the EA does not include any further analysis of social or economic effects of the proposed action.

3.2 PHYSICAL ENVIRONMENT

The following section provides a brief description of the unique or ecologically critical resources within the action area. There are no National Marine Sanctuaries, nor designated critical habitats located within the area for the proposed activities; thus these are not considered in this EA. However, bordering the River are many historic sites and parkland in the Hudson River Valley. Also, the Hudson River Estuarine Research Reserve and designated EFH exists for federally managed species within the proposed study area.

3.2.1 *Sanctuaries, Parks, Historic Sites, Protected Areas, etc.*

The proposed action area encompasses the Hudson River Valley National Heritage Area stretching from Troy to New York City containing a rich assemblage of natural features and nationally significant cultural and historical sites. Recreational opportunities abound in local parks, protected open space, and greenways (http://www.hudsonrivervalley.com). However, due to the nature of the fishery research proposed in the study, none of the parkland or historical sites would be affected.

Also, the action area overlaps four separate locations set aside as the Hudson River Estuarine Research Reserve. The Estuarine Reserve, administered by multiple agencies, including the NYSDEC and NOAA, encompasses about 5,000 acres of freshwater and brackish tidal wetlands and uplands distributed at four sites spanning the middle 100 miles of the river. The Estuarine Reserve is highlighted online at http://www.dec.ny.gov/lands/4915.html. Nevertheless, the current research is not proposing any boating or netting activities in aquatic habitats within the reserve. Consequently, NMFS PR considers the proposed fishery research would have very limited environmental impact, if any, to the Estuarine Reserve areas.

3.2.2 *Essential Fish Habitat (EFH)*

Designated EFH exists for federally managed species in the Hudson River within the action area. More detailed information on designated EFH in the proposed action area can be found online at: http://www.nero.noaa.gov/hcd/index2a.htm and http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx

Activities potentially adversely affecting EFH identified by the NMFS Office of Habitat Conservation include: (1) disturbance or destruction of habitat from stationary fishing gear, (2) dredging and filling, agricultural and urban runoff, (3) direct discharge, and (4) the introduction of exotic species. Since substrates in the Hudson River consist of shallow mud bottoms, coarse textured sand substrates and some substrates consisting of rocks, oyster and marl, there would be very little bottom drag on bottom substrate and benthic organisms by these nets typically.

With respect to the proposed research activities, NMFS PR concludes minimal potential impacts to EFH would be caused by the proposed boating, gill netting and trawling activities. Specifically, the researcher's boats would pass through and over the water column of the action area to retrieve telemetry data from fixed station receivers; although, NMFS PR considers this activity would minimally impact the physical environment, including any portion that is considered EFH.

Further, gill netting activities would have little substantial impact on the bottom substrates located in the Hudson River because there would be very little bottom drag by nets on the bottom substrate and benthic organisms. Thus, impacts on EFH from netting would be short-term and result in minimal disturbance and no adverse effects.

Also, NMFS considers the effects of trawling with smaller trawls on EFH in the tidally mixed zone of the Hudson River would be insignificant. The researcher proposes using short tow times, up to10 minute at slow speeds (2.5 to 3 knots), selecting bottom areas conducive to trawling, and using a GPS system limiting substrate disturbance. Dovel and Berggren (1983) found trawling with similar smaller trawls was effective for collecting juvenile shortnose sturgeon in the Hudson River with little impact to the bottom substrate. Similar results have been obtained when trawling in the upper and lower Connecticut River, the Merrimack River (Permit Nos. 1549 and 1516), the Delaware River (Permit No. 1486 and 14604), and South Carolina rivers (Permit No1505). Conditions placed in these permits have thus far resulted in minimal impacts documented to EFH over the past five years (T. Savoy, B. Kynard, W. Post; and H. Brundage; pers. com.; Nov 2010). Further, when consulted on each of these former trawling actions, the NMFS Office of Habitat Conservation agreed the these would not impact EFH where it existed in each of these respective action areas. Therefore, NMFS considers trawling in the current study with this type of gear would also not adversely impact the physical environment in the Hudson River, including any portion having EFH.

NMFS PR also considered what impacts sampling shortnose sturgeon with these gear types would have on bycatch of managed species, either as direct mortality from netting activities or indirectly by reducing a food source for another managed species. For example, the tidally mixed area of the Hudson river system has designated EFH for different life stages of potentially impacted species. Such species as winter flounder, windowpane, summer flounder, juvenile and adult bluefish, Atlantic sea herring, Atlantic butterfish, scup, and black sea bass and others might potentially be affected by netting (http://www.nero.noaa.gov/hcd/STATES4/conn_li_ny/40407350.html). Additionally, because anadromous fish (e.g., striped bass, American shad, alewife, blueback herring, etc.) use river sections for spawning, nursery, and migratory pathway, and because their resulting juvenile anadromous fish are an essential food source for managed species such as adult bluefish, any impact to these prey producing species would also be considered an adverse effect on EFH based upon the EFH rules.[2] However, as noted previously, nets would typically be checked at short intervals, and thus, it is believed most all bycatch would be released alive, producing minimal stress or mortality. Thus, direct or indirect impacts to EFH or managed species would be negligible.

NMFS PR therefore concludes from reviewing the applicant's research proposal that none of the sampling for shortnose sturgeon would likely have adverse impacts on designated EFH, bottom substrate or prey species. NMFS, Northeast Office of Habitat Conservation, was contacted by email on June 3, 2011 to ask for concurrence whether the proposed action, as conditioned, would have adverse impacts on designated EFH in the Hudson River. The results of this informal consultation appear in Section 4.3.2 of this EA.

3.3 BIOLOGICAL ENVIRONMENT

The following is a brief summary of the status and occurrence of targeted shortnose sturgeon range-wide, including the proposed study area. Further descriptions of the status of these species can be found in the Biological Opinion accompanying this document as well as NMFS Recovery Plans and other documents at http://www.nmfs.noaa.gov/pr/publications/.

3.3.1 *ESA Target Species Under NMFS Jurisdiction*:

ESA Endangered: Shortnose sturgeon (*Acipenser brevirostrum*)

3.3.1.1 Range-wide distribution of shortnose sturgeon:

Shortnose sturgeon occur along the east coast of North America in rivers, estuaries and the sea. They were once present in most major rivers systems along the Atlantic coast (Kynard, 1997). Their current distribution extends north to the Saint John River, New Brunswick, Canada, which has the only known population in Canada (Scott and Scott 1988). Their southerly distribution historically extended to the Indian River, Florida (Everman and Bean 1898) but the southern limit of their range is currently believed to be in the Saint Johns River, FL (NMFS 1998). They are sympatric with the Atlantic sturgeon throughout much of their range. However, the Atlantic sturgeon spends more of its life cycle in the open ocean. In rivers such as the Hudson River, shortnose sturgeon and Atlantic sturgeon have been shown to share foraging habitat and resources but shortnose sturgeon generally spawn farther upriver and earlier than Atlantic sturgeon (Kynard 1997, Bain 1997). Magnin (1963) theorized the species was primarily found in freshwater on the basis of growth (i.e., if shortnose sturgeons spent more time in the ocean they would grow to larger sizes). In recent years, however, telemetry data and genetic analyses have demonstrated coastal migrations of shortnose sturgeon between adjacent river systems may be relatively common in some areas (S. Fernandes, 2008; P. Dionne, 2010 and D. Peterson, pers. comm., 2009).

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2 The EFH final rule at 50 CFR Section 600.810 defines an adverse effect on EFH as "any impact which reduces the quality and/or quantity of EFH." The rule further states: "An adverse effect may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from action occurring within EFH or outside EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions."

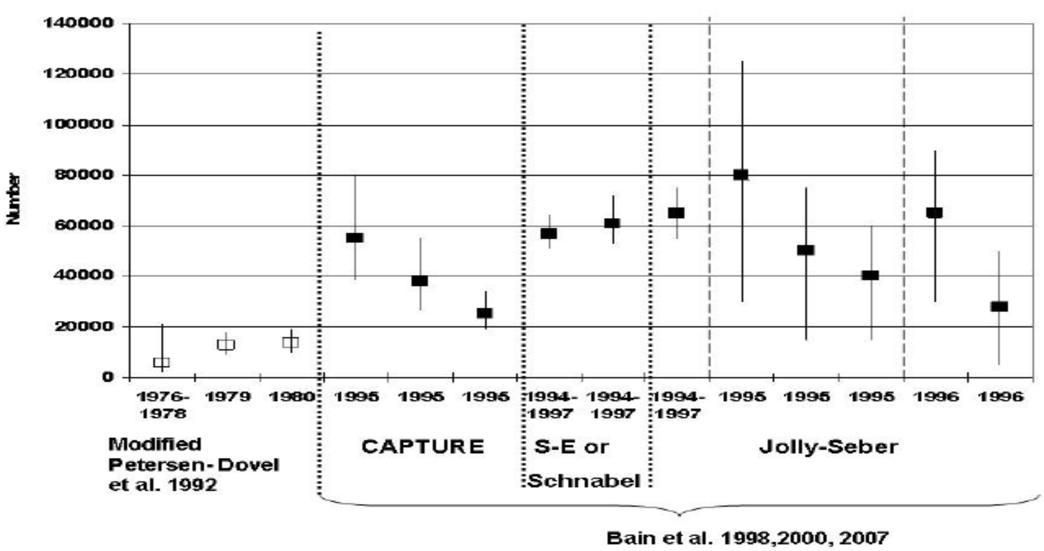
3.3.1.2 <u>Status of Shortnose sturgeon in the Hudson River</u>:

- ***<u>Current Distribution and Abundance</u>*:**

Results of several major mark-recapture studies suggest that major changes have potentially occurred in Hudson River population of shortnose sturgeon within the past thirty years (See Figure 2 below). The first estimate of the Hudson River shortnose sturgeon "spawning" population size was generated in 1978 based on a mark/recapture study performed from 1976 to 1978 (Dovel 1979). A modified Petersen closed population model estimated population size at 5,837 (CI = 1,989 – 21,276). Wide confidence intervals were apparently the result of the low number of tagged shortnose sturgeon. This population estimate was most likely biased low due to the use of inappropriate gear used for sampling adult shortnose (trawls and limited use of gill nets), as noted by the authors who also suspected the actual major spawning area was not identified.

Field sampling during a preliminary power plant siting study in the Coxsackie Reach of the Hudson River in 1977 and 1978 resulted in the capture of several shortnose in spawning condition (Pekovitch 1979). Subsequent sampling in 1979 and 1980 began in very early spring in the Kingston over-wintering area and included long stretches of river with groups of gill net sets spanning several river kilometers. In this study, nets were moved northward in the river as catches in the lower net sets declined and increased in the upper sets with net sets continuing as far north as the Troy Dam over the spawning season. Data were analyzed using a modified Petersen model for direct comparison (Dovel et al. 1992) and was 12,669 spawning adults (CI = 9,080–17,735) in 1979 and 13,844 (CI = 10014–19,224) in 1980 (Figure 2). These mark/recapture studies focused on the

Figure 2. Various population estimates of shortnose sturgeon in the Hudson River, NY.



annual spawning migration with individuals older than age five. Based on spawning frequencies of every two years for males and every three years for females, plus a 2:1 male to female sex ratio, the total adult population abundance was estimated at 30,311 individuals. Further, this estimate does not include YOY or immature (< age five) (Dovel 1981).

Fifteen years later, another mark recapture study was conducted over the period 1994 to 1997 (Bain et al. 1998a) that again focused on the Hudson River shortnose sturgeon active spawning stock. Bain et al. (1998a) stated the same sample design was performed as described by Dovel et al. (1992). Initial sampling to mark presumed pre-spawn adults occurred in early spring in the Kingston over-wintering area. However, recapture sampling occurred at only one sampling site (Albany, NY, rkm 235) within the 31 km spawning reach. A total of 2,064 individuals were marked with only 44 recaptures (Bain et al. 1998a). Several population models were used to analyze the data and discussed below.

The most publicized abundance estimate for the Hudson River shortnose population is 61,057 total individuals (Bain et al. 1998, 2000, 2007). This estimate was generated from all mark/recapture data collected over three years of sampling from 1994-1997. Closed population models used were a Schumacher-Eschmeyer (Bain et al. 1998b) or a Schnabel population model (Bain et al. 2000, 2007). The 1994-1997 estimate of spawning adults comprised 56,708, or 93% of the entire population, "indicating that all or nearly all adult shortnose sturgeon are present annually at the over-wintering and spawning sites" (Bain et al. 2000). The remaining 7% of the population was associated with non-spawning adults (3%) and juveniles (4%).

Clearly major changes may have occurred in the Hudson's shortnose population from the 1970s to the 1990s, but the exact nature of that change is difficult to measure. Overall, a positive change most likely occurred from 1980 to the late 1990s, but the true quantitative level remains unknown. Although these recent population estimates look promising, NMFS cautions using them as a management benchmark until more definitive studies confirm them again.

- ***Natural History and Habitat Information*:**

The northward spawning migration of shortnose sturgeon from the Kingston over-wintering site commences when water temperatures reach 8 to 9°C; and can begin in late March through early April (Dovel et al. 1992). Most spawning occurs at water temperatures between 10 to 18°C in the Hudson river reach from Coeyman's, NY (rkm 212) north to the Troy Dam (rkm 245, Fig. 1). Some shortnose sturgeon were captured in the spawning area as early as late March and individuals may remain in this area for up to 30 days (Dovel et. al. 1992).

Both Dovel et al. (1992) and Greely (1937) indicated the presence of egg-bearing females in the lower sections of the Hudson below Kingston, in the mid-Hudson (Highland, near Poughkeepsie) and farther south in Haverstraw Bay. Dovel et al. (1992) indicated that these individuals were not yet ready to spawn, but thought they were in the pre-spawn development phase. However, Greely reported a "ripe" female, along with a spent male near Highland NY (rkm 121) in early April. Some roe (females) taken May 1 were also spent. The proximity of spent males with ripe females in the mid-Hudson location is notable in light of Dovel's identification of the major spawning area up-river near Albany. Highland is several kilometers south of an identified over-wintering area near Kingston (rkm 140). Spawning has not been verified in Kingston-Highland reach, but the possibility exists that it could occur. Another possibility is that post-spawn adults may move downriver quickly, assisted by the Hudson's strong tides.

Dadswell et al. (1984) described the differences in age at maturation for shortnose along the coast. Shortnose sturgeon from the Hudson River were thought to mature at three to five years for males and six to ten years for females. Males may spawn annually once mature. This was supported by Dovel et al. (1992) who tagged one male on the spawning grounds in 1979, recaptured the same male the following winter in the over-wintering area, and again the following spring on the spawning grounds. Female shortnose sturgeon are thought to spawn less frequently approximately every three years. Maturity patterns for shortnose sturgeon are similar to those of Atlantic sturgeon where males can spawn annually and females spawn on longer term intervals of three to five years (Van Eenennaam et al. 1996). The early work by Bain et al. (1998a) agreed with a three to five year spawning interval for female shortnose sturgeon; however, recent work (Bain et al. 1998b, 2000, 2007) suggested spawning may be an annual event for nearly all of the Hudson's population. Extensive substrate mapping of the Hudson River began in 1998; classification includes various bottom types, including sediments, size, and hardness. Descriptions of sampling methods can be found at http://www.dec.ny.gov/lands/33607.html. Within the Coeymans-Troy spawning reach, bottom types varied: gravel and sand dominated throughout the deepwater channel areas.
Prior to 1826 when the Troy Dam was constructed at rkm 256, the first natural barrier occurred at Glens Falls, 32 km farther upriver. Anecdotal notes indicate that shortnose may have congregated at the base of Cohoes Falls, 5 rkm upriver from Troy, where the Mohawk River empties into the Hudson. This suggests that some spawning habitat loss may have occurred when the dam was built.

Rearing

Few researchers have been able to collect YOY or even small (less than 400mm) shortnose (Dovel et al. 1992 and Bain et al. 2000) from the Hudson River. From 1996 through 2004, about ten small shortnose were collected each year as part of the utility trawling of the entire river (ASA 2007). Further examination of these data may lend insight to identifying rearing habitat characteristics important for shortnose in the Hudson.

Foraging

Foraging behavior varies for each age/maturity group of shortnose sturgeon: spawning, post-spawn, non-spawn adults and juveniles. Haley (1996) found that shortnose are opportunistic feeders in that they utilize food resources seasonally and locally abundant. Salinity and depth affect distribution of fish in the river throughout the year. Most (~80%) of the 48 fish collected were collected from freshwater; a few (<10) were collected in oligo-haline water (<2.9 ppt). Gammarid amphipods, dreissenid mussels, isopods, and chironomids were the most prevalent food items for the freshwater portion of the estuary.

Haley (1999) also attempted to address the issues of resource partitioning. Both shortnose and Atlantic sturgeon co-occur and co-exist in over two-thirds of the Hudson estuary from Catskill to New York Harbor. Haley (1999) noted spatial and food overlaps occurred between the species, attributed to the marked abundance of prey species in the lower estuary. However, she stated the need for further studies to understand habitat preferences for each section of the river and if there are "differences in habitat and food use between allopatric and sympatric populations of the shortnose and Atlantic populations" in the river. It appears that there is some interaction between the two species in areas where the two species co-occur.

Overwintering/resting

Two over-wintering sites were identified from previous studies on the river: (1) Dovel et al. (1992) indicated that the largest over-wintering site occurred near Esopus Meadows, just south of Kingston, NY primarily comprised of pre-spawn adults; and (2) Geoghegan et al. (1992) agreed with Dovel et al. (1992), but suggested that other similar, but smaller, deepwater areas in the mid-Hudson may also serve as over-wintering sites. Both conclusions are based on scattered catches of shortnose sturgeon that occurred throughout the greater Kingston reach from Saugerties to Hyde Park during the late fall and winter. Both groups of authors also indicated a downriver over-wintering site in the Croton-Haverstraw Bay area.

Sampling by the NY DEC for juvenile Atlantic sturgeon in late winter and early spring confirmed shortnose utilize the Haverstraw Bay area. Annual winter-trawl sampling for striped bass in the upper New York harbor has consistently collected low numbers of shortnose sturgeon off Manhattan during the winter (November to March) since 2004. Improved water quality in the mid 1990s may have opened up additional habitat that shortnose can now utilize in the harbor.

Benthic mapping of the Kingston-Esopus Meadows reach of the Hudson River indicates a variety of bottom types. Habitat types were derived from original bottom mapping and grain size analysis. Depth was divided into two categories based on a four meter contour line; areas less than four meters was considered "shallow" and those greater than four meters was considered "deep". Three substrate types, consisting primarily of mud, were grouped to form a "fine" sediment type. Other categories consisting primarily of sand and/or gravel were grouped to form a "coarse" sediment type that predominates the benthos.

Migration

Shortnose sturgeon spawning migration n the Hudson River was described above. Post- spawning shortnose sturgeon begin a downriver movement through the entire lower river. Dovel et al. (1992) indicated that some spawning adults tagged at Troy were recaptured in Haverstraw Bay in early June, indicating some individuals moved quickly downriver while others move more slowly as confirmed by both Geoghegan et al. (1992) and Woodland and Secor (2007).

Although shortnose sturgeon are assumed to remain within their natal river, some out migration from the Hudson River has been documented. Two individuals tagged in 1995 in the over-wintering area near Kingston, NY were later recaptured in the Connecticut River. One fish was at large for over two years and was recaptured at the mouth of the Connecticut River at Saybrook, CT; and the other was at large for over eight years, recaptured in the lower Connecticut River.

3.3.2 *Non Target Species*:

3.3.2.1 *Invertebrates*

From previous catch records of the applicant, NMFS would expect that netting could capture some other non-target invertebrate species such as blue crab (*Callinectes sapidus*) in the estuarine reaches of the action area during summer months. The applicant has stated that virtually all by-catch will be released alive.

3.3.2.2 *Fish*

From previous catch records of the applicant, NMFS would expect that netting could capture some non-target fish species, such as American shad (*Alosa sapidissima),* alewife (*Alosa seudoharengus),* common carp (*Cyprinus carpio*), freshwater drum (*Aplodinotus grunniens*),gizzard shad (*Dorosoma cepedianum),* weakfish (*Cynoscion regalis*), white perch (*Morone Americana*), striped bass (*Morone saxatilis*), white sucker (*Catostomus commersoni*), largemouth bass (*Micropterus salmoides*), channel catfish (*Ictalurus punctatus*), white catfish (*Ictalurus catus*), brown bullhead (*Ictalurus nebulosus*), and menhaden (*Brevoortia tyrannus*). However, nets would be checked at short intervals and it is believed that virtually all by-catch would be released alive.

Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*): The Atlantic sturgeon, under NMFS jurisdiction, co-occurs in the Hudson River waters of the study area with shortnose sturgeon. Reviewed in 1998, NMFS and USFWS received a petition to list Atlantic sturgeon as endangered. Although a protective ESA status was denied at that time, the species remained a 'species of concern' under NMFS's jurisdiction. In 2007, NMFS completed a second status review for this species and has since accepted a petition evaluating whether the species warrants listing under the ESA. More recently, Atlantic sturgeon were proposed for listing under the ESA and five distinct population segments (DPS) were projected. The Atlantic sturgeon New York Bight DPS was proposed for listing as endangered (75 FR 61872 & 75 FR 61904).

Although the final rule has not been published for Atlantic sturgeon to provide ESA protections to the species, NMFS expects the listing to coincide with the applicant's proposed research activities for shortnose sturgeon. If Atlantic sturgeon are listed subsequent to issuance of Permit 16439, the applicant would be required to possess an ESA scientific permit for taking Atlantic sturgeon prior to conducting shortnose sturgeon studies in the Hudson River. Consequently, the effects of the researcher's actions on Atlantic sturgeon are currently being analyzed under separate NEPA and Section 7 actions designed to lead to issuance of a separate ESA permit to study Atlantic sturgeon in the Hudson River. Each permit would provide for separate exemptions to the take prohibitions listed in Section 9 of the ESA upon taking either species. Appropriately, however, if an Atlantic sturgeon were captured while fishing for shortnose sturgeon prior to the ESA listing of Atlantic sturgeon, the researcher would be expected to monitor capture gear closely and follow the same netting protocols and standard research conditions protective for shortnose sturgeon ensuring Atlantic sturgeon survival.

3.3.2.3 *Sea Turtles*

Kemp's ridley (*Lepidochelys kempii*), loggerhead (*Caretta caretta*), and green (*Chelonia mydas*) sea turtles have been observed in Long Island Sound located to the north of the Hudson River mouth. However, all five species of ocean-going turtles may be found in New York coastal waters from time to time (Morreale et al. 1992). Until recently, however, there have been limited occurrences of any sea turtles venturing into the lower Hudson estuary (NYSDEC 2010, Hudson River Almanac. http://www.dec.ny.gov/lands/68003.html).

In 2010, the Riverhead Foundation, the marine mammal and turtle stranding network for the lower Hudson, received a report of a dead Kemp's ridley sea turtle on the beach at Verplanck (Hudson River Mile 45). The carapace was marked by the strike of a propeller that went through the full thickness of the carapace and was most likely the cause of death. However, this is the only the second reported sea turtle recovered in the lower Hudson where limited dispersed sampling for shortnose sturgeon and boating activity would take place in the proposed study. According to the applicant, while sampling shortnose and Atlantic sturgeon in the action area of Hudson River during the last thirty years, no sea turtles have been observed or captured (K. Hattala, pers. comm., 2011).

3.3.2.4 Marine Mammals

Various sightings of marine mammals (listed below) have been documented, although rarely, with one exception in the Hudson River estuary and other upriver locations. Bottlenose dolphin (*Tursiops truncatus*) is the most abundant cetacean species from New Jersey to Florida; however, they are rarely encountered on the Hudson River. The Riverhead Foundation (2008), the stranding network for marine mammals in the Hudson River area, documented two different sightings of dolphin in recent history, once in 1997 and another event in 2008. The ESA protected Florida manatee occurring in the Hudson River in 2006 is considered extremely rare and outside its known typical range. Other marine mammal sightings and dates of occurrence on the Hudson River are recorded below:

Harbor seal, *Phoca vitulina* (relatively common)
Harp seal, *Phoca groenlandica* (1996)
Hooded seal, *Cystophora cristata* (1996)
Gray seal, *Halichoerus grypus* (2004)
Harbor porpoise, *Phocoena phocoena* (1995, 1997, 1999, 2005)
Florida manatee *Trichechus manatus* (2006)

3.3.2.5 Aquatic Nuisance Species

The U.S. Geological Survey has documented several aquatic nuisance species (USGS 2011) occurring in the estuary of the Hudson River including: zebra mussel (*Dreissena polymorpha*); green crab (*Carcinus maenas*); Chinese mitten crab (*Eriocheir sinensis*); common reed (*Phragmites australis*); fanwort (*Cabomba caroliniana*); curly-leaf pondweed (*Potamogeton crispus*); Eurasian watermilfoil (*Myriophyllum spicatum*) and water chestnut (*Trapa natans*). Because the proposed research activities have the potential to spread these aquatic nuisance species to other watersheds, mitigations measures proposed by NMFS, (See Section *4.2.2.5* of this EA) were agreed to be implemented by the researcher as standard research protocol.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This chapter represents the scientific and analytic basis for comparison of the direct, indirect, and cumulative effects of the alternatives. 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 EFFECTS OF ALTERNATIVE 1: NO ACTION

An alternative to the proposed action is no action, i.e., denial of the permit request. This alternative would eliminate any potential risk to all aspects of the environment from the proposed research activities. However, it would also prohibit researchers from gathering information that could help endangered and protected shortnose sturgeon.

4.2 EFFECTS OF PROPOSED ALTERNATIVE 2: ISSUANCE OF PERMIT WITH STANDARD CONDITIONS

Any impacts of the proposed action would be limited primarily to the biological environment, specifically the animals that would be studied or affected by the research. The type of action proposed in the permit request would have a negligible effect on the physical environment and would be unlikely to affect the socioeconomic environment or pose a risk to public health and safety.

4.2.1 *Effects of Research Activities on Shortnose Sturgeon*:

4.2.1.1 Effects of Capturing:

The applicant proposes to use anchored and drift gill nets and trawl nets to capture up to 240 and 2,340 shortnose sturgeon in year 1-3 and year 4-5, respectively. Entanglement in nets or damage suffered in trawls could result in injury and mortality, reduced fecundity, and delayed or aborted spawning migrations of sturgeon (Moser and Ross 1995, Collins et al. 2000, Moser et al. 2000). Historically, the majority of shortnose sturgeon mortality during scientific investigations using nets or trawls has been related to such factors as water temperature, low D.O concentration, netting duration, meshes size, net composition, and netting experience of the researcher (Table 5).

Table 5: The number and percentage of shortnose sturgeon killed by gill nets associated with scientific research permits prior to 2005

	Permit Number					
	1051	1174	1189	1226	1239	1247
Time Interval	1997, 1999 – 2004	1999–2004	1999, 2001 – 2004	2003–2004	2000 – 2004	1988 – 2004
Sturgeon captured	126	3262	113	134	1206	1068
Sturgeon mortality	1	7	0	0	5	13
Percentage	0.79	0.22	0	0	0.41	1.22

In 2005, NMFS-PR began analyzing the results of previous research and updating permit conditions to reduce the chances of stress and mortality to shortnose sturgeon during capture. Since that time, there have been two mortalities caused by capture (Table 6), each occurring in 2010.

Reviewing permits issued prior to 2005, the primary causes of mortality were associated with high temperatures, low D.O., and long net set durations. Despite more recent permit modifications reducing mortality of sturgeon in nets, there is a chance of delayed mortality occurring without being reported. There is unfortunately no way to estimate the rate of delayed mortality, but NMFS believes it would be minimal based on reports of various species of sturgeon captured and transported to rearing facilities.

Table 6. Number of shortnose sturgeon mortalities under recent scientific research permits		
Permit Number	Shortnose sturgeon captured	Shortnose sturgeon mortalities
1420 (2005-2009)[1]	1472	0
1447 (2006-2010)	107	0
1444 (2005-2009)[1]	1	0
1449 (2007-2009)[1]	50	0
1486 (2006-2009)[1]	416	0
1505 (2006-2010)[1]	279	0
1516 (2007-2010)[1]	344	0
1547-02 (2006-2010)[2]	150	0
1549 (2006-2010)	522	0
1575 (2007-2010)	14	0
1580 (2007-2010)	112	0
1595 (2007-2010)	695	1
10037 (2007-2010)	235	0
10115 (2008-2010)	12	0
14394 (2010)	383	
14604 (2010)	34	1
14759 (2010)	0	0
Totals	4,826	2

1. Expired permit.
2. Permit in the Hudson River replaced by proposed File 16439.

The applicant has maintained a record of no verifiable mortalities while engaged in current authorized research on shortnose and Atlantic sturgeon within the same proposed action area. However, the applicant has also been working under much more conservative sampling effort since 2006 (Permit No. 1547), taking an average of 50 shortnose sturgeon annually, and has not been performing surgical procedures other than gastric lavage under light anesthesia. Consequently, because the current application requests authorization for capturing 5,400 shortnose sturgeon over five years of increased netting activity, having potentially much larger individual catches and associated stress, NMFS would anticipate some minor mortality and/or delayed harmful stress associated with capture and increased netting activity. (See Section *4.2.1.11*of this EA).

- ***Gill Netting*:**

Since water temperature and D.O. levels are variable and can impact the amount of time sturgeon are safely netted and handled, the guidelines in Table 2 would be adhered to as part of the permit mitigation conditions. No netting activity would take place below 0°C or above 28°C; and no surgical procedures would take place below 7°C or above 27°C. If temperature were not within these limits, sturgeon would be only measured, weighed, photographed, PIT and Floy tagged and genetic tissue sampled before being recovered and released as soon as possible.

Although the applicant stated typical net set duration during the study would be two hours, to limit stress at temperatures less than 15 ^{o}C, NMFS would authorize net sets not exceeding 4 hours duration. Further, at temperatures between 15^{o}C and 25^{o}C, net sets would not exceed 2 hours; and at temperatures between 25^{o}C and 27^{o}C, soak times would not exceed 1.0 hour.

Dissolved oxygen levels would also be measured prior to each net set ensuring at least a 4.5 mg/L concentration is maintained (Table 2).

- ***Drift Netting*:**

Drift gillnets can be used very effectively capturing sturgeon by drifting through relatively snag-free areas while dragging near or on the bottom (O'Herron and Able 1990, McCord 1998). Researchers propose to set drift gillnets during early stage flood tide (slack) perpendicular to the tidal current and tend them closely until high tide. This method is to be used through upriver runs and pools without using very light lead line (just enough to take the net to the bottom) avoiding entanglements. Often this method results in lower debris loading because the nets drift along with the debris and does not intercept it.

Generally, the shorter soak times used while drift netting (30 minutes to two hours depending on tides) results in reduced pressure on the driftnets with less resulting injury, stress and/or mortality to captured fish. Also, because researchers check drift nets at short intervals, sturgeon or non-target animals are removed early from the nets at capture, resulting in animals less likely to experience stress. Further, closely tending drift nets also reduces the risk of gear entanglement or gear loss resulting from ghost nets.

- ***Trawling:***

Most negative effects resulting from trawling capture of sturgeon typically are related to the speed and duration of the trawl (Moser et al. 2000). However, the applicant has proposed similar methods of past and present permits where trawling has been employed in the upper and lower Connecticut River, in South Carolina rivers and in the Delaware River (NMFS Permit No. 1549, 1516, 1505 and 1486). These permitted actions have not reported mortalities of shortnose sturgeon and have not experienced significant impacts to bottom substrates.

Therefore, NMFS concludes any adverse effects from trawling to shortnose sturgeon, non-target species, or habitat would be localized and minor. To limit effects of trawling, measures would include in the current research such as, trawling at slow speeds, towing between 5 and 10 minutes, and avoiding multiple trawls over the same area during the day using a GPS unit. Further, trawling would primarily be conducted over smooth sand and muddy substrates, avoiding hard bottoms, vegetated areas, organic material, or woody debris. If the trawl does become entangled in debris, efforts would begin immediately to free the gear, avoiding injuring to any captured target or non-target species.

4.2.1.2 Effects of General Handling (e.g., Holding, Measuring, Weighing):

Shortnose sturgeon is a hardy species, but can be sensitive to handling stress when water temperatures are higher or D.O. is lower. Also, handling stress can escalate if sturgeon are held for long periods after capture; and conversely, stress is reduced when fish are returned as soon as possible to their natural environment to recover (D. Peterson, *pers. comm.* January 2011). The applicant's researchers are experienced at capturing larger numbers of sturgeon and are aware of signs of handling stress—redness around the neck and fins and soft fleshy areas, excess mucus production on the skin, and a rapid flaring of the gills. Additionally, sturgeon tend to inflate their swim bladder when stressed and when handled in air (Moser et al. 2000). Further, if not returned to neutral buoyancy prior to release, sturgeon would also tend to float and thus be susceptible to sunburn and bird attacks.

In order to minimize handling stress after removal from capture gear, researchers have been trained to recognize and recover stressed animals. Researchers would recover sturgeon in floating net pens or in onboard live wells, shielding them from direct sunlight. Additionally, should there be catches larger than anticipated, additional net pens would be kept onboard to accommodate excess numbers of sturgeon and/or bycatch ensuring these can be safely handled. Further, the applicant would enlist the help of additional field personnel to process the fish in a safe and timely manner. The total holding time of shortnose sturgeon after removal from the capture gear until they are returned to the river would not exceed two hours, unless individual fish had not recovered from anesthesia or a stressed condition.

The total handling time for all onboard handling, would never exceed 20 minutes, unless fish had not recovered from anesthesia or a stressed condition. During onboard handling and processing, all sturgeon would be handled carefully, kept in water as much as possible, and rubber gloves worn to avoid skin abrasion and removal of mucous coats from sturgeon. Flow-through holding tanks would also allow for total replacement of water volume every 15 minutes; and backup oxygenation of holding tanks with compressed oxygen would be kept on hand ensuring D.O. levels remain above 4.5mg/L.

Following processing, all fish would be treated with slime coat restorative and placed in separate net pens for observation ensuring full recovery prior to release. Any fish not responding readily would be recovered further in another net pen by holding the fish upright and immersed in river water, gently moving the fish front to back to aid freshwater passage over the gills to stimulate the fish. When showing signs of being able to swim away strongly, the sturgeon would be released and a spotter would watch to make sure the fish stays down and fully recovered.

Although the proposed netting activity would be expected to be intensive, and at times, large numbers of sturgeon are anticipated, NMFS believes the conditions described for mitigating handling stress would be consistent with the best management practices recommended by Moser et al. (2000) and Kahn and Mohead (2010). Further, the commitment of additional manpower and net pens during periods when larger catches are anticipated would also help minimize stress. Thus, NMFS expects minimal direct impacts, including stress, mortality or delayed mortality, would result from handling stress.

4.2.1.3 Effects of Genetic Tissue Sampling:

Tissue sampling does not appear to impair the sturgeon's ability to swim and is not thought to have any long-term adverse impact (Wydoski and Emery 1983). Many researchers, including the applicant, have reported removing tissue samples with no adverse effects; therefore, NMFS does not anticipate any long-term adverse effects to sturgeon from this activity.

4.2.1.4 Effects of PIT Tagging:

PIT tags are commonly used in fisheries research for permanently marking and identifying individual fish. The PIT tags used for permanently marking and identifying individual captured fish are biologically inert and have been shown not to cause problems associated with some other methods of tagging fish, such as scarring and tissue damage or otherwise adversely affecting growth or survival (Brännäs et al. 1994). Due largely to the fact that they are injected internally, PIT tags have the highest reported retention rate of all identification tags, though they are not visible to the researcher or fisherman upon capture. Smith et al. (1990) noted 100% retention after 60 days in wild shortnose sturgeon. In the Penobscot River, retention rates for PIT tags in Atlantic sturgeon were 93% after as much as 8.8 years (Fernandes, pers. comm.). Consequently, NMFS does not anticipate adverse effects to the environment from small numbers of potentially expelled PIT tags.

However, since smaller sturgeon are more difficult to properly PIT tag, and thus more susceptible to mortality as a result of this procedure (Henne et al. 2008), the applicant would only be permitted to PIT tag sturgeon ≥300mm (TL). Lastly, to avoid duplicate tagging, all sturgeon captured would be scanned with a PIT tag reader prior to the insertion of a PIT tag, and results of PIT tag retention would be reported to NMFS in annual reports to document PIT tag retention.

4.2.1.5 Effects of Floy Tagging:

The applicant requested an additional externally identifiable tagging method using Floy tags during the study, suggesting the additional information gained from visible tags would be important because a sizable percentage of sturgeon interactions on the Hudson River are reported by commercial and recreational fishermen, as well as the scientific community.

Smith et al. (1990) compared the effectiveness of Floy tags with similar nylon T-bar tags, anchor tags, and Carlin tags in shortnose and Atlantic sturgeon. Collins et al. (1994) found no significant difference in healing rates (with T-bar tags) between fish tagged in freshwater or brackish water. Clugston (1996) also looked at T-bar anchor tags placed at the base of the pectoral fins and found that beyond two years, retention rates were about 60%. Collins et al. (1994) compared T-bar tags inserted near the dorsal fin, T-anchor tags implanted abdominally, Floy tags attached near the dorsal fin, and disk anchor tags implanted abdominally. They found, long-term, T-bar anchor tags were most effective (92%), but also noted minor, slow-healing lesions at the insertion points.

NMFS concludes the use of Floy tags to externally mark shortnose sturgeon is an acceptable, though duplicative means to identify recaptured fish. The practice is not expected to significantly impact sturgeon health; though, to lessen potential negative impacts described above using such tags, applicant would use sterile tagging technique and subsequently monitor dorsal fins tag sites of recaptured sturgeon. Also, shed tags would not be considered an adverse impact to the environment, as these tags are small in size and the numbers insignificant. Additionally, results of tag retention and fish health would be reported to NMFS-PR in annual reports and as periodically requested by NMFS. If impacts of the Floy tags on the health of fish are other than insignificant, NMFS would reevaluate their use at that time.

4.2.1.6 Effects of Implanting Acoustic Transmitters:

In the first three years of the study, a maximum of 100 Lotek dual acoustic/radio tags would be implanted surgically in adult, sub-adult and juvenile shortnose sturgeon using the outlined protocol presented in Section 2.3.2.2.

The applicant has reported to NMFS that they had surgically implanting acoustic tags in hundreds of striped bass and Atlantic sturgeon adult and juvenile fish with few mortalities or adverse effects directly attributable to implanting. According to the applicant, the behavior of acoustically tagged fish in past studies (with some fish tracked for long periods) suggests the research methods used have had little verifiable negative effects on individual animals.

Other precautions by the applicant would exclude invasive procedures (those requiring anesthetization) on fish in stressed conditions; or when the water temperature is outside the range of 7 to 27 °C. To verify normal mobility and swimming behavior of sturgeon receiving internal transmitters, the total weight of all transmitters and tags would not exceed 2% of the weight of the fish.

In other research, Dr. Collins in South Carolina (M. Collins, pers. comm., November 2006) tracked radio tagged shortnose sturgeon for two years and documented no mortality from surgical implantation of internal transmitters. Additionally, Kieffer and Kynard (In press) reported sturgeon retained implanted tags for their operational life, and in most cases, lasted much longer (mean, 1,370.7 days). However, in a telemetry study of shortnose sturgeon in the Altamaha River, Georgia, only 9 of the 12 tagged fish were detected for the duration of a study; although attempts were made to locate the three remaining sturgeon, they were not found again (Devries 2006).

Although no mortality or serious harm was directly documented for these fish, and transmitter failure or emigration out of the study area are possible explanations, NMFS must consider the possibility for adverse effects as a result of internal transmitter implantation.

While often not verifiable, NMFS believes surgical implantation of acoustic transmitters does have the potential to produce delayed effects on shortnose sturgeon. For this reason the applicant would be required to regularly document behaviors which could signify tag adaptation (e.g. swimming behavior, frequency of detection) by manually and passively tracking individual fish and noting the number of unrelocated individuals.

In general, direct effects of the proposed tagging procedure could include increased pain, handling discomfort, hemorrhage at the site of incision, risk of infection from surgery, affected swimming ability, and/or abandonment of spawning runs. However, use of proper anesthesia, sterilized conditions, and the surgical techniques described, could minimize potential short-term effects from surgery reducing the long-term risks of injury and mortality. Although more invasive surgical procedures are required for internal implantation verses external tagging, this tagging procedure provides greater retention rates than external attachment. NMFS therefore expects the tagging would result in primarily short-term stress to the animal with some unverifiable potential for mortality resulting from such tagging.

Lastly, many fish have sensitivity to sound energy from 200 Hz up to 800 Hz, and some species are able to detect lower frequency sounds (Popper 2005). However, the potential for the proposed internal sonic transmitters to affect sturgeon carrying them would be small because the frequency of the acoustic tags is 69 kHz, well above the audible threshold of most fish. Also, NMFS considered unverified potential for predation on tagged sturgeon by seals or sea lions which have been reported to have hearing capability in the range of the proposed tags (B. Southall, *pers. comm.*, November 2009). But because such marine mammal predators are very rare in the Hudson River Estuary, NMFS does not believe such predation is an extensive risk for shortnose sturgeon tagged with acoustic tags.

4.2.1.7 Effects of Anesthesia:

The applicant proposes to use tricaine methane sulphonate (MS-222) at concentrations up to 150 mg/L to anesthetize shortnose sturgeon for implanting sonic transmitters, performing gastric lavage and taking fin ray samples. This concentration is commonly used by sturgeon biologists to induce adequate levels of anesthesia for the proposed surgeries (Kahn and Mohead 2010). The induction time required for optimal sedation varies with dosage, water temperature, size of fish and water chemistry; however, typical induction times range between five to eight minutes. Because telemetry tags can be inserted into the coelom in less than a minute after surgery begins, there is little risk to the sturgeon (M. Matsche; pers. comm.; December 2009). Anesthetizing sturgeon for gastric lavage and fin ray sampling present less of a threat, because a lower concentration of anesthesia is needed for these methods (Kahn & Mohead 2010). Complete recovery time from the anesthetic averages four to six minutes (Brown 1988).

Risks associated with anesthetizing with MS-222 would include hypoxia from overexposure (caused by inexperience at recognizing the proper level of narcosis) (Coyle et al. 2004), anesthetizing fish in poor health or stressed conditions, and injury from thrashing during the excited phase of anesthetic induction. To reduce such risks, the applicant employes experienced researchers in the use of MS-222, having performed multiple tagging surgeries, gastric lavage and fin ray samples on sturgeon using similar anesthetic protocol. Further, only non-stressed animals in good health would be anesthetized for each of these procedures. Also, fish would be monitored closely during induction and recovery phases to reduce risk. To avoid injury while being anesthetized, sturgeon would also be restrained with netting to prevent animals from jumping or falling out the anesthetic bath. Also, because MS-222 is an acidifying solution, potentially extending the induction time for narcosis, the bath solution would be buffered to a neutral pH with sodium bicarbonate, as well as oxygenated prior to use.

Finally, although the FDA permits the use of MS-222, it also requires a 21 day withdrawal period before an anesthetized fish can be consumed. This poses a public health concern when non-listed fish are released into the wild where they may be captured for human consumption. However, a 21 day withdrawal is not a consideration for threatened or endangered sturgeon, as taking or possessing them is prohibited by the ESA. Therefore, no external marks or tags are required for shortnose sturgeon treated with MS-222, as is typically required by the FDA in the case of non-listed fish anesthetized with MS-222. (F. Pell; FDA; pers. comm.; email; 2/24/2009).
Therefore, NMFS considers the proposed anesthetizing protocol well established with known risks minimized to produce limited effects on sturgeon and the environment.

4.2.1.8 Effects of Blood Collection:

Effects of drawing blood samples with syringes from the caudal vein of shortnose sturgeon could include pain, handling discomfort, possible hemorrhage at the site, or risk of infection. To mitigate these effects, the needle would be slowly advanced while applying gentle negative pressure to the syringe until blood freely flows into the syringe. Once blood is collected, direct pressure would be applied to the site to ensure clotting and prevent subsequent blood hemorrhaging (Stoskopf, 1993). The site would then be disinfected and checked again after recovery prior to release. Additionally, the project staff responsible for obtaining these samples would have received extensive experience in the procedure. Drawing blood in the manner described, appears to have little probability of killing shortnose sturgeon or producing sub-lethal effects.

4.2.1.9 <u>Effects of Gastric Lavage</u>:

Information gains on diets and how they relate to seasonal foraging and habitat use of shortnose sturgeon have been made using gastric lavage (Foster 1977; Haley 1998; Murie and Parkyn 2000; Moser et al. 2000 and Collins 2008). Although, due to the morphology of the gut tract and position of the swim bladder in the shortnose sturgeon, care must be taken in the procedure to not injure sturgeon while inserting the tube into the esophagus and positioning it within the gut. Potential injury to sturgeon could include abrasion of the gut wall near the pyloric caecum, potential trauma associated with the researcher not seating the tubing properly in the gut, and potential negative growth responses of sturgeon (going off-feed) after gastric lavage. To mitigate these concerns, the applicant will use the practice of lightly anesthetizing sturgeon with MS-222 prior to gastric lavage relaxing the gut wall and allowing easy penetration of the tubing to the proper position in the gut (Kahn and Mohead 2010).

Savoy and Benway (2004) reported results from 246 shortnose sturgeon collected on the Connecticut River between 2000 and 2003. All of the fish tolerated the procedure well, recovered rapidly and were released unharmed after the procedure. The lavage technique was successful in evacuating stomach contents effectively of shortnose sturgeon of all sizes without internal injury; in some cases, recently ingested prey items were still alive after retrieval (Savoy and Benway 2004). Collins et al (2008) also successfully lavaged 198 Atlantic sturgeon and 20 shortnose sturgeon, reporting shortnose sturgeon stomach contents consisted of almost entirely of amphipods of varying species. In contrast, Atlantic sturgeon diet consisted primarily of benthic polychaete worms (38% of Atlantic sturgeon had polychaetes and only 12.4% of Atlantics had amphipods in their stomachs). These results suggest that at least in South Carolina subadult and adult shortnose sturgeon and sub-adult Atlantic sturgeon do not compete for food resources even though both species are often collected together. During 2009 and 2010, the applicant also successfully lavaged the stomach contents from 48 shortnose sturgeon captured in the Hudson River (Permit No. 1547-02).

Based on the reported experience with this procedure, it is believed shortnose sturgeon undergoing gastric lavage as proposed would experience handling discomfort, but would be exposed to only minimal short-term risk associated with the procedure.

4.2.1.10 <u>Effects of Fin Ray Sampling</u>:

The applicant proposes to section-notch (~1cm^2) the leading pectoral fin ray on up to 200 shortnose sturgeon captured each year for age-growth study of shortnose sturgeon over the five year permitting period. In the past, it was common practice for fisheries biologists to remove the entire fin spine from sturgeon to conduct the age analysis. It was believed that the removal of the entire fin spine did not impact locomotion, as was concluded that the function of the pectoral fin lay in orientation during rising and sinking (Wilga and Lauder 1999).

Parsons et al. (2003) conducted a similar study removing pectoral fin rays from shovelnose sturgeon. These cultured sturgeon were able to hold their position in a current without fin spines as ably as the controls. However, Kohlhorst (1979) reported potentially deleterious effects of fin spine removal, including some mortality in white sturgeon during a mark-recapture study. The significance of the mortality noted could have been influenced by small sample sizes; nevertheless, this concern triggered additional research in the laboratory by Collins (1995) and Collins and Smith (1996). Using methods removing the entire spine from the base, these researchers found wounds healing within one year, as the pectoral fin rays behind the leading spine "bulked up" growing in circumference and later appearing similar to the original fin spine. Furthermore, there were no significant differences in growth or survival between treatment and control sturgeon.

Later, however, while conducting a mark-recapture study of Atlantic and shortnose sturgeon, Collins et al. (2008) again noted enlarged secondary fin spines upon recapturing larger individuals having the entire leading pectoral fin spine removed. However, in this study, based on observations of poor growth, it was concluded the fin-ray removal procedure could potentially be detrimental to sturgeons' health, particularly larger sturgeons. Although there were no statistically significant deleterious effects found, researchers were concerned about the biologically significant effects of removing the entire fin spine. Currently, until further research takes place, their team has concluded to no longer remove entire fin spines from adult sturgeon (M. Collins; pers. comm.; 2009).

Subsequently, D. Peterson (File Nos. 14394 and 10037) (pers. comm. April 21, 2009) reported his method of removing a small notched portions of the pectoral fin spines has experienced few deleterious effects on re-sampled shortnose and Atlantic sturgeon. Photographic evidence submitted to NMFS by the researcher shows no obvious signs of unhealed lesions or reduced growth on sturgeon sampled one year after notching the fin ray. Currently, NMFS does not consider this "notching" of fin rays in aging studies to be a deleterious procedure; while it also does not sanction removal of the entire leading fin ray (Kahn and Mohead 2010).

Most age studies conducted on various species of sturgeon have in recent years documented difficulties validating age estimates, suggesting age in older sturgeon fin rays consistently underestimate actual age (Rien and Beamesderfer 1994, Paragamian and Beamesderfer 2003, Hurley et al. 2004, Whiteman et al. 2004). Although NMFS suggests results obtained when estimating age of shortnose sturgeon using fin rays be evaluated carefully, fin rays currently provide the safest and most viable age estimator available. NMFS also considers this procedure would be expected to cause short-term discomfort to individuals, but would not be expected to have a significant impact on the survivability or the normal behavior of individuals. However, should other more viable research methods be proven, NMFS would reevaluate the use of fin rays for age studies.

To minimize adverse effects, fin rays would be collected using sterilized surgical instruments to remove the 1 cm^2 sections of pectoral fin rays while fish are under anesthesia. Additionally, no other research method requiring anesthesia (i.e., gastric lavage or sonic tag implants) would be conducted on the same fish selected for fin-ray sectioning sampling. Finally, each researcher authorized to conduct fin-ray sectioning would be required to have had adequate prior training in the procedure.

4.2.1.11 *Effects of Incidental Mortality* (*or Serious Harm*) on Shortnose sturgeon: The researcher has maintained a record of 0.00% verifiable mortality while engaged in other authorized research with shortnose sturgeon in Newburg and Haverstraw Bays on the Hudson River. Annual reports from the applicant between 2000 and 2010 (Permit Nos. 1226 and 1542-02) indicate a total of 497 shortnose sturgeon were captured, measured, weighed, PIT and Carlin tagged and tissue sampled. Of this number, 28 were also gastric lavaged in 2009 and 2010.

However, the methods described for previous research on the Hudson River are considered much more conservative than described in the current proposed study in File 16439. The applicant requests authorization over five years for taking up to 5,400 adult, sub-adult and juvenile shortnose sturgeon and an incidence of mortality or serious harm of four over five years.

Although changes in permit modifications issued by NMFS have resulted in significantly reduced research related mortality and harm reported for shortnose sturgeon, there is still increased risk of direct and delayed mortality occurring under a heavier schedule of netting and other research methods proposed. Moreover, there is evidence of incidental mortality potentially being underreported for internally tagged fish in studies (Devries (2006). Consequently, NMFS believes the increased potential for serious injury or mortality in the proposed research could result in at least two annual mortalities or incidences of serious harm in year four and five, or a total of four (4) during the five year study.

If a greater incidence of mortality or serious injury should occur, researchers would be required to cease the study and consult with NMFS-PR to determine the cause of mortality and to discuss any remedial changes in research methods. The Permits Division could grant authorization to resume permitted activities based on review of the incident depending on the circumstances, or else suspend activities indefinitely.

4.2.2 *Effects on Non-Target Species*

4.2.2.1 Listed Species Under USFWS Jurisdiction

There are no non-target ESA-listed species under USFWS jurisdiction located within the action area.

4.2.2.2 Sea Turtles

As per the applicant's experience and the historical record of very rare sea turtle strandings and sightings within the action area (combined with the mitigation conditions set forth in the permit), no significant impacts on sea turtles are anticipated. The following standard condition would be included in the permit: If a sea turtle were incidentally captured during netting, the Permit Holder, Principal Investigator, Co-investigator(s), or Research Assistant(s) acting on the Permit Holder's behalf must use care when handling a live turtle to minimize any possible injury; and appropriate resuscitation techniques must be used on any comatose turtle prior to returning it to the water. Further, all turtles must be handled according to procedures specified in 50 CFR 223.206(d)(1)(i).

4.2.2.3 Marine Mammals

The majority of the proposed research would be conducted in sections of the river where such animals are rarely encountered. Although NMFS recognizes the chances of interaction with these marine mammals are limited, as precautionary measures, the following mitigation conditions would be applied in the permit, namely: netting would not be deployed when marine mammals are observed within the vicinity of the research; and animals would be allowed to either leave or pass through the area safely before net setting is initiated. Should any marine mammal enter the research area after the nets have been deployed, the lead line would be raised and dropped in an attempt to make marine mammals in the vicinity aware of the net. If marine mammals remain within the vicinity of the research area or approach the set, nets would be removed.

Additionally, in all boating activities, researchers would be advised to keep a close watch for marine mammals to avoid harassment or interaction and also to review the NMFS Guidelines for Viewing Marine Mammals (http://www.nmfs.noaa.gov/pr/education/regional.htm).

As per the applicant's experience and the available information of marine mammal strandings and sightings within the action area, combined with the mitigation conditions set forth in the permit, no significant impacts on marine mammals are expected.

4.2.2.4 Non-Listed By-catch Species

NMFS does not anticipate significant impacts on non-listed by-catch species. All non-listed by-catch species are expected to be released alive (see Section 3.3.2). However, as discussed, the following conditions would apply to Atlantic sturgeon incidentally captured prior to ESA listing: NMFS requests that Atlantic sturgeon be minimally be PIT tagged, genetically sampled, and released. Further, if an Atlantic sturgeon is incidentally captured prior to listing, NMFS also requests that all other netting protocols and research conditions protective of shortnose sturgeon be used by researchers to ensure survival of Atlantic sturgeon.

Additionally, NMFS requests all Atlantic sturgeon incidental interactions prior to listing to be reported to Lynn Lankshear, NMFS PR at 978-281-9300 ext. 6535 (Lynn.Lankshear@noaa.gov). This report would contain descriptions of take, including lethal take, location and final disposition of the sturgeon. Specimens or body parts of dead Atlantic sturgeon would be preserved (preferably on ice or refrigeration) until sampling and disposal procedures were discussed with NMFS.

Alternately, if Atlantic sturgeon are listed subsequent to issuance of Permit 16439, without a separate permit for Atlantic sturgeon, the researcher would be required to cease study of shortnose sturgeon, applying for and having issued a separate ESA scientific permit for taking Atlantic sturgeon. Thereafter, the effects on the environment of the researcher's actions on Atlantic sturgeon and shortnose sturgeon would be considered separately while netting both species concurrently. Each permit would have similar, but separate mitigating conditions protective of each species.

4.2.2.5 Aquatic Nuisance Species

To prevent potential spread of aquatic nuisance species identified in the watershed, all equipment assigned to the research should not be reassigned to other watersheds until the research is completed or suspended. If the research has been completed or suspended, all gear and equipment should be bleached, washed and air dried before being re-deployed to a new location.

4.3 SUMMARY OF COMPLIANCE WITH APPLICABLE LAWS, NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

4.3.1 *Compliance with Endangered Species Act* (*ESA*):

To comply with Section 7 of the regulations governing takes of shortnose sturgeon (50 CFR 402.14(c)), a Section 7 consultation was initiated by the NMFS, Permits, Conservation and Education Division, Office of Protected Resources under the ESA. In accordance with Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 *et seq.*), a Biological Opinion was prepared for this proposed action by the NMFS' Endangered Species Division, Office of Protected Resources. It concluded, after reviewing the current status of shortnose sturgeon, the environmental baseline for the action areas, the effects of the take authorized in the permits, and the probable cumulative effects of the proposed permit, would not likely jeopardize the continued existence of shortnose sturgeon or any other NMFS ESA-listed species; nor would it likely destroy or adversely modify designated critical habitat.

Based on the information currently available, none of the non-target threatened or endangered (or proposed) species, or any related critical habitat, under the jurisdiction of the USFWS, are known to occur in the project area. Therefore, NMFS-PR concludes the researcher's activity in the Hudson River would not affect any of these threatened or endangered species, or their defined critical habitat. Thus no coordination under Section 7 of the Endangered Species Act is required with the USFWS.

4.3.2 *Compliance with the Magnuson-Stevens Fishery Conservation & Management Act*: NMFS determined the applicant's proposed netting and boating activity would occur within designated EFH zones for managed species in the Hudson River (see Section 3.3.2 of this EA). However, NMFS concludes the activities would likely only have minimal impacts based on the history of mitigation conditions contained other permits for similar permitting actions.

NMFS PR requested concurrence by email on June 3, 2011, from NMFS, Northeast Office of Habitat Conservation whether the proposed action, as conditioned, would have adverse impacts on designated EFH in the Hudson River. On October 12, 2011, Karen Greene and Diane Rusanowsky, NOAA Habitat Specialists, responded by email agreeing the proposed boating and netting activities would have no more than minimal impact to EFH in the action area for the proposed research. Suggestions were made by each specialist and were implemented in this EA to better define the EFH zones and managed species potentially affected within the action area.

4.4 COMPARISON OF ALTERNATIVES

While the "no action" alternative would have no environmental effects, the opportunity to conduct this particular research would be lost. Initiation of this research is important to collect information that would contribute to better understanding of shortnose sturgeon and to provide information to NMFS that would be needed to implement NMFS management activities if shortnose sturgeon are present in these river systems. This is important information that would help conserve and manage shortnose sturgeon as required by the ESA and implementing regulations.

The environmental effects of the preferred alternative would mainly be limited to individual shortnose sturgeon. However, effects would be minimal and this alternative would allow collection of valuable information assisting NMFS' efforts to recover shortnose sturgeon. Neither option is expected to have adverse population nor stock-level effects on shortnose sturgeon. Given the preferred option's minimal impact to the environment and the potential positive benefits of the research, NMFS believes the information gained would outweigh any likely negative affect to the target species.

4.5 **MITIGATION MEASURES**

The activities authorized under proposed Permit No. 16439, if approved, would follow certain procedures diminishing and mitigating impacts of the proposed action appearing in the attached permit. The permit conditions would require specific conditions ensuring compliance with appropriate research protocols standard to such research, minimizing the potential for injury and stress during procedures, and reducing impacts to the environment.

4.6 UNAVOIDABLE ADVERSE EFFECTS

The research activities would cause disturbance and stress and injury to the captured shortnose sturgeon and non-target species (temporarily interrupting normal activities such as feeding). The mitigation measures imposed by permit conditions are intended to reduce, to the maximum extent practical, the potential effects of the research on the targeted species as well as any other species that may be incidentally harassed. While the research techniques used may have an effect on the individual shortnose sturgeon being targeted for research, the effect on the animals is not expected to have an adverse or long-term effect on target or non-target individuals or populations

4.7 CUMULATIVE EFFECTS

In addition to the direct and indirect effects assessed above, in accordance with NEPA, this EA considers the potential for cumulative effects. Cumulative effects are those that result from incremental impacts of a proposed action which when added to other past, present, and reasonably foreseeable future threats or actions, regardless of which agency (federal or nonfederal) or person(s) undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time. For shortnose sturgeon range-wide, these effects include: research, bycatch, poaching, artificial propagation, dams, dredging, blasting, water quality and contaminants.

4.7.1 *Other Shortnose Sturgeon Research Permits*:

Shortnose sturgeon have been the focus of field studies since the 1970's. The primary purpose of this research is for monitoring populations and gathering data for physiological, behavioral and ecological studies. Over time, NMFS has issued dozens of permits for takes of shortnose sturgeon within its range for a variety of activities including capture, handling, age and growth, gastric lavage, bloodwork, habitat, spawning verification, genetics, contaminants, and tracking. Research on shortnose sturgeon in the U.S. is carefully controlled and managed so it does not operate to the disadvantage of the species. As such, all scientific research permits are also conditioned with mitigation measures, ensuring the research impacts target and non-target species as minimally as possible.

Range wide, there are 18 active scientific research permits targeting shortnose sturgeon populations in the wild with similar objectives as the proposed Hudson River permit (See Appendix 1). In addition, there are also four captive shortnose sturgeon permits eliminating collection from the wild. Current shortnose sturgeon research in the Hudson River is associated with: (1) the applicant's current permit (Permit No. 1547-02) focusing on juvenile and sub-adult shortnose sturgeon in the Haverstraw and Newburg Bays of the Hudson River Estuary; (2) the annual estuary-wide monitoring program conducted by Dynegy Northeast Generation (Permit No. 1580); and (3) Earth-Tech Northeast's permit (Permit No. 1575) evaluating impacts of the Tappan Zee Bridge project crossing the Hudson River the lower Haverstraw Bay. Various other researchers studying the Atlantic sturgeon population in the Hudson River also impact shortnose sturgeon and its habitat to some extent.

A Biological Opinion was issued for each of these permits including the requirement for consideration of cumulative effects to the species (as defined for ESA). For each, the Biological Opinion concluded issuance, as conditioned, would not likely jeopardize the continued existence of the shortnose sturgeon, either individually or cumulatively.

4.7.2 *Bycatch and Poaching*:

4.7.2.1 *<u>Bycatch</u>*:

Directed harvest of both shortnose and Atlantic sturgeon is prohibited. As stated, shortnose sturgeon are listed as endangered under the ESA and therefore, prohibited from take. In 1998, the Atlantic States Marine Fisheries Commission (ASMFC) imposed a coast-wide fishing moratorium on Atlantic sturgeon until 20 year classes of adult females could be established (ASMFC 1998). NMFS followed this action by closing the Exclusive Economic Zone (EEZ) to Atlantic sturgeon take in 1999. Shortnose sturgeon has likely benefited from this closure as any bycatch in the fishery targeting Atlantic sturgeon (primarily for meat since the 1950s) has been eliminated.

Although directed harvest of shortnose sturgeons has been prohibited since 1967, bycatch of this species has been documented in other fisheries throughout its range. Adults are believed to be especially vulnerable to fishing gears for other anadromous species (such as shad, striped bass and herring) during times of extensive migration – particularly the spawning migration upstream, followed by movement back downstream (Litwiler 2001). Additionally, bycatch in the southern trawl fishery for shrimp *Penaeus* spp. was estimated at 8% in one study (Collins et al. 1996).

The 1998 Recovery Plan for shortnose sturgeon lists commercial and recreational shad fisheries as a source of shortnose bycatch. Although shortnose sturgeon are primarily captured in gill nets, they have also been documented with pound nets, fyke/hoop nets, catfish traps, shrimp trawls and hook and line fisheries (recreational angling).

Bycatch in the gill net fisheries can be quite substantial and is believed a significant threat to the species. The catch rates in drift gill nets are believed to be lower than for fixed nets; longer soak times of the fixed nets appear to be correlated with higher rates of mortalities. In an American shad gill net fishery in South Carolina, of 51 fish caught, 16% were bycatch mortality and another 20% of the fish were visibly injured (Collins et al. 1996).

4.7.2.2 *<u>Poaching</u>*:

There is evidence of shortnose sturgeon targeted by poachers throughout their range, and particularly where they appear in abundance (such as on the spawning grounds) but the extent this is occurring is difficult to assess (Dadswell 1979, Dovel et al. 1992, Collins et al. 1996). There have been several documented cases of shortnose sturgeon caught by recreational anglers. One shortnose sturgeon illegally taken on the Delaware River was documented by a New Jersey Department of Fish and Wildlife conservation officer in Trenton New Jersey (NJCOA 2006). Additionally, citations have been issued for illegal recreational fishing of shortnose in the vicinity of Troy, New York on the Hudson River and on the Cooper River in South Carolina. Poaching has also been documented for other sturgeon species in the United States. Cohen (1997) documented poaching of Columbia River white sturgeon sold to buyers on the U.S. East Coast. Poaching of Atlantic sturgeon has also been documented by law enforcement agencies in Virginia, South Carolina and New York and is considered potentially a significant threat to the species; but the present extent and magnitude is largely unknown (ASPRT 2008).

4.7.3 *Artificial Propagation*:

Since there are aquaculture or research facilities currently raising captive shortnose sturgeon on watersheds of native shortnose sturgeon, there is a potential for escapement and impact to the wild population. Potential threats from aquaculture escapement include the genetic alterations to native populations and potential competition for space and resources between hatchery-reared and wild fish. Further, since most sturgeon diseases have been documented in captive-reared fish, there is also the chance that escapees could spread pathogens and disease. To date, there have been no reports of escapees from the two facilities in Canada or from the USFWS facilities in South Carolina and Georgia. However, on the Connecticut River six fish artificially spawned from adults captured at Holyoke were released with radio tags upstream of the Holyoke Dam in 1989 and 1990 and they were subsequently never recovered. Additionally, several juveniles were accidentally released in 2006 and unrecovered.

There are currently two private companies producing shortnose sturgeon in Canada. Both are located on the St. John River and one is currently operating at a commercial scale. In the United States, the USFWS has been raising shortnose sturgeon (NMFS Permit No. 1604) for approximately 22 years. Until recently Bears Bluff National Fish Hatchery located on Wadmalaw Island in South Carolina raised the bulk of these fish while some fish were also reared at the USFWS' Warm Springs, GA and Orangeburg, SC hatcheries. Propagation of shortnose sturgeon at the Bears Bluff facility ended in the spring of 2008 but a subset of the broodstock and offspring are still maintained at Warm Springs, GA and Orangeburg, SC.

Captive shortnose sturgeon are also maintained by the USGS at the Conte Anadromous Fish Research Center (Permit No. 1549-02) located on the Connecticut River. These stocks are held in quarantine and are primarily used as test animals for upstream and downstream fish passage studies, but some progeny are also made available to other research facilities and educational display aquaria when requested. The F-1 progeny are produced periodically using wild native fish from the Connecticut River in a *living stream* natural spawning environment; however, hatchery protocol is not a research objective at the facility.

4.7.4 *Dams*:

Dams are used to impound water for water resource projects such as hydropower generation, irrigation, navigation, flood control, industrial and municipal water supply, and recreation. Dams can have profound effects on diadromous fish species by fragmenting populations, eliminating or impeding access to historic habitat, modifying free-flowing rivers to reservoirs and altering downstream flows and water temperatures. Direct physical damage and mortality can occur to diadromous fish that migrate through the turbines of traditional hydropower facilities or as they attempt to move upstream using fish passage devices.

In addition to dams impeding anadromous fish migration and associated mortalities, Hill (1996) identified the following potential impacts from hydropower plants: altered D.O. concentrations; artificial destratification; water withdrawal; changed sediment load and channel morphology; accelerated eutrophication and change in nutrient cycling; and contamination of water and sediment.

Furthermore, activities associated with dam maintenance, such as dredging and minor excavations along the shore, can release silt and other fine river sediments that can be deposited in nearby spawning habitat. Dams can also reduce habitat diversity by forming a series of homogeneous reservoirs; these changes generally favor different predators, competitors and prey, than were historically present in the system (Auer 1996a).

The effects of dams on populations of shortnose sturgeon are generally well documented (Kynard 1998, Cooke et al. 2004). However, there may be some rivers where shortnose sturgeon have been extirpated almost without notice due to the construction of impassable dams. In these rivers historical presence of shortnose sturgeon was likely but unknown; there are historical accounts of sturgeon but it is unclear if both Atlantic and shortnose sturgeon used the river and if the river supported spawning of either species. For example, the Susquehanna River is the second largest river on the east coast of the U.S. and there are historical and anecdotal accounts of plentiful "sturgeon" upriver. Currently the Susquehanna has four mainstem dams, the lowermost of which is at approximately rkm 16. The dam has a fish lift but it is not used by shortnose sturgeon. If the Susquehanna River once supported a population of shortnose sturgeon, it is no longer available to them.

Perhaps the biggest impact dams have on shortnose sturgeon is the loss of upriver spawning and rearing habitat. Migrations of shortnose sturgeon in rivers without barriers are wide-ranging with total distances exceeding 200 km or more depending on the river system (Kynard 1997). The construction of dams has blocked upriver passage for the majority of the shortnose sturgeon populations. Dams have restricted spawning activities to areas below the impoundment, often in close proximity to the dam (Kynard 1997, Cooke et al. 2004). The suitability of riverine habitat for shortnose sturgeon spawning and rearing depends on annual fluctuations in flow, which can be greatly altered or reduced by the presence and operation of dams (Cooke et al. 2004). Effects on spawning and rearing may be most dramatic in hydropower facilities that operate in peaking mode (Auer 1996a). Daily peaking operations store water above the dam when demand is low and release water for electricity generation when demand is high, creating substantial, daily fluctuations in flow and temperature regimes. Kieffer and Kynard (*in press*), have documented that flow fluctuations for hydroelectric power generation affected access to spawning habitat and possibly deterred spawning of shortnose sturgeon on the Connecticut River. Similar results were reported in studies conducted for lake sturgeon *A. fulvescens* in the Sturgeon River, Michigan (Auer 1996b) and white sturgeon *A. transmontanus* in the Columbia River, Oregon and Washington (Parsley and Beckman 1994). Kieffer and Kynard (in review), have also observed flow regimes from an upstream hydroelectric facility that were either so forceful that they scoured the shortnose sturgeon rearing shoals or so low that the shoals were dry and exposed. Auer (1996b) demonstrated that there is greater spawning success of lake sturgeon on the Sturgeon River, MI, when facilities operated in the more natural "run-of-the-river" mode.

4.7.5 *Dredging and Blasting:*

4.7.5.1 *Dredging*:

Many rivers and estuaries are periodically dredged for flood control or to support commercial shipping and recreational boating. Dredging also aids in construction of infrastructure and in marine mining. Dredging may have adverse impacts on aquatic ecosystems including direct removal/burial of organisms; turbidity; contaminant resuspension; noise/disturbance; alterations to hydrodynamic regime and physical habitat and actual loss of riparian habitat (Chytalo 1996, Winger et al. 2000).

Dredges are generally either mechanical or hydraulic. Mechanical dredges are used to scoop or grab bottom substrate and are capable of removing hard-packed materials and debris. Mechanical dredge types are clamshell buckets; endless bucket conveyor, or single backhoe or scoop bucket types; however, these dredge types often have difficulty retaining fine materials in the buckets and do not dredge continuously. Material excavated from mechanical dredging is often loaded onto barges for transport to a designated placement site (USACOE 2008).

Hydraulic dredges are used principally to dredge silt, sand and small gravel. Hydraulic dredges include cutterhead pipeline dredges and self-propelled hopper dredges. Hydraulic dredges remove material from the bottom by suction, producing slurry of dredged material and water, either pumped directly to a placement site, or in the case of a hopper dredge, into a hopper and later transported to a dredge spoil site. Cutterhead pipeline dredges can excavate most materials including some rock without blasting and can dredge almost continuously (USACOE 2008).

The impacts of dredging operations on sturgeon are often difficult to assess. Hydraulic dredges can lethally take sturgeon by entraining sturgeon in dredge drag arms and impeller pumps (NMFS 1998). Mechanical dredges have also been documented to lethally take shortnose sturgeon (Dickerson 2006). In addition to direct effects, indirect effects from either mechanical or hydraulic dredging include destruction of benthic feeding areas, disruption of spawning migrations, and deposition of resuspended fine sediments in spawning habitat (NMFS 1998).

Another critical impact of dredging is the encroachment of low D.O. and high salinities upriver after channelization (Collins et al. 2001). Adult shortnose sturgeon can tolerate at least short periods of low D.O. and high salinities, but juveniles are less tolerant of these conditions in laboratory studies. Collins et al. (2001) concluded harbor modifications in the lower Savannah River have altered hydrographic conditions for juvenile sturgeon by extending high salinities and low D.O. upriver.

In addition to impacts of dredging noted above, Smith and Clugston (1997) reported dredging and filling eliminates deep holes, and alters rock substrates. Nellis et al. (2007) documented dredge spoil drifted 12 km downstream over a 10 year period in the Saint Lawrence River, and spoils significantly lessened macrobenthic biomass compared to control sites. Using an acoustic trawl survey, researchers found Atlantic and lake sturgeon were substrate dependent avoiding spoil dumping grounds (McQuinn and Nellis, 2007). Similarly, Hatin et al. (2007) tested whether dredging operations affected Atlantic sturgeon behavior comparing CPUE before and after dredging events in 1999 and 2000. The authors documented three to seven-fold reductions in Atlantic sturgeon presence after dredging operations began, indicating sturgeon avoided these areas during operations.

4.7.5.2 <u>Blasting</u>:

Bridge demolition and other projects may include plans for blasting with powerful explosives. Fish are particularly susceptible to effects of underwater explosions and are killed over a greater range than other organisms (Lewis 1996). Unless proper precautions mitigate the damaging effects of shock wave transmission to physostomous fish like shortnose sturgeon, internal damage and/or death may result (NMFS 1998).

A study testing the effects of underwater blasting on juvenile shortnose sturgeon and striped bass was conducted in Wilmington Harbor, NC in December 1998, and January 1999 (Moser 1999). There were seven test runs including 32-33 blasts (3 rows with 10-11 blast holes per row and each hole ~ 10 ft apart) with about 24-28 kg explosives per hole. For each blast 50 hatchery reared shortnose sturgeon and striped bass were placed in cages three feet from the bottom at distances of 35, 70, 140, 280 and 560 ft upstream and downstream of the blast area. A control group of 200 fish was held 0.5 miles from the blast site (Moser 1999). Test blasting was conducted with and without an air curtain in-place 50 ft from the blast site. Survival was similar for both species. External assessments of impacts to the caged fish were conducted immediately after the blasts and 24 h later. After the 24 h period, a subsample of the caged fish, primarily from those cages nearest the blast, at 35 ft and some from 70 ft, were sacrificed for later necropsy.

Externally, shortnose sturgeon and striped bass selected for necropsy all appeared to be in good condition externally and behaviorally after blasts. However, results of necropsies found many had substantial internal injuries. Moser concluded many of the injuries would have resulted in eventual mortality (Moser 1999). Therefore, based on necropsy results, an apparent estimate of mortality was conducted finding that fish held in cages at 70 ft from blast sites were less seriously impacted by the test blasting than those held at 35 ft. Lastly, it was concluded shortnose sturgeon suffered fewer, less severe internal injuries than striped bass tested. For striped bass and shortnose sturgeon held in cages at 35 ft, approximately 66 and 12 percent, respectively, would have probably not survived the blasts due to their internal injuries. Also there appeared to be no reduction of injury in fish experiencing blasts while air curtains were in place

4.7.6 *Water Quality and Contaminants*:

The quality of water in river/estuary systems is affected by human activities conducted in the riparian zone and those conducted more remotely in the upland portion of the watershed. Industrial activities can result in discharges of pollutants, changes in water temperature and levels of D.O., and the addition of nutrients. In addition, forestry and agricultural practices can result in erosion, run-off of fertilizers, herbicides, insecticides or other chemicals, nutrient enrichment and alteration of water flow. Coastal and riparian areas are also heavily impacted by real estate development and urbanization resulting in storm water discharges, non-point source pollution, and erosion.

The water quality over the range of shortnose sturgeon varies by watershed but is notably poorer in the north than in the south. The U.S. Environmental Protection Agency (EPA) published its second edition of the National Coastal Condition Report (NCCR II) in 2005, a “report card” summarizing the status of coastal environments along the coast of the United States (USEPA 2005; See Table 6 below). The report analyzes water quality, sediment, coastal habitat, benthos, and fish contaminant indices to determine status. The northeast region and the Chesapeake Bay received grades of F. The Southeast region received an overall grade of B-, the best rating in the nation.

Table 6: Summary of the USEPA National Coastal Condition Report (NCCR II) for the U.S. east coast published by the U.S. Environmental Protection Agency (2005) grading coastal environments. (Northeast Region = ME through VA; southeast region = NC-FL; and the Chesapeake Bay = the central region).

	Region		
Status Index	**Northeast**	**Chesapeake Bay**	**Southeast**
Water Quality	D	F	B
Sediment	F	F	B
Coastal Habitat	B	-	C
Benthos	F	F	C
Fish Tissue	F	F	A
Overall	**F**	**F**	**B-**

Areas of concern having poor index scores were: 1) Hudson River – water quality, sediment, and tissue contaminants, 2) Delaware River – water quality and tissue contaminants, 3) Upper Chesapeake Bay – water quality and sediment, 4) Potomac River – sediment, 5) Pamlico Sound – water quality, 6) ACE Basin – water quality, and 7) St. Johns River – sediment. There was also a mixture of poor benthic scores scattered along the Northeast and Southeast region.

Although the south region scored relatively well in terms of water quality, low D.O. and elevated temperatures in the south may limit available habitat and survival of juvenile shortnose sturgeon. Secor (1995) noted a correlation between low abundances of sturgeon during this century and decreasing water quality caused by increased nutrient loading and the increased spatial and temporal frequency of hypoxic conditions. Further, Secor and Gunderson (1998) and Collins *et al* (2001) hypothesized survival of juvenile sturgeon in estuaries may be compromised due to combined effects of increased hypoxia and temperature in nursery areas impacted by human activity. Hypoxia affects sturgeon species more than other fish species due to their limited ability to oxyregulate at low D.O. (Secor and Gunderson 1998, Secor 2002). Sturgeon's first year of life may leave it particularly susceptible to hypoxia owing to high sensitivities to low D.O. at early life stages and the limited means to escape from hypoxic waters (Secor and Niklitschek 2001).

Niklitschek (2001) modeled suitable habitat availability for juvenile shortnose and Atlantic sturgeon in the Chesapeake Bay using a multivariable bioenergetics and survival model. Results indicated the cumulative stresses of hypoxia, high temperatures and salinity during summer months caused large reductions in potential nursery habitat for both species during 1990-1999 (Niklitschek 2001). The modeling established during dry years, when persistent hypoxia in deeper areas consistently precluded access to thermal refuges, there may little suitable habitat for juvenile sturgeon.

The EPA adjusted open water minimum DO-criteria for the Chesapeake Bay (increased from ~2 ppm to 3.5 mg/L) to provide protection specifically for sturgeon species, requiring higher levels of D.O. than other fish species (USEPA 2003). Niklitschek and Secor (2005) modeled the achievement of EPA's D.O. criteria for Atlantic sturgeon predicting available habitat for Atlantic sturgeon would increase by 13% per year, while an increase of water temperature by 1°C would reduce available habitat by 65%. Similar results may occur for sturgeons in southern rivers where high water temperatures and low D.O. are a common occurrence during the summer months.

Life history of shortnose sturgeon (i.e., long lifespan, extended residence in estuarine habitats, benthic foraging) predispose them to long-term, repeated exposure to environmental contamination and potential bioaccumulation of heavy metals and other toxicants (Dadswell 1979, NMFS 1998). However, there has been little work on the effects of contaminants on shortnose sturgeon to date.

Chemicals and metals such as chlordane, dichlorodiphenyl dichloroethylene (DDE), DDT, dieldrin, PCBs, cadmium, mercury, and selenium settle to the river bottom and are later consumed by benthic feeders, such as macroinvertebrates, and then work their way higher into the food web (e.g. to sturgeon). Some of these compounds may affect physiological processes and impede a fish's ability to withstand stress, while simultaneously increasing the stress of the surrounding environment by reducing DO, altering pH, and altering other physical properties of the water body.

Although there have been very few analyses of shortnose sturgeon tissues for contaminants, shortnose sturgeon collected from the Delaware and Kennebec rivers had total toxicity equivalent concentrations of polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), PCBs, DDE, aluminum, cadmium, and copper above adverse effect concentration levels reported in the literature (ERC 2002, 2003). In the Hudson, six fish have been tested over the past 37 years. Most fish carried very high burden load of PCBs, or one of its derivatives (DDT).

Dioxin and furans were detected in ovarian tissue from shortnose sturgeon caught in the Sampit River/Winyah Bay system (SC). Results showed that four out of seven fish tissues analyzed contained tetrachlorodibenzo-*p*-dioxin (TCDD) concentrations greater than 50 pg/g (parts-per-trillion), a level which can adversely affect the development of sturgeon fry (J. Iliff, NOAA Habitat Restoration Division, Silver Spring, MD, unpublished data).

Heavy metals and organochlorine compounds accumulate in sturgeon tissue, but their long-term effects are not known (Ruelle and Henry 1992, Ruelle and Keenlyne 1993). High levels of contaminants, including chlorinated hydrocarbons, in several other fish species are associated with reproductive impairment (Cameron et al. 1992, Longwell et al. 1992, Hammerschmidt et al. 2002, Giesy et al. 1986, Mac and Edsall 1991, Matta *et al*. 1998, Billsson *et al*. 1998), reduced survival of larval fish (Berlin *et al*. 1981, Giesy et al. 1986), delayed maturity (Jorgensen *et al*. 2003) and posterior malformations (Billsson et al. 1998). Pesticide exposure in fish may affect anti-predator and homing behavior, reproductive function, physiological maturity, swimming speed and distance (Beauvais et al. 2000, Scholz et al. 2000, Moore and Waring 2001, Waring and Moore 2004). Sensitivity to environmental contaminants also varies by life stage. Early life stages of fish appear to be more susceptible to environmental and pollutant stress than older life stages (Rosenthal and Alderdice 1976). Dwyer et al. (2005) compared the relative sensitivities of common surrogate species used in contaminant studies to 17 listed species including shortnose and Atlantic sturgeons. The study examined 96-hour acute water exposures using early life stages where mortality is an endpoint. Chemicals tested were carbaryl, copper, 4-nonphenol, pentachlorophenal (PCP) and permethrin. Of the listed species, Atlantic and shortnose sturgeon were ranked the two most sensitive species tested (Dwyer et al. 2005). Additionally, a study examining the effects of coal tar, a byproduct of the process of destructive distillation of bituminous coal, indicated that components of coal tar are toxic to shortnose sturgeon embryos and larvae in whole sediment flow-through and coal tar elutrtraite static renewal (Kocan et al. 1993).

Lastly, the operation of power plants can have unforeseen and detrimental impacts to water quality which can affect shortnose sturgeon. For example, the St. Stephen Power Plant near Lake Moultrie, South Carolina was shut down for several days in June 1991 when large mats of aquatic plants entered the plant's intake canal and clogged the cooling water intake gates (Balciunas et al. 2002). Decomposing plant material in the tailrace canal coupled with the turbine shut down (allowing no flow of water) triggered a low D.O. water condition downstream and a subsequent fish kill. The South Carolina Wildlife and Marine Resources Department reported that twenty shortnose sturgeon were killed during this low D.O. event.

4.7.7 *Summary of Cumulative Impacts*:

Effects of past and ongoing human and natural factors and current threats (fisheries, water quality, dredging, dams, existing NMFS research permits, propagation and other actions) are occurring (or have occurred) in the action area contributing to the current status of the species, are described above, and are also included in the baseline section of the Biological Opinion issued for this proposed research activity. These activities and threats are expected to continue into the future.

Overall, the preferred alternative would not be expected to have more than short-term effects on shortnose sturgeon if sturgeon are present in the research locations. The impacts of the non-lethal portion of the research activities are not expected to have more than short-term effects on individual animals and any increase in stress levels from the capture and handling would dissipate rapidly. Even if an animal was exposed to additional capture (e.g., a week later), no significant cumulative effects from the research itself would be expected given the nature of the effects. Based on the analysis in this EA and supported by the Biological Opinion, NMFS expects the proposed authorization of shortnose sturgeon research activities of the preferred alternative would not appreciably reduce the species likelihood of survival and recovery in the wild, nor would it adversely affect spawning, mortality rates, or recruitment rates. In particular, NMFS expects the proposed research activities not to affect adult reproductive adults in a way appreciably reducing their reproductive success, the survival of young, or the number of young that annually recruit into the breeding populations.

The incremental impact of the proposed research on these animals, when added to other past, present, and reasonably foreseeable future actions discussed here, would not be significant at an individual or a population level. Therefore, no species level events would result from the capture, handling, and release of shortnose sturgeon. The data collected during sampling activities linked with the proposed action would help assess movement and habitat use of juvenile shortnose sturgeon found in the Hudson River action area. The research would provide information helpful in managing, conserving, and recovering this species and would outweigh any adverse impacts.

Moreover, the Biological Opinion prepared for File No. 16439 provides an integration and synthesis of the information about the status of the species, past and present activities affecting the species, possible future actions that might affect the species, and effects of the proposed action to provide a basis for determining the additive effects of the take authorized in this permit on ESA listed sturgeon, in light of their present and anticipated future status. The conclusion of the biological opinion for File No. 16439 was that the proposed action would not likely jeopardize the continued existence of the species.

The opinion also indicated that NMFS is not aware of any future State, tribal, local, or private actions in the action area that may have a bearing on the risk assessment, and finds that the that the issuance of the proposed permit would have only negligible impacts to shortnose sturgeon. The analysis of past, present and reasonably foreseeable actions indicates that no cumulatively significant impacts would occur associated with the proposed action.

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Habitat Conservation Division National Marine Fisheries Service James J. Howard Marine Sciences Laboratory Highlands, NJ 07732	Informal Consultations on Effects on EFH on Federally managed species

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Appendix 1. Existing shortnose sturgeon research permits similar to the proposed action.			
Permit No.	***Location***	***Authorized Take***	***Research Activity***
10115 Expires: 8/3/2013	Saltilla & Saint Marys Rivers, GA & FL	85 adult/juv 20 ELS	Capture, handle, measure, weigh, PIT tag, tissue sample, collect ELS
14394 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
10037 Expires: 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
1447 Expires: 2/28/2012	S. Carolina Rivers and Estuaries	100 adult/juv. (2 lethal), 100 ELS	Capture, handle, measure, weigh, PIT and FLOY tag, transmitter tag, anesthetize, tissue sample, gastric lavage, collect ELS
1505 Expires: 5/31/2011	S. Carolina Rivers and Estuaries	98 adult/juv. (2 lethal), 200 ELS	Capture, handle, measure, weigh, PIT and FLOY tag, transmitter tag, anesthetize, laparoscopy, blood collection, tissue sample, gastric lavage, collect ELS
1542 Expires: 7/31/2011	Upper Santee River Basin, SC	5 adult/juv.; 100 ELS	Capture, handle, weigh, measure, PIT and Floy tag, tissue sample, ELS collection
1543 Expires:11/30/2011	Upper Santee River Basin, SC	3 adult/juv.	Capture, handle, weigh, measure, tissue sample
14759 Expires: 8/19/2015	North Carolina Rivers	70 adult/juv.	Capture, handle, weigh measure, Floy tag, PIT tag, genetic tissue sample; anesthetize acoustic tag
14176 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
14604 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
14396 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
1547-02***** Expires:10/31/2011	Hudson River, (Haverstraw & Newburgh), NY	500 adults/juv.	Capture, handle, weigh, measure, PIT & Carlin tag, genetic tissue sample, and gastric lavage
1575 Expires11/30/2011	Hudson River (Tappan-Zee), NY	250 adult/juv.	Capture, handle, measure
1580 Expires: 3/31/2012	Hudson River and Estuary, NY	82 adult/juv.; 40 ELS	Capture, handle, measure, weigh, PIT tag, Carlin tag, photograph, tissue sample, collect ELS
1549-02 Expires: 1/31/2012	Upper Conn. River, Merrimack River, MA	673 adult/juv. (5 lethal), 1,430 ELS from East Coast rivers	Capture, handle, measure, weigh, anesthetize, PIT tag, TIRIS tag, radio tag, temperature/depth tag, tissue sample, borescope, laboratory tests, photographs, collect ELS
15614 Expires: 5/23/2016	Lower Conn. River & Estuary., CT	500 adult/juv (2 lethal); 300 ELS	Capture, handle, measure, weigh, PIT & Floy tag acoustic tag, gastric lavage, fin ray section, collect ELS
1578-01 Expires: 11/30/2011	Kennebec Complex and Estuary, ME	500 adult/juv.; 30 ELS	Capture, handle, measure, weigh, tissue sample, PIT tag, acoustic tag, lavage, anesthetize, collect ELS
1595-04 Expires: 3/31/2012	Penobscot River and Estuary, ME	300 adult/juv. (2 lethal); 50 ELS	Capture, handle, measure, weigh, borescope, tissue sample, blood sample, PIT & Floy tag, anesthetize, acoustic tag, collect ELS, lavage, scute sample

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

FINDING OF NO SIGNIFICANT IMPACT
ON THE EFFECTS OF THE ISSUANCE OF A SCIENTIFIC RESEARCH PERMIT (File No. 16439) TO CONDUCT SCIENTIFIC RESEARCH ON SHORTNOSE STURGEON IN THE HUDSON RIVER ESTUARY

National Marine Fisheries Service

On April 22, 2011, the National Marine Fisheries Service, Office of Protected Resources (NMFS PR) received a new scientific research permit application from the New York State Department of Environmental Conservation (NYSDEC) 21 South Putt Corners Rd., New Paltz, NY 12561 to conduct shortnose sturgeon research in the Hudson River Estuary.

In accordance with the National Environmental Policy Act (NEPA), NMFS prepared an Environmental Assessment (EA) analyzing the impacts on the human environment associated with issuing the permit (*Environmental Assessment on the Effects of the Issuance of a Scientific Research Permit (File 16439) to Conduct Research on Shortnose Sturgeon in the Hudson River*. In addition, a Biological Opinion was issued under Section 7 of the Endangered Species Act (ESA) (*Biological Opinion on the Permits, Conservation and Education Division's proposal to issue a Scientific Research Permit (Number 16439 to the New* York *State Department of Environmental Conservation (Kathryn Hattala, Responsible Party) for research on shortnose sturgeon* in the Hudson River *pursuant to section 10(a)(1)(A) of the Endangered Species Act of 1973.)* The analyses in the EA, as informed by the Biological Opinion, support the following findings and determination.

The National Oceanic and Atmospheric Administration's Administrative Order 216-6 (May 20, 1999) for implementing NEPA, contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality (CEQ) NEPA implementing regulations at 40 C.F.R. 1508.27 state the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These include:

(1) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat (EFH) as defined under the Magnuson - Stevens Act and identified in Fishery Management Plans?

<u>Response</u>: The proposed research activities include boating and netting activity taking place in the Hudson River. However, no coral reef, seagrass beds and other sensitive ecosystems occur in the action areas of the proposed activities, and thus none would be affected. However, designated EFH does exist for federally managed species in the Hudson River within the action area. Specifically, coinciding with the proposed research activities of gill netting, trawling and boating activities, the tidally mixed areas have designated EFH that could be impacted.

However, with respect to the proposed research activities, NMFS PR concluded minimal potential impacts to EFH of managed species would be caused. Further, because prey of managed species, potentially captured as by-catch in gill nets, would be returned unharmed, few indirect impacts are anticipated.

NMFS PR contacted the Northeast Regional Office of Habitat Conservation by email on June 3, 2011 asking for concurrence with our conclusion that the permitted activities would not likely impact EFH for other managed species in the action area. The Office agreed with NMFS PR on October 12, 2011 (by email received from Karen Greene and Diane Rusanowsky) that the proposed use of anchored and drift gill nets and trawls to capture shortnose sturgeon in the Hudson River would have minimal impacts on designated Essential Fish Habitat in these areas. Thus, no further consultation was necessary.

(2) Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?

Response: No substantial impacts on biodiversity or ecosystem function within the affected action areas are expected. The bottom substrate of the proposed areas for sampling consists of sandy loam sediment, mud flats and some deep and shallow rocky substrate in the channels and off drop-offs of elevated shoreline. Thus, the impacts to bottom substrate would typically be during capture; however, due to the minimal contact by nets in localized areas— in addition to the proposed mitigation measures set forth in the permit for trawling—NMFS expects minimal disturbance of the benthic organisms and substrate.

Due to the nature of netting, NMFS would expect some other non-targeted species would become enmeshed. However, non-target fish would be removed from the net and released at the site of capture at short intervals, and it is believed that virtually all by-catch would be released alive without long-term effects on predator-prey relationships. It is also expected some sub-adult and adult Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) would be taken during sampling for shortnose sturgeon. Atlantic sturgeon is currently a candidate species proposed for listing under NMFS jurisdiction, co-occurring with shortnose sturgeon in the described action area. A proposed rule for listing Atlantic sturgeon was published on October 4, 2010; however, the species does not receive protections under the ESA until a final rule becomes effective. Consequently, should a listing of Atlantic sturgeon occur coinciding with the applicants' research activities, the effects on Atlantic sturgeon would be analyzed at that time. In the interim, the researcher would monitor gill nets closely, and if an Atlantic sturgeon is captured, NMFS would request similar netting protocols and standard research conditions in the permit for shortnose sturgeon be used for ensuring Atlantic sturgeon survival.

(3) Can the proposed action reasonably be expected to have a substantial adverse impact on public health or safety?

Response: Issuance of the permit modifications is not expected to have substantial adverse impacts on public health or safety. These actions would involve the use of 95% ethanol pre-measured in vials for preservation, storage, and transportation of tissue samples. Premeasured MS-222 powder would also used for anesthetizing shortnose sturgeon during surgery.

Researchers would handle these chemicals safely and be advised in the permit to dispose of the chemicals safely following state approved measures.

(4) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, their critical habitat, marine mammals, or other non-target species?

Response: The proposed research activities could potentially have adverse effects on individual endangered shortnose sturgeon, but the effects are not expected to be significant, and have not been shown to be significant at the population or species level. Further, the permit activities require standard NMFS research and mitigation protocols to minimize stress and harmful effects on the species. Because the netting activity and numbers of fish captured would be high, up to four incidental mortalities of shortnose sturgeon are authorized or anticipated in the permitted activities over five years of research. In the Biological Opinion produced for this action, NMFS concluded issuance of the permit would not likely jeopardize the continued existence of the endangered shortnose sturgeon.

Likewise, NMFS believes any by-catch encountered would be returned immediately to the water with minimal exposure to handling stress. That is, because nets would typically be checked at varied short intervals by temperature, NMFS considers virtually all by-catch would be released alive. Atlantic sturgeon is considered a NMFS "species of concern" occurring in action area in small numbers; hence, there is potential for Atlantic sturgeon to be captured as by-catch. Accordingly, the researchers would monitor nets closely and if this sturgeon species is captured, appropriate measures would be taken to ensure its survival. Also, in the event a protected marine mammal or other protected non-target species is encountered while boating or netting, researchers would be directed by permit conditions to avoid contact with the animals, and would also be advised on how to protect these animals and minimize stress if captured. Critical habitat has yet to be designated for shortnose sturgeon; thus, none would be affected. Likewise, there is none specified for other listed animals in the action area.

(5) Are significant social or economic impacts interrelated with natural or physical environmental effects?

Response: There are no known social or economic impacts associated with the proposed actions. Therefore, there would be no significant social or economic impacts interrelated with natural or physical environmental effects.

(6) Are the effects on the quality of the human environment likely to be highly controversial?

Response: A *Federal Register* notice (76 FR 33703) was published on June 9, 2011, allowing other agencies and the public to comment on the action. No comments from the public were received on the application. All agency comments were appropriately addressed within the scoping summary of the EA and responses were included in the decision memos for the permits. None of the comments were controversial and none addressed the proposal's potential effects on the quality of the human environment.

(7) Can the proposed action be reasonably expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, essential fish habitat, or ecologically critical areas?

Response: The research methods in the proposed permits have been analyzed under the current EA, and the activities would not be expected to result in significant impacts to any unique areas mentioned above. The proposed action area flows through the Hudson River Valley National Heritage Area stretching from Troy to New York City which contains a rich assemblage of natural features and nationally significant cultural and historical sites. Recreational opportunities abound in local parks, protected open space, and greenways (http://www.hudsonrivervalley.com). However, due to the nature of the fishery research proposed in the study, none of the parkland or historical sites would be affected.

Also, the action area overlaps four separate locations set aside as the Hudson River Estuarine Research Reserve. The Estuarine Reserve, administered by multiple agencies, including the NYSDEC and NOAA, encompasses about 5,000 acres of freshwater and brackish tidal wetlands and uplands distributed at four sites spanning the middle 100 miles of the river. The Estuarine Reserve is highlighted online at http://www.dec.ny.gov/lands/4915.html. Nevertheless, the applicant is not proposing any boating or netting activities in aquatic habitats within the reserve. Consequently, NMFS PR considers the proposed fishery research would have very limited environmental impact, if any, to the Estuarine Reserve areas.

Additionally, with respect to anticipated effects on EFH by gill nets, trawls and boating activities, NMFS concluded these would result in minimal disturbance to the physical environment, including the bottom substrate and any portion having EFH.

(8) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

Response: Potential risks by proposed research methods are not unique or unknown, nor is there significant uncertainty about impacts. Monitoring reports from other permits of similar nature, and published scientific information on impacts of research on shortnose sturgeon, indicate the proposed activities would not result in significant adverse impacts to the human environment or the species. There is also considerable scientific information available on the minimal likelihood of such impacts.

(9) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

Response: In addition to the applicant's current permit (Permit 1547-02), expiring on October 31, 2011, there are two other shortnose sturgeon permits authorized in Hudson River Estuary. Although the applicant's current permit has some similar objectives as the proposed new action, its authorized activity would be expired when the permit expires. Also, neither of the other two permits have similar objectives as proposed in File 16439. Researchers in the first permit (Permit 1575), have completed their study documenting the presence of shortnose sturgeon near the proposed new Tappan Zee Bridge crossing (RM 26-29); and Permit 1580, documenting shortnose sturgeon collected during the annual Hudson River Biological

Monitoring Program (BMP) trawl, sampling the entire river stem, but with only limited take authorized. Consequently, each of the actions, including the proposed action, would be expected to have no more than short-term effects on individual endangered shortnose sturgeon and no effects on other aspects of the environment. The incremental impacts of the actions when added to other past, present, and reasonably foreseeable future actions discussed in the environmental assessment would be minimal and not significant.

(10) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

Response: The action would not take place in any district, site, highway, structure, or object listed in or eligible for listing in the National Register of Historic Places; thus, none would be impacted. The proposed action would also not occur in an area of significant scientific, cultural or historical resources and would not cause their loss or destruction.

(11) Can the proposed action reasonably be expected to result in the introduction or spread of a non-indigenous species?

Response: The U.S. Geological Survey has documented several aquatic nuisance species occurring in the proposed research area having potential to be spread by research into adjacent watersheds. However, the applicant has agreed to follow certain conditions proposed by NMFS (outlined in the accompanying EA) minimizing the potential spread of these aquatic nuisance species. Therefore, the proposed research activities would not be expected to result in introduction or spread of non-indigenous species to other watersheds. The research activities would also not involve discharging bilge water or other issues of concern relative to non-indigenous species.

(12) Is the proposed action likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

Response: The decision to issue this research permit would not be precedent setting nor would it affect any future decisions. NMFS has issued numerous scientific research permits to study shortnose sturgeon pursuant to section 10 of the Endangered Species Act; thus, this is not the first permit NMFS has issued for this type of research activity. Issuance of a permit or permit modification, to a specific individual or organization for a given research activity, does not in any way guarantee or imply NMFS would authorize other individuals or organizations to conduct the same research activity. Any future request received, including those by the applicants, would be evaluated upon its own merits relative to the criteria established in the ESA and NMFS' implementing regulations.

(13) Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

Response: Issuance of the proposed permit is not expected to violate any Federal, State, or local laws for environmental protection. NMFS has sole jurisdiction for issuance of such permits for shortnose sturgeon and has determined the proposed research activities are consistent with applicable provisions of the ESA. The permit contains language stating the permit does not relieve the Permit Holder of the responsibility to obtain other permits, or comply with other Federal, State, local, or international laws or regulations.

(14) Can the proposed action reasonably be expected to result in cumulative adverse effects having a substantial effect on the target species or non-target species?

Response: NMFS concluded the proposed procedures would have potential adverse effects on individual shortnose sturgeon. However, because shortnose sturgeon are a robust species and respond well to the types of handling proposed, the cumulative effects on the population are not likely long-term or significant to the species.

Because a new proposed listing was published for the Atlantic sturgeon on October 4, 2010, NMFS PR considered the future potential for cumulative effects on Atlantic sturgeon as by-catch in these studies. Accordingly, NMFS established in the permit's provisions for monitoring interactions with Atlantic sturgeon, placing conditions in the permit detailing procedures to be used if an Atlantic sturgeon is incidentally captured. In particular, the permit is conditioned outlining how Atlantic sturgeon should be handled with similar protocols protective for shortnose sturgeon. NMFS concludes since researchers would be monitoring their nets closely, if Atlantic sturgeon or other by-catch were captured, appropriate measures would be in place to ensure survival.

Likewise, NMFS considered potential impacts on marine mammal interactions with researcher's nets. Although based on historical records, interactions would be extremely rare; sampling methods used to minimize contact would also be conditioned to minimize adverse effects of boating and netting activities of researchers.

DETERMINATION

In view of the information presented in this document and the analyses contained in the EA prepared for issuance of the permit, pursuant to the ESA, and the ESA section 7 Biological Opinion, it is hereby determined that the issuance of Permit No. 16439 would not significantly impact the quality of the human environment as described above. In addition, all beneficial and adverse impacts of the proposed action have been addressed, reaching the conclusion of no significant impacts. Accordingly, preparation of an Environment Impact Statement (EIS) for this action is not necessary.

for James H. Lecky
Director, Office of Protected Resources

11/21/11
Date