National Marine Fisheries Service
Endangered Species Act Section 7 Consultation

Biological Opinion

Agency:	Permits, Conservation and Education Division of the Office of Protected Resources, National Marine Fisheries Service
Activities Considered:	Biological opinion on the issuance of Permit Number 14754 authorizing importation and toxicological research on hatchery produced shortnose sturgeon pursuant to section 10(a)(1) of the Endangered Species Act of 1973
Consultation Conducted by:	Endangered Species Division of the Office of Protected Resources, National Marine Fisheries Service
Approved by:	
Date:	APR 02 2010

Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. ' 1531 et seq.) requires that each Federal agency shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a Federal agency may affect a protected species, that agency is required to consult with either the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the protected species that may be affected. For the actions described in this document, the action agency is NMFS' Office of Protected Resources - Permits, Conservation and Education Division (F/PR1). The consulting agency is NMFS' Office of Protected Resources - Endangered Species Division (F/PR3).

This document represents NMFS' biological opinion (Opinion) based on our review of F/PR1's draft environmental assessment (EA), the final recovery plan for shortnose sturgeon, the most current stock assessment reports, past and current research and population dynamics modeling efforts, and monitoring reports from prior research.

Consultation History

On February 17, 2010, F/PR1 provided an EA and an initiation memo to F/PR3 and consultation was initiated.

BIOLOGICAL OPINION

Description of the Proposed Action

NMFS proposes to issue a permit for scientific research pursuant to section 10(a)(1)(A) of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 *et seq.*). The proposed activities involve importing hatchery-produced shortnose sturgeon (*Acipenser brevirostrum*) from Canada (St. John River stock), conducting toxicological exposure tests on the eggs and early life stage shortnose sturgeon, and euthanizing all surviving individuals.

The applicant proposes to determine the environmental sensitivity of polychlorinated biphenyls (PCBs) and dioxin (TCDD) on up to 25,000 early life stage (ELS) hatchery-reared shortnose sturgeon. Research objectives would include: (1) Identifying conditions for maintenance and rearing suitable for experimental toxicology of ELS; (2) determining relationships between uptake of PCB 126 by sturgeons and the duration and life stage of exposure; (3) assessing and quantifying the ELS toxicities of sturgeons to PCB 126 and TCDD comparing their sensitivities to each other and to other fish taxa; (4) assessing and quantifying ELS toxicities of these sturgeon to Aroclor 1254 PCB mix and TCDD, comparing their sensitivities to each other and to other fish taxa; and (5) determining toxic equivalency factors for four coplanar PCB congeners — PCB 77, PCB 81, PCB 126, and PCB 169.

The shortnose sturgeon would be imported as live fertilized embryo from Acadian Sturgeon and Caviar Inc., Saint John, New Brunswick, Canada under the Convention on International Trade in Endangered Species (CITES) Permit Number 10US213634/9. If necessary, shortnose sturgeon eggs could be supplemented with embryo of Connecticut River descent obtained from the Conte Lab, United States Geological Survey (USGS), Turner Falls, Massachusetts. Larvae produced from embryos would be non-releasable and cultured under quarantine laboratory conditions. The permit would not require any St. John River shortnose sturgeon to be removed from the wild, nor would it authorize any release of captive sturgeon into the wild.

Permit Conditions

A. Number and Age of Shortnose Sturgeon

Table 1. Shortnose sturgeon (*Acipenser brevirostrum*) proposed to be taken annually and the activities authorized performed on each animal.

# Takes	Life stage/Sex	Species/ Population River Origin	Take Action	Location	Notes
25,000	Early life stages: Eggs & Larvae (either sex)	Captive: Shortnose sturgeon Saint John River or Connecticut River New Brunswick or Massachusetts	Contaminant research with PCB and TCDD	New York University School of Medicine	Importing early life stages for directed lethal research of captive animals CITES Import Permit 10US213634/9

1. All captive shortnose sturgeon (Table 1), gametes or biological samples at the facility must remain in the possession of the Permit Holder; the Permit Holder may not transfer live fish, gametes, or biological samples to anyone not listed in the application without obtaining prior written approval from NMFS. Any such transfers/transports will be subject to such conditions as NMFS deems appropriate.
2. Commercial aquaculture and sale of shortnose sturgeon or sturgeon parts is forbidden.
3. At the conclusion of yearly studies, all surviving ELS must be humanely euthanized and properly disposed of. However, preserved samples of specimens are authorized.
4. At the cessation of research, the permit holder may apply to renew the permit for another five years.
5. All waste contaminated with PCBs and other chemicals, including exposed dead embryos and larvae and pads used to cleanup spills, must be disposed of as hazardous waste using state adopted procedures.
6. Biological samples held for lethal research (Table 1) shall not come into contact with any other fish, water or equipment used with other fish without proper disinfection; the water they are held in should not come into contact with any natural waters; and after testing, the samples should be properly disposed using state adopted procedures.
7. Water quality for fish held at research facilities should be conservative. Relative values can change depending on the type of water conditioning system and/or degree of fresh water being provided to the system. However, the following criteria are recommended for long-term holding:

Table 2. Water Quality Requirements for Long-Term Holding

pH	between 6.7 and 7.7
Dissolved Oxygen	> 5 mg/l
Alkalinity	between 50 and 200 mg/l
Hardness	between 50 and 200 mg/l
Ammonia-N	<0.5 mg/l Total Ammonia
Stocking Density (long term)	<0.5 lb-sturgeon per cu ft. water

8. For reporting purposes, researchers shall provide to NMFS a record of final disposition of all fish held at the facility and all fish (including mortalities) at the end annually scheduled studies.
9. The identity of all separate stocks held at the holding facility must be clearly and uniquely marked on holding tanks and also recorded in a master record.

Approach to the Assessment

NMFS approaches its section 7 analyses of research permits through a series of steps. The first step identifies those aspects of proposed actions that are likely to have direct and indirect physical, chemical, and biotic effects on listed species or on the physical, chemical, and biotic environment of an action area. As part of this step, we identify the spatial extent of these direct and indirect effects, including changes in that spatial extent over time. The results of this step define the action area for the consultation. The second step of our analyses identifies the listed resources that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (these represent our exposure analyses). In this step of our analyses, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent. Once we identify which listed resources are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed resources are likely to respond given their exposure (these represent our response analyses).

The final steps of our analyses – establishing the risks those responses pose to listed resources – are different for listed species and designated critical habitat (these represent our risk analyses). Our jeopardy determinations must be based on an action's effects on the continued existence of threatened or endangered species as those "species" have been listed, which can include true biological species, subspecies, or distinct populations of vertebrate species. Because the continued existence of species depends on the fate of the populations that comprise them, the continued existence of these "species" depends on the fate of the populations that comprise them. Similarly, the continued existence of populations are determined by the fate of the individuals that comprise them; populations grow or decline as the individuals that comprise the population live, die, grow, mature, migrate, and reproduce (or fail to do so).

Our risk analyses reflect these relationships between listed species, the populations that comprise that species, and the individuals that comprise those populations. Our risk analyses begin by identifying the probable risks actions pose to listed individuals that are likely to be exposed to an action's effects. Our analyses then integrate those individual risks to identify consequences to the populations those individuals represent. Our

analyses conclude by determining the consequences of those population level risks to the species those populations comprise.

We measure risks to listed individuals using the individuals' "fitness," or the individual's growth, survival, annual reproductive success, and lifetime reproductive success. In particular, we examine the scientific and commercial data available to determine if an individual's probable lethal, sub-lethal, or behavioral responses to an action's effect on the environment (which we identify during our response analyses) are likely to have consequences for the individual's fitness.

When individual, listed plants or animals are expected to experience reductions in fitness in response to an action, those fitness reductions are likely to reduce the abundance, reproduction, or growth rates (or increase the variance in these measures) of the populations those individuals represent (see Stearns 1992). Reductions in at least one of these variables (or one of the variables we derive from them) is a necessary condition for reductions in a population's viability, which is itself a necessary condition for reductions in a species' viability. As a result, when listed plants or animals exposed to an action's effects are not expected to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise (e.g., Brandon 1978, Mills and Beatty 1979, Stearns 1992, Anderson 2000). As a result, if we conclude that listed plants or animals are not likely to experience reductions in their fitness, we would conclude our assessment.

Although reductions in fitness of individuals are a necessary condition for reductions in a population's viability, reducing the fitness of individuals in a population is not always sufficient to reduce the viability of the population(s) those individuals represent. Therefore, if we conclude that listed plants or animals are likely to experience reductions in their fitness, we determine whether those fitness reductions are likely to reduce the viability of the populations the individuals represent (measured using changes in the populations' abundance, reproduction, spatial structure and connectivity, growth rates, variance in these measures, or measures of extinction risk). In this step of our analyses, we use the population's base condition (established in the *Environmental Baseline* and *Status of the Species* sections of this Opinion) as our point of reference. If we conclude that reductions in individual fitness are not likely to reduce the viability of the populations those individuals represent, we would conclude our assessment.

Reducing the viability of a population is not always sufficient to reduce the viability of the species those populations comprise. Therefore, in the final step of our analyses, we determine if reductions in a population's viability are likely to reduce the viability of the species those populations comprise using changes in a species' reproduction, numbers, distribution, estimates of extinction risk, or probability of being conserved. In this step of our analyses, we use the species' status (established in the *Status of the Species* section of this Opinion) as our point of reference. Our final determinations are based on whether threatened or endangered species are likely to experience reductions in their viability and whether such reductions are likely to be appreciable.

To conduct these analyses, we rely on all of the evidence available to us. This evidence might consist of monitoring reports submitted by past and present permit holders; reports

from NMFS Science Centers; reports prepared by natural resource agencies in states, and other countries; reports from foreign and domestic nongovernmental organizations involved in marine conservation issues; the information provided by F/PR1 when it initiates formal consultation; information from commercial interests; and the general scientific literature.

During each consultation, we conduct electronic searches of the general scientific literature using *SCOPUS*, *American Fisheries Society*, *Google Scholar*, *ScienceDirect*, *BioOne*, *Agricola*, *SiteSeer*, *Conference Papers Index*, *JSTOR*, and *Aquatic Sciences and Fisheries Abstracts* search engines. We supplement these searches with electronic searches of doctoral dissertations and master's theses. These searches specifically try to identify data or other information that supports a particular conclusion (for example, a study that suggests shortnose sturgeon will exhibit a particular response to dissolved oxygen concentrations) as well as data that does not support that conclusion. When data are equivocal, or in the face of substantial uncertainty, our decisions are designed to avoid the risks of incorrectly concluding that an action would not have an adverse effect on listed species when, in fact, such adverse effects are likely.

We rank the results of these searches based on the quality of their study design, sample sizes, level of scrutiny prior to and during publication, and study results. Carefully designed field experiments (for example, experiments that control potentially confounding variables) are rated higher than field experiments that are not designed to control those variables. Carefully designed field experiments are generally ranked higher than computer simulations. Studies that produce large sample sizes with small variances are generally ranked higher than studies with small sample sizes or large variances.

Description of the Action Area

The action area is defined in 50 CFR 402.2 as "all areas to be affected directly or indirectly by the Federal Action and not merely the immediate area involved in the action." Because these sturgeon will be imported to the United States as fertilized eggs, used for toxicological tests, and then destroyed, the action area is only the laboratory at New York University. The action area would not extend to the St. John River or Connecticut River because non-lethal fertilization using sperm and eggs from captive fish should not require either laboratory to replace any captive shortnose sturgeon. Likewise, the action area would not extend to the Hudson River because all water used for the maintenance of these captive shortnose sturgeon will be treated prior to being discharged.

Status of the Species

NMFS has determined that the action being considered in this Opinion may affect the following species that are protected under the ESA:

Shortnose sturgeon	*Acipenser brevirostrum*	Endangered

No critical habitat has been designated for shortnose sturgeon; therefore, none will be affected by the proposed action.

The following summarizes the biology and ecology of the captive populations of

endangered shortnose sturgeon in the action area that are relevant to the effects analysis in this Opinion. For more comprehensive treatments of the biology, ecology, and management of shortnose sturgeon should refer to Dadswell *et al.* (1984), Gilbert (1989), the Final Recovery Plan for Shortnose Sturgeon (NMFS 1998), and the Canadian Assessment and Update Status Report on the Shortnose Sturgeon (COSEWIC 2005).

Species' Description, Distribution, and Population Structure

Wild shortnose sturgeon occur along the Atlantic Coast of North America, from the St. John River in Canada to the St. Johns River in Florida. There are also several captive populations of shortnose sturgeon (Table 3). All wild and captive shortnose sturgeon are listed as endangered under the ESA. Canada, however, considers shortnose sturgeon a species of special concern in the St. John River (COSEWIC 2005).

There is no commercial fishery for shortnose sturgeon but any sturgeon over four feet in length can be kept when recreationally fishing, which could result in some legal removal of large shortnose sturgeon. The fertilized eggs for this research project are being created solely for this project from captive fish being held by Acadian Sturgeon and Caviar Inc. in New Brunswick. If additional fertilized eggs are needed, they can be created in Conte Laboratory in Connecticut, but no eggs will be fertilized unless necessary.

NMFS authorizes several captive populations of shortnose sturgeon for scientific and educational purposes. One captive population of shortnose sturgeon is maintained at the Conte Anadromous Fish Research Center in Massachusetts, which is operated by the USGS. These sturgeon were taken from the Connecticut River population and are currently held by Dr. Boyd Kynard under Permit Number 1549. Captive shortnose sturgeon captured from the Savannah River population are housed at the USFWS fish hatcheries in Warm Springs (Georgia) and Orangeburg (South Carolina) under Permit Number 1604. The University of Florida (Gainesville) maintains shortnose sturgeon from these USFWS hatcheries for research purposes under Permit Number 1579. The University of Georgia is conducting research on captive shortnose sturgeon under Permit Number 14634, which were acquired from Alden Research Laboratory. Alden Research Laboratory still maintains a permit (Number 1579) to possess shortnose sturgeon even though no shortnose are currently at their facility.

Smaller, captive populations that have been developed from these USFWS facilities are maintained in several facilities for educational purposes. These fish are currently authorized to be displayed at the Maritime Aquarium in Norwalk, Connecticut; The Virginia Museum in Newport News, Virginia; the North Carolina Zoo in Asheboro, North Carolina; Liberty Science in Jersey City, New Jersey; the North Carolina Aquarium in Wilmington, North Carolina; the Springfield Science Museum in Springfield, Massachusetts; the Riverbanks Zoo in Columbia, South Carolina.

Table 3: Current inventory of shortnose sturgeon held in captivity at research facilities

Permit	Research Facility	River Origin	Research Activity	No.Fish
1549	Conte Research Center, (USGS)Turner Falls, MA	Conn. R. Savannah R.	Fish passage technology, behavior, & tagging.	F-1 Adult----22 F-1 Juv ------92 F-1 YOY----12 F-2 Juv------110

			Fish passage & tagging	
1574	University of Florida	Savannah R.	Embryonic & reproductive	F-1 Adult------9 F-2 Adult---113 F-3 Juv-------65
1579	Alden Research Lab Holden, MA	Savannah R. Savannah R. Conn. R.	Fish passage technology	F-2 YOY----0 F-2 Juv-------0 F-1 Juv-------0
1604	Warm Springs NFH (USFWS) Warm Springs, GA	Savannah R.	Refugia, embryonic, genetic sampling, gamete bank and fish health lab	F-2 Adult----20
1604	Orangeburg NFH (USFWS) Orangeburg, SC	Savannah R.	Refugia	F-1Adult-25 F-2 Adult-17
14634	University of Georgia	Savannah R. Savannah R. Conn. R	Temperature/DO tolerance test	95 juveniles/sub-adults

Life History Information

Shortnose sturgeon are anadromous fish that live primarily in slower moving rivers or nearshore estuaries near large river systems. They are benthic omnivores that feed on crustaceans, insect larvae, worms, and molluscs (Moser and Ross 1995, NMFS 1998) but they have also been observed feeding off plant surfaces and on fish bait (Dadswell *et al.* 1984).

For much of their lives, shortnose sturgeon remain in their natal rivers, migrating between tidally influenced reaches and upstream in cool, deep areas (Dadswell *et al.* 1984, Buckley and Kynard 1985, Hall *et al.* 1991, Flournoy *et al.* 1992, Rogers and Weber 1994, Rogers and Weber 1995, Weber 1996). Because they rarely leave their natal rivers, Kieffer and Kynard (1993) considered shortnose sturgeon to be freshwater amphidromous (*i.e.* adults spawn in freshwater but regularly enter saltwater habitats during their life).

Shortnose sturgeon in the northern portion of the species' range live longer than individuals in the southern portion of the species' range (Gilbert 1989). The maximum age reported for a shortnose sturgeon in the St. John River in New Brunswick is 67 years (for a female), 40 years for the Kennebec River, 37 years for the Hudson River, 34 years in the Connecticut River, 20 years in the Pee Dee River, and 10 years in the Altamaha River (Gilbert 1989 using data presented in Dadswell *et al.* 1984). Male shortnose sturgeon appear to have shorter life spans than females (Gilbert 1989).

Listing Status

Shortnose sturgeon were listed as endangered on March 11, 1967 (32 FR 4001) pursuant to the Endangered Species Preservation Act of 1966. Shortnose sturgeon remained on the list as endangered with the enactment of the ESA in 1973. In Canada, they have been a species of special concern since 1980 and that status was reaffirmed in 2005 (COSEWIC 2005). Shortnose sturgeon were first listed on the International Union for Conservation

of Nature and Natural Resources Red List in 1986 where it is still listed as Vulnerable and facing a high risk of extinction based in part on: an estimated range reduction of greater than 30% over the past three generations, irreversible habitat losses, effects of habitat alteration and degradation, degraded water quality and extreme fluctuations in the number of mature individuals between rivers.

Status and Trends of Shortnose Sturgeon Populations

Despite the longevity of adult sturgeon, the viability of sturgeon populations are highly sensitive to juvenile mortality that result in reductions in the number of sub-adults that recruit into the adult, breeding population (Anders *et al.* 2002, Gross *et al.* 2002, Secor *et al.* 2002). This relationship caused Secor *et al.* (2002) to conclude that sturgeon populations can be grouped into two demographic categories: populations that have reliable (albeit periodic) natural recruitment and those that do not.

The eggs and ELS sturgeon to be tested and euthanized under this permit will be originating from captive parents, maintained at the Acadian Sturgeon and Caviar Inc. in New Brunswick, Canada or from Conte Anadromous Fish Research Center in Massachusetts, which is operated by the USGS. These eggs are being fertilized to produce offspring for research.

Environmental Baseline

By regulation, environmental baselines for biological opinions include the past and present impacts of all state, Federal or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR '402.02).

The action area under consideration in this proposed project is the laboratory at New York University. The laboratory at New York University is clean and sterile. The imported shortnose sturgeon will not come into contact with any other fish, water, or equipment without proper disinfection and the water they are held in should not come into contact with any natural waters.

Effects of the Proposed Action

In this section of the Opinion, we assess the probable direct and indirect effects of authorizing the proposed procedures on shortnose sturgeon in the action area. The specific stressors associated with the proposed permit are mortality or euthanization of all captive shortnose sturgeon eggs and ELS. There is no effect to shortnose sturgeon populations in the St. John River in Canada or the Connecticut River in the United States because the adults used to spawn the fertilized eggs for this experiment will not need to be replaced in the laboratory. Also, there is no effect to shortnose sturgeon in the Hudson River because the water from New York University's laboratory should not come into contact with any natural waters.

The following sections provide specific details of the stressors and summarize the available data on the responses of individuals that have been exposed to the procedures.

The lone stressor resulting from this project will be toxicological tolerance tests followed by euthanasia of all surviving eggs and ELS.

Toxicological Tolerance Testing and Euthanasia

This permit will authorize New York University to import 25,000 fertilized shortnose sturgeon eggs from parental stock maintained in laboratories in New Brunswick or, if necessary, Massachusetts. Eggs and ELS will be maintained in the laboratory until they are subjected to toxicological tolerance tests to evaluate shortnose sturgeon susceptibility to elevated levels of PCBs and TCDDs. When the research has been completed, all sturgeon that remain alive will be euthanized.

Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. There are no cumulative effects in the action area.

Conclusion

After reviewing the current status of endangered shortnose sturgeon, the environmental baseline for the action area, the effects of the proposed research program, and the cumulative effects, it is NMFS's biological opinion that the issuance of this permit to Dr. Isaac Wirgin of New York University is not likely to jeopardize the continued existence of the endangered shortnose sturgeon. Critical habitat is not designated.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by USFWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Amount or Extent of Take

The proposed action requests the directed take of hatchery-reared shortnose sturgeon eggs and ELS. NMFS does not expect any other listed species to be taken incidentally to

this research.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The following conservation recommendation would provide information that would improve the scientific understanding and lead to potential recovery actions related to endangered shortnose sturgeon:

1. *Additional research.* NMFS suggests additional toxicological tolerance testing be conducted on hatchery-reared sturgeon eggs and ELS to assist with ongoing research to analyze priority pollutants and establish safe water quality standards for threatened and endangered species.

REINITIATION NOTICE

This concludes formal consultation on the NMFS proposal to issue a permit to Dr. Isaac Wirgin of the New York University [Permit Number 14754] pursuant to the provisions of section 10 of the ESA. Reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of allowable take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

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