

Center of Independent Experts review of
STATUS REVIEW OF SHORTNOSE STURGEON
Acipenser brevirostrum

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Executive Summary

The draft of “Status Review of Shortnose Sturgeon *Acipenser brevirostrum*” examines the accuracy of the current status of shortnose sturgeon classification of the Endangered Species Act (50 CFR 17.11-17.12). The scope of the status review team (SRT) review was broad, as there has been a great deal of information produced since the 1998 review, particularly in the area of genetics and population structure. They reviewed information on a river-by-river basis, summarizing much of the published literature relevant to the scope of their review. They used published literature, unpublished literature and information to develop distinct population status following the distinct population policy (61 FR 4721) for this species throughout its range.

Threats to this species were outlined in general and then a specific threat matrix was developed for each river in which shortnose sturgeon occurs. The SRT concluded that some of the ESA factors were impacting the species status more than others. Because of this, they decided to weight the influence of each ESA factor in order to develop the status and assess risks to this species throughout its range and in important river populations within each distinct population segment (DPS).

The SRT’s Extinction Risk analysis and DPS designations are supported by current information. They recommended that shortnose sturgeon be divided into six distinct population segments, with one in Canada based on jurisdictional issues (Canada and US) and five US DPS, based on recent genetic analyses. As suggested in the SRR (Status Review Report), I agree that considerably more effort needs to be taken in determining the complete range of shortnose sturgeon and that this information coupled with genetic samples and analyses will provide us with a clearer picture of the shortnose sturgeon DPSs. I also agree with the SRT recommendation that because of the genetic diversity within each DPS and that individual river populations within a DPS often face different threats that each river population should be considered a separate management/recovery unit for future recovery planning proposes.

It is clear that current information on population dynamics, distribution, movement and factors leading to reproductive success are not adequate to assess the status of this species in each population segment. The most important threats identified by the SRT to population viability were: 1) dams, 2) dredging, 3) poor water quality, and 4) fisheries’ bycatch. They determined that destruction or modification available habitat in every river studied throughout their range was more important than any other factor. In light of this list, I would also strongly recommend that more research on ecophysiology and ecotoxicology also be conducted in order to better interpret results and the potential effects from the aforementioned areas of research.

Introduction

The primary objective of the CIE review of the draft of “Status Review of Shortnose Sturgeon *Acipenser brevirostrum*”, is to provide an impartial review, evaluation and recommendation(s) to ensure that the best available science is utilized in NMFS management decisions. Further, it is to ensure that the contents of the draft review are factually supported, the methodology is sound and the conclusions are scientifically valid. The report is a 392 page document consisting of text, figures, and tables.

Background

The draft of “Status Review of Shortnose Sturgeon *Acipenser brevirostrum*” examines the accuracy of the current status of shortnose sturgeon classification of the Endangered Species Act (50 CFR 17.11-17.12). The scope of the status review team (SRT) review was broad, as there has been a great deal of information produced since in the 1998 review, particularly in the area of genetics and population structure. They reviewed information on a river-by-river basis summarizing much of the published literature relevant to the scope of their review. They used current published and some unpublished literature and information to develop distinct populations’ status following the distinct population policy (61 FR 4721) for this species throughout its range.

Threats to this species were outlined in general and then a specific threat matrix was developed for each river in which shortnose sturgeon occurs. The SRT concluded that some of the ESA factors were impacting the species status more than others. They decided to weight the influence of each ESA factor in order to develop the status and assess risks to this species throughout its range and in important river populations within each DPS. An extinction risk analysis was also run by Hightower on the Hudson, Cooper and Altamaha Rivers populations in order to develop a modeling approach to better understand the risks of catastrophic events on shortnose sturgeon populations.

Terms of Reference

Evaluate the adequacy, appropriateness and application of data used in the Shortnose Sturgeon Status Review Report.

1. In general, does the Status Review Report include and cite the best scientific and commercial information available on the species and its habitats, including threats to the species and to its habitat?
2. Where available, are opposing scientific studies or theories acknowledged and discussed?
3. Are the scientific conclusions sound and derived logically from the results?

Evaluate the recommendations made in the Shortnose Sturgeon Status Review Report.

1. Concerning distinct population segments, is the species delineation supported by the information presented and currently available?
2. Are the results of the Extinction Risk Analysis supported by the information presented?
3. Review the research recommendations made in the Status Review Report and make any additional recommendations, if warranted.

Description of review activities

I received access to the report on December 16, 2008. I reviewed the report over the first few weeks of January, spending 8 days on the review. No other materials were supplied for the review; however, I conducted the review in the context of the available literature on shortnose and other sturgeons.

Review of Information used in the Status Review Report (as outlined in the table of contents in the Status Review Report)

Overall

The scope of the status review team's (SRT) review was complex, as there has been a great deal of information produced in the past few years, particularly in the area of genetics and population structure. They reviewed information on a river-by-river basis summarizing much of the published literature relevant to the scope of their review. They used current and some unpublished information to develop distinct populations status (DPS) following the distinct population policy (61 FR 4721).

Potential threats to this species were outlined in general and then a specific threat matrix was developed for each river in which shortnose sturgeon occurs. SRT acknowledged that not all threats are equal and decided to take a "weighting" approach in order to assess the risks to population viability that exists in each river. An extinction risk analysis by Hightower was run on Hudson, Cooper and Altamaha Rivers in order to develop a modeling approach to better understand the risks of catastrophic events on shortnose sturgeon populations.

Most of the relevant information on shortnose sturgeon is cited. It is often hard to find all of the pertinent literature and generally they have done an excellent job. However, there is other literature on shortnose sturgeon physiology, genetics, and water quality that has not been cited. This is of particular significance when discussing construction and/or demolition of dams, climate changes affecting water flow which will affect salinity, and water pollution among other factors. Additionally, research on hermaphroditism is important, as it can make gender identification in the field more difficult and potentially unreliable. Although the number of fish that have been observed to have ovo-testes is low relative to the number of fish sampled, it is not insignificant and this needs to be mentioned. Since we really are not sure of their sex determination mechanism, coupled with the presence of estrogenic compounds in many of the rivers in which shortnose occur, the potential for skewing the sex ratio with a species that already has hermaphrodites may not be trivial.

It may be that the SRT concluded that these areas of research were not important. However, if not, then these papers should be considered. Please see the following list of papers that may be of interest to the SRT in the section below entitled "Other pertinent information and considerations".

Other pertinent information and considerations:

Physiology:

Other citations for habitat discussion (flow choice, oxygen requirements) and navigation of obstructions:

- Baker DW, Wood AM, Litvak MK, Kieffer JD. 2005. Haematology of juvenile acipenser oxyrinchus and acipenser brevirostrum at rest and following forced activity. *J Fish Biol* 66(1):208-21.
- Beyea MM, Benfey TJ, Kieffer JD. 2005. Hematology and stress physiology of juvenile diploid and triploid shortnose sturgeon (acipenser brevirostrum). *Fish Physiol Biochem* 31(4):303-13.
- Cooke D, Leach S, Isely J. 2002. Behavior and lack of upstream passage of shortnose sturgeon at a hydroelectric facility and navigation lock complex. Van Winkle W, Anders PJ, Secor DH, and others, editors. 5410 Grosvenor Ln. Ste. 110 Bethesda MD 20814-2199 USA, [URL:<http://afs.allenpress.com>]: American Fisheries Society. 101-110.
- Finney ST, Isely JJ, Cooke DW. 2006. Upstream migration of two pre-spawning shortnose sturgeon passed upstream of pinopolis dam, cooper river, south carolina. *Southeast Nat* 5(2):369-75.
- Kynard B and Horgan M. 2001. Guidance of yearling shortnose and pallid sturgeon using vertical bar rack and louver arrays. *N Am J Fish Manage* 21(3):561-70.

Stress response:

- Lutz I, Gessner J, Loeschau P, Hogans B, Kirschbaum F, Kloas W. 2006. The influence of rearing density as environmental stressor on cortisol response of shortnose sturgeon (acipenser brevirostrum). *J Appl Ichthyol /Z Angew Ichthyol* 22(Suppl.):269-71.

Osmoregulation—effect of salinity on shortnose sturgeon. May be useful for a discussion of climate change effects and habitat:

- Jarvis PL and Ballantyne JS. 2003. Metabolic responses to salinity acclimation in juvenile shortnose sturgeon acipenser brevirostrum. *Aquaculture* 219(1-4):891-909.
- Jarvis PL, Ballantyne JS, Hogans WE. 2001. The influence of salinity on the growth of juvenile shortnose sturgeon. *N Am J Aquacult* 63(4):272-6.
- Jarvis P. 2002. Effects of salinity on the growth and metabolism of shortnose sturgeon, acipenser brevirostrum. . 393 p.
- Krayushkina LS. 1998. Characteristics of osmotic and ionic regulation in marine diadromous sturgeons acipenser brevirostrum and A. oxyrinchus (acipenseridae). *J Ichthyol* 38(8):660-8.

Water quality: Could be integrated into the pollution/contaminants section.

- Fontenot QC, Isely JJ, Tomasso JR. 1999. Characterization and inhibition of nitrite uptake in shortnose sturgeon fingerlings. *J Aquat Anim Health* 11(1):76-80.
- Fontenot QC, Isely JJ, Tomasso JR. 1998. Acute toxicity of ammonia and nitrite to shortnose sturgeon fingerlings. *Prog Fish-Cult* 60(4):315-8.
- Fontenot Q, Isely J, Tomasso J, Department of Fisheries and Oceans, Vancouver, BC [Canada], Towson University, Baltimore, MD [USA]. 1999. Uptake, inhibition, and depuration of

nitrite to shortnose sturgeon *Acipenser brevirostrum* fingerlings. Kennedy C and MacKinlay D, editors. . 127 p.

Genetics:

- Flynn SR and Benfey TJ. 2007. Effects of dietary estradiol-17 beta in juvenile shortnose sturgeon, *Acipenser brevirostrum*, Lesueur. *Aquaculture* 270(1-4):405-12.
- Flynn SR and Benfey TJ. 2007. Sex differentiation and aspects of gametogenesis in shortnose sturgeon *Acipenser brevirostrum* Lesueur. *J Fish Biol* 70(4):1027-44.
- Flynn SR, Matsuoka M, Reith M, Martin-Robichaud DJ, Benfey TJ. 2006. Gynogenesis and sex determination in shortnose sturgeon, *Acipenser brevirostrum* Lesueur. *Aquaculture* 253(1-4):721-7.
- May B, Krueger CC, Kincaid HL. 1997. Genetic variation at microsatellite loci in sturgeon: Primer sequence homology in acipenser and scaphirhynchus. *Can J Fish Aquat Sci /J can Sci Halieut Aquat* 54(7):1542-7.
- Vasil'eva ED. 2004. Morphological data corroborating the assumption of independent origins within octoploid sturgeon species. *Journal of Ichthyology/Voprosy Ikhtiologii [J. Ichthyol./Vopr. Ikhtiolog.]*. Vol.44, Suppl.1 44(Suppl. 1).
- Wang D, Wei Q, Wang C, Luo X. 2005. PCR-RFLP analysis of mitochondrial DNA in thirteen species of acipenseriformes. *J Fish Sci China/Zhongguo Shuichan Kexue* 12(4):383-9.

I would also suggest that a citation for the program STRUCTURE (is it -- <http://pritch.bsd.uchicago.edu/structure.html> or Pritchard et al 2000) and a citation for AMOVA be added to the report.

Potential for sturgeon to develop ovo-testes – hermaphrodites have been found in shortnose sturgeon.

- Henne JP, Ware KM, Wayman WR, Bakal RS, Horvath A. 2006. Synchronous hermaphroditism and self-fertilization in a captive shortnose sturgeon. *Trans Am Fish Soc* 135(1):55-60.
- Atz, J.W. and C.L. Smith. 1977. Hermaphroditism and gonadal teratom-like growths in sturgeon (*Acipenser*), *Bull. South. Calif. Acad. Sci.* **75** (1977) (2), pp. 119–126.

Reproduction--fecundity: I am very concerned that we all promulgate the same conclusion that spawning occurs about every 3-5 years with this species. I am concerned that we have little or no evidence to truly back up this claim. This is a very important point because this information is required to better estimate life-time reproductive output. This reproductive periodicity will vary relative to latitude, which suggests that this research needs to be undertaken for each DPS, at a minimum and hopefully for each population.

Size: There is an error in the COSEWIC report when discussing maximum length attained. It should have read Total Length not Fork Length. The largest fish caught on the Saint John River was 140.5 cm Total Length which exceeds the 120 cm restriction set out by the provincial and federal governments. They have caught a number of fish greater than the commercial and recreational fishing size restriction suggesting that this limit should be increased.

Artificial propagation (5.5.3) – commercial:

Unfortunately, Gray Aqua Farms did not pursue shortnose sturgeon aquaculture as they had planned. I would remove this information from the document. However, there are, as the SRT indicated, two sturgeon aquaculture companies in New Brunswick Canada. The first to successfully start shortnose sturgeon aquaculture is Supreme Sturgeon and Caviar located near Pennfield NB (Latitude 45.113639°, Longitude -66.758723°). Their site is not located on the Saint John River. It is located near, but not on, the Letang River which opens to the Bay of Fundy. They use groundwater and recirculation systems. They have been the major player in sturgeon aquaculture in NB and have been actively pursuing shortnose aquaculture since the mid 1990's. They are now in production and are selling shortnose sturgeon caviar. The second, more recent initiative is Acadian Sturgeon and Caviar. They are based at Carter's Point, Westfield NB on the Saint John River.

Also, I was curious why Conte was not cited for the propagation information. Is it because of the existence of the NMFS 1998 document? It is a very important contribution to our approach to propagating this and other sturgeons.

Conte, F.S., Doroshov, S.I., Lutes, P.B., Strange, E.M. (1988). *Hatchery Manual for the White Sturgeon (Acipenser transmontanus Richardson) with Application to Other North American Acipenseridae*. Publication, vol. 3322. Division of Agriculture and Natural Resources, University of California, Oakland.

Images: I like the use of images by the SRT in their report. However, I think it would be better to get new images as the quality of the pictures published in 1984 (e.g. Figure 3) are not good. I would strongly recommend that others be acquired or taken that will better demonstrate the morphological features that you would like to highlight.

Minor notes and comments:

Page 21- Scott and Scott should be cited directly not through the COSEWIC document.

Page 21- Indentation changes and should be made consistent throughout.

Page 23- Is there any data to support the spawning frequency information provided here? This cites Dadswell 1979. But are the conclusions of Dadswell 1979 strong?

Page 25- Behavior—What is meant by allowing for more typical swimming behavior? What is their classification of swimming behaviour as larvae compared to juveniles? Or are they talking about swimming more typical of juvenile and adult sturgeon?

Page 25- “beginning when they became larvae.” What convention are they following with regard to life history?

Page 35- Limited observations indicate that feeding occurs primarily at night. This is a pretty strong statement based on the available data.

Page 32- “while in other rivers, a portion of the wintering sites occur in the freshwater/saltwater zone of the estuary (Saint John River, Dadswell 1979, Li et al. 2007).” This was not the case for Li et al. 2007. The only overwintering site that we have found to date is in freshwater (Li et al. 2007). Although this was in the lower reaches of the Saint John River and is under tidal influence, the site is shallow and the salinity remains at 0 ppt.

Page 55 and page 74-- Figure 18a.—it is referred to as figure 11 in the text. It should be Figure 18ab.

Page 84- Table 14. It is indicated that “Reports include only those trips when an observer was on board to document capture, and numbers do not reflect all sturgeon captures”. Does the blank space indicate that there were no observers? Does that mean every time an observer went out there were sturgeon captured. This would be good information as then, based on the sampling, one could predict how often and how many sturgeon would be captured through dredging. This would provide some very important information on the potential population level impacts due to mortality from dredging.

Page 92- Downeast LNG Maine (<http://www.downeastlng.com/index.php>) has proposed to put in an LNG facility in Passamaquoddy Bay which opens to the Gulf of Maine. This is in the St.

Croix River estuary and may or may not be an area for occasional or resident shortnose sturgeon. Page 98- Alisha Giberson is female not male.

Page 98- Potential effect of zebra mussels. See McCabe et al. 2006. Negative effect of zebra mussel on foraging and habitat use by lake sturgeon (*Acipenser fulvescens*) Aquatic Conservation 16(5):493-500. They found that juveniles were more vulnerable to zebra mussels because the mussels eliminated the juvenile sturgeon habitat and access to invertebrate prey. I would suggest that those shortnose sturgeon that feed on zebra mussels are most likely larger juveniles or adults. I would be worried about the younger juveniles. Also, even if sturgeon do feed on zebra mussels, the sturgeon diet may become more restricted and ultimately may effect sturgeon growth and reproductive health.

Throughout- I do not understand why there are so many “xx authors as referenced by yy authors” were these papers not available? I assume that this will be corrected in the final version.

Review of the Findings made in the Status Review Report

a. DPS considerations

I think based on the available published and unpublished literature that they have done a thorough analysis of DPS. Their recommendation that shortnose sturgeon be divided into six distinct populations segments, with one in Canada based on jurisdictional issues (Canada and US) and five US DPS, based on recent genetic analyses, seems appropriate at this time. As suggested in the Report, I agree that considerably more effort needs to be taken in determining the complete range of shortnose sturgeon and that this information coupled with genetic samples and analyses will provide us with a clearer picture of the shortnose sturgeon DPSs. Because of the genetic diversity within each DPS and because individual river populations within a DPS often face different threats, I also agree with the SRT recommendation that each river population should be considered a separate management/recovery unit for future recovery planning proposes.

b. Extinction Risk Analysis

This document provided a thorough outline of many of the risks for extinction facing shortnose sturgeon. There is no doubt it is very difficult to estimate the risk of extinction particularly in light of the fact that there are no standard protocols available. This is also exacerbated by the lack of information to input into any analysis (suggesting the importance of more research). The SRT decided to use two approaches, a semi-quantitative analysis and a modeling analysis. The

semi-quantitative approach was used to determine the status within each DPS and the modeling with RAMAS looked at three specific rivers.

Semi-quantitative analysis--Although the semi-quantitative approach is subjective, because different weights on factors can produce different outcomes, it can provide framework for management and areas for future research. They used this approach to recommend the status of the shortnose sturgeon within each DPS. They concluded, based on available information, that all five DPSs met ESA listing thresholds; three DPSs, the Connecticut and Housatonic Rivers, Delaware River and Chesapeake Bay, and the Southeast Rivers all met the criteria for endangered status and the Hudson and Gulf of Maine DPSs were determined to be threatened. The most important threats identified by the SRT to population viability were: 1) dams, 2) dredging, 3) poor water quality, and 4) fisheries bycatch. They determined that destruction or modification of available habitat in every river studied throughout the species' range was more important than any other factor. Although the semi-quantitative analysis is subjective and is dependent on the input values and their weightings, I think, based on the available information, that their analysis is most likely correct, and, if it is off, it will err on the side of caution for the fish.

Modeling-- The extinction risk analysis of the Hudson, Altamaha and Cooper River populations was an informative appendix to the review. Although not playing a central role to the SRT's analysis, I am glad it was included. This approach provides a nice case study/model and demonstrates that this approach can and should be used with other populations. The analysis also showed that the even under catastrophic events there is a chance that these populations may have the potential to rebound. I agree with the recommendation that inclusion of density dependence in the model would provide a more realistic picture on the effects of catastrophic events. However, I would add a cautionary note that it would be advisable to add the potential for an "Allee effect" in this model. This is a very interesting area of research in conservation which suggests, among other things, that even though it looks like a population can rebound from a low number because of density dependent release it may not be able to do so because of a host of factors. I would also suggest that they conduct sensitivity analyses or add a comment on the importance of sensitivity analyses on the main assumptions (e.g. sex ratio, spawning frequency ...). This would help provide guidance on what areas need the most attention in terms of future research.

c. Evaluation of Non-regulatory Conservation Measure

It is encouraging to see the number of non-profit organizations that donate, time and resources to shortnose sturgeon protection, recovery and education activities. This is in addition to many of environmental initiatives that are occurring in the watersheds in which shortnose sturgeon occurs.

d. Research Recommendations

Genetics: There is no doubt that more genetic studies should be conducted, and as the SRT suggested, they should be directed towards population identification and delineation so that DPSs can be identified, protected and potentially rehabilitated. Although this is a big request, I would also add that it would be very nice if there were a non- or minimally invasive test(s)

developed to determine gender for both immature and mature fish. This would improve any recruitment and/or risk modeling efforts and help us to determine how often they reproduce.

Surveys and Presence/Absence Studies: I agree very strongly with the SRT that we need to determine the true distribution of this species. There are many rivers along the east coast of North America that could potentially support shortnose sturgeon as an occasional or resident species. This is particularly important in light of the more recent information on shortnose sturgeon movement to saltwater environs around their natal rivers. It is clear that the merger of genetic and tracking studies is important for this work.

Designating Critical Habitat: Although the delineation of critical habitat through ontogeny for such a long-lived species is a very large undertaking, it is crucial to their conservation and protection. The SRT suggests the importance of studying foraging ecology throughout their life history and also to define the “benthic habitats which supply the preferred and alternative diets”. They suggest that the mapping of these habitats of the benthic organisms is important. I agree with this assertion as it will provide information necessary for declaring an area as critical to this species. Probabilistic/generalized linear models or similar approaches used to map benthic habitat should be constructed to help identify the distribution of this species through space and time. I would also add that although there has been great progress on identifying reproductive habitat, the task is not complete. The same can be said for overwintering sites. These two locations in which shortnose sturgeon aggregate are small relative to their distribution during the remainder of the year and will therefore make them very vulnerable to disturbance while the fish are there. There is also little information on potential nursery areas (that is, if they exist) for this species and I would suggest that this too remains a priority.

Dam passage: The SRT considered that improvement to both downstream and upstream passage be a highly ranked recovery goal in the future. I agree. Their suggestion indicates the importance of understanding shortnose sturgeon physiology in order to better design and develop passage systems that allow shortnose sturgeon greater access to their natal rivers.

Contaminant risks: This research area also reinforces the need to better understand the ecophysiology of this species. These fish occur in large and heavily utilized rivers. Yet there is little work on ecotoxicology, both in terms of chronic and acute exposures. This deficiency needs to be corrected. Just as a suggestion, it might be useful to couple acute exposure studies with those of the on-going dredging research. It would also be informative if research was conducted on the potential effects of estrogenic compounds through ontogeny.

Summary of findings made by the CIE peer reviewer.

The SRT’s report is an ambitious undertaking considering the wide distribution of this species and the new information made available for this report. Their report is a very thorough examination of the status of shortnose sturgeon. Based on the information provided in this report, I agree with their analysis that at this time: 1) shortnose sturgeon can be viewed as occurring in six DPSs and that 2) each individual river population should be managed separately relative to the different risks and high degree of genetic variability found within each of these rivers.

Although this is a comprehensive document, there are a number of areas that may need to be augmented. For example, it would be beneficial to see more ecophysiology and ecotoxicology research reported in this document. This is particularly true in light of SRT's emphasis on the risks from habitat modification and contaminants to this species and other sturgeons.

The SRT also commented on the importance of river obstruction and potential effects of climate change. Considering the importance of river obstructions and the potential for climate change alterations of the temperature and salinity of natal rivers for this species I would suggest that the SRT look at the literature available on oxygen consumption (exercise physiology), stress response, osmoregulation, and water quality for shortnose and other sturgeon species.

Conclusions and Recommendations

This is an excellent and thorough contribution to our knowledge and understanding of shortnose sturgeon throughout its range. Although not central to the major objectives of determination of DPS and risks, there are a number of studies that could have been incorporated into and/or acknowledged in this report (please see above). The SRT's analysis and designation of six DPSs is supported by current information. The Extinction Risk analysis approach is appropriate relative to the information currently available and their analysis is most likely correct. Note that even if it is off, it errs on the side of caution for the fish.

In terms of research objectives, the SRT indicated that while there has been progress made to meet the objectives set out in the shortnose sturgeon recovery plan (NMFS 1998) many of the goals have not been met. This is understandable as the list was rather exhaustive. It is clear that current information on population dynamics, distribution, movement and factors leading to reproductive success are not adequate to assess the status of this species in each population segment. I also agree with their assertion that more needs to be done on designation of critical habitat, fisheries, dam passage, contaminants, and dredging. In light of this list, I would also strongly recommend that more research on ecophysiology and ecotoxicology also be conducted in order to better interpret results and the potential effects from the aforementioned areas of research.

Appendices

Bibliography of all material provided

Status Review of Shortnose Sturgeon *Acipenser brevirostrum*.

Attachment A: Statement of Work for Dr. Matthew Litvak

External Independent Peer Review by the Center for Independent Experts

Shortnose Sturgeon Status Review Report

Project Background:

The subject of this peer review is a status review report for shortnose sturgeon (*Acipenser brevirostrum*) that is being prepared for the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) by a team of Federal and state biologists.

NMFS has Endangered Species Act (ESA) jurisdiction of species listed at 50 CFR 223.102 and 224.101. The U.S. Fish and Wildlife Service (USFWS) adds species under NMFS jurisdiction to its official list (List), published at 50 CFR 17.11 (for animals) and 17.12 (for plants). Shortnose sturgeon was listed as an "endangered species threatened with extinction" under the Endangered Species Preservation Act on March 11, 1967. Shortnose sturgeon as a species remained on the endangered species list with the enactment of the ESA.

NMFS initiated this shortnose sturgeon status review in July 2007 to update the biological information on the status of the species. The status review will compile and analyze the best available information on the status of and threats to the species; it will also consider if shortnose sturgeon should be identified and assessed as Distinct Population Segments (DPSs) (see 61 FR 4722; February 1, 1996).

If it is determined that the species meets the requirements to be divided into DPSs, NMFS in turn considers each DPS independently for listing consideration under the ESA. That is, each DPS is reviewed and may or may not be proposed for listing under the ESA as threatened or endangered. It is not uncommon for the various DPSs to be listed differently (i.e., one DPS may be listed as endangered; another as threatened). Listing or reclassifying each DPS separately allows NMFS to protect and conserve species and the ecosystems upon which they depend before large-scale decline occurs; it may also allow for more timely and less costly protection and recovery on a smaller scale.

As part of the status review, NMFS assembled a Status Review Team (SRT) consisting of Federal and state biologists to compile and review the best available commercial and scientific information on shortnose sturgeon and to present its factual findings to NMFS Service in a Status Review Report. The SRT was to compile the best available information rather than re-analyze or conduct new analyses or modeling. The SRT also summarizes ongoing protective efforts in the Status Review Report, to determine to what degree these protective measures abate risks to the shortnose sturgeon.

The scientific and commercial information presented in the status review report should contain essential factual elements upon which NMFS can base our ESA listing determination (endangered, threatened or not warranted). NMFS is required to use the best available scientific and commercial data in making determinations and decisions under the ESA. As such, it is

critical that the status review contain the best available information relevant to the status of, and factors and threats affecting, shortnose sturgeon and that all scientific findings are both reasonable, and supported by valid information contained in the document. Accordingly, NMFS requires a peer review that focuses on the factual information and scientific validity of the status review report along with the application and interpretation of the available data in making conclusions and recommendations found in the Status Review Report.

Overview of CIE Peer Review Process:

NMFS Office of Science and Technology (OST) coordinates and manages a contract for obtaining external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of stock assessments and various scientific research projects. The primary objective of the CIE peer review is to provide an impartial review, evaluation, and recommendations in accordance to the Statement of Work (SoW), including the Terms of Reference (ToR) herein, to ensure the best available science is utilized for the National Marine Fisheries Service management decisions.

The OST serves as the liaison with the NMFS Project Contact to establish the SoW which includes the expertise requirements, ToR, statement of tasks for the CIE reviewers, and description of deliverable milestones with dates. The CIE, comprised of a Coordination Team and Steering Committee, reviews the SoW to ensure it meets the CIE standards and selects the most qualified CIE reviewers according to the expertise requirements in the SoW. The CIE selection process also requires that CIE reviewers can conduct an impartial and unbiased peer review without the influence from government managers, the fishing industry, or any other interest group resulting in conflict of interest concerns. Each CIE reviewer is required by the CIE selection process to complete a Lack of Conflict of Interest Statement ensuring no advocacy or funding concerns exist that may adversely affect the perception of impartiality of the CIE peer review. The CIE reviewers conduct the peer review, often participating as a member in a panel review or as a desk review, in accordance with the ToR producing a CIE independent peer review report as a deliverable. At times, the ToR may require a CIE reviewer to produce a CIE summary report. The Office of Science and Technology serves as the COTR for the CIE contract with the responsibilities to review and approve the deliverables for compliance with the SoW and ToR. When the deliverables are approved by the COTR, the Office of Science and Technology has the responsibility for the distribution of the CIE reports to the Project Contact. Further details on the CIE Peer Review Process are provided at <http://www.rsmas.miami.edu/groups/cie/cieprocess.htm>

Requirements for CIE Reviewers:

CIE shall provide four CIE reviewers to conduct a desk peer review (i.e., without travel requirement) of the Shortnose Sturgeon Status Review Report to ensure that its contents can be factually supported and that the methodology and conclusions are scientifically valid. Although there shall be four CIE reviewers in total, the composition of the reviewers may be divided between reviewers with expertise in shortnose sturgeon and reviewers with expertise in other

sturgeon species or sturgeons in general. Specifically, it is strongly preferred that as many as two of the four CIE reviewers shall have the combined expertise specific to shortnose sturgeon to conduct the scientific peer review in the following categories;

1. Life history and population dynamics of shortnose sturgeon
2. Shortnose sturgeon genetic, physiological, behavioral, and/or morphological variation throughout the species' range;
3. Habitat requirements of shortnose sturgeon;
4. Predation and disease affecting shortnose sturgeon;
5. Regulatory mechanisms for managing the species;
6. Other natural or man-made impacts affecting shortnose sturgeon;
7. Propagation of shortnose sturgeon; and
8. Conservation actions including restoration efforts and recovery activities for shortnose sturgeon.

Additionally, if specific expertise in shortnose sturgeon cannot be obtained, all four of the CIE reviewers may have more broad expertise in other sturgeon species or sturgeons in general. These reviewers shall have the combined expertise to conduct the scientific peer review in the following categories;

1. Life history and population dynamics of sturgeon species;
2. An understanding of sturgeon genetics, physiology, and behavior;
3. Sturgeon habitat requirements;
4. Predation and diseases affecting sturgeon species;
5. Regulatory mechanisms for managing sturgeon species;
6. Other natural or man-made impacts affecting sturgeons;
7. Sturgeon propagation; and
8. Conservation actions including restoration efforts and recovery activities that have benefited sturgeon species.

Familiarity with ESA is also highly desirable. Each reviewer will be supplied with the Status Review Report prepared by the SRT. Any of the reports and papers cited in the Status Review Report will be made available to the reviewers upon their request.

Each reviewer's duties shall not exceed a maximum of seven work days. Each reviewer shall analyze the Status Review Report and develop a detailed report in response to the ToR (see Annex I). The reviewers shall conduct their analyses and writing duties from their primary locations. Each written report is to be based on the individual reviewer's findings. See Annex II for details on the report outline.

The CIE reviewers shall have the requested expertise necessary to complete an impartial peer review and produce the deliverables in accordance with the SoW and ToR as stated herein (refer to the ToR in Annex 1).

Statement of Tasks for CIE Reviewers:

The CIE reviewers shall conduct necessary preparations prior to the peer review, conduct the peer review, and complete the deliverables in accordance with the ToR and milestone dates as specified in the Schedule section.

Prior to the Peer Review: The CIE shall provide the CIE reviewers contact information (name, affiliation, address, email, and phone) to the Office of Science and Technology COTR no later than the date as specified in the SoW, and this information will be forwarded to the Project Contact.

Pre-review Documents: Approximately two weeks before the peer review, the Project Contact will send the CIE reviewers the necessary documents for the peer review, including supplementary documents for background information. The CIE reviewers shall read the pre-review documents in preparation for the peer review.

- A copy of the Shortnose Sturgeon Status Review Report, the document to be reviewed. The draft citation follows:
Shortnose Sturgeon Status Review Team. 2008. Status Review of shortnose sturgeon (*Acipenser brevirostrum*). Report to National Marine Fisheries Service, Northeast Regional Office. [Date completed]. [xxx] pp.
- Access to an electronic copy of most reference documents cited in the Shortnose Sturgeon Status Review Report.
- Electronic access to the Endangered Species Act text at:
<http://www.nmfs.noaa.gov/pr/laws/esa/text.htm>
- Electronic access to “Recognition of Distinct Vertebrate Population Segments (DPS) Under the Endangered Species Act (FWS and NMFS) (61 FR 4722; February 7, 1996)” at: <http://www.nmfs.noaa.gov/pr/pdfs/fr/fr61-4722.pdf>

This list of pre-review documents may be updated up to two weeks before the peer review. Any delays in submission of pre-review documents for the CIE peer review will result in delays with the CIE peer review process. Furthermore, the CIE reviewers are responsible for only the pre-review documents that are delivered to them in accordance to the SoW scheduled deadlines specified herein.

Desk Peer Review:

The reviewers shall conduct their analyses and writing duties from their primary locations as a “desk” review. Each written report is to be based on the individual reviewer’s findings and no consensus report shall be accepted.

The primary role of the CIE reviewer is to conduct an impartial peer review in accordance to the Terms of Reference (ToR) herein, to ensure the best available science is utilized for the National Marine Fisheries Service (NMFS) management decisions (refer to the ToR in Annex 1).

Terms of Reference: The Terms of Reference (ToR) for the CIE peer review are attached to the SoW as Annex 1. Up to two weeks before the peer review, the ToR may be updated with minor modifications as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToR are not adversely impacted.

Please see Annex 1 attached.

Independent CIE Peer Review Reports:

The primary deliverable of the SoW is each CIE reviewer shall complete and submit an independent CIE peer review report in accordance with the ToR, and this report shall be formatted as specified in the attached Annex 2.

Schedule of Milestones and Deliverables:

The CIE review and milestones shall be conducted in accordance with the dates below;

13 October 2008	CIE provides COTR with the CIE reviewer contact information, which will then be sent to the Project Contact
12 December 2008	Project Contact will send the CIE Reviewers the pre-review documents
2-16 January 2009	Each reviewer shall conduct an independent peer review
23 January 2009	CIE shall submit draft CIE independent peer review reports to the COTRs
7 February 2009	CIE will submit final CIE independent peer review reports to the COTRs
14 February 2009	The COTRs will distribute the final CIE reports to the Project Contact

Acceptance of Deliverables:

Each CIE reviewer shall complete and submit an independent CIE peer review report in accordance with the ToR, which shall be formatted as specified in Annex 2. The report shall be sent to Manoj Shivilani, CIE lead coordinator, via shivlanim@bellsouth.net and to Dr. David Sampson, CIE regional coordinator, via david.sampson@oregonstate.edu . Upon review and acceptance of the CIE reports by the CIE, the CIE shall send via e-mail the CIE reports to the COTR (William Michaels William.Michaels@noaa.gov) at the NMFS Office of Science and Technology by the date in the Schedule of Milestones and Deliverables. The COTRs will review the CIE reports to ensure compliance with the SoW and ToR herein, and have the responsibility

of approval and acceptance of the deliverables. Upon notification of acceptance, CIE shall send via e-mail the final CIE report in *.PDF format to the COTRs. The COTRs at the Office of Science and Technology have the responsibility for the distribution of the final CIE reports to the Project Contacts.

Key Personnel:

Contracting Officer's Technical Representative (COTR):

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Request for Changes:

Requests for changes shall be submitted to the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the Contractor within 10 working days after receipt of all required information of the decision on substitutions. The contract will be modified to reflect any approved changes. The Terms of Reference (ToR) and list of pre-review documents herein may be updated without contract modification as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToR are not adversely impacted.

ANNEX 1:

Terms of Reference

CIE peer review of the Shortnose Sturgeon Status Review Report

Evaluate the adequacy, appropriateness and application of data used in the Shortnose Sturgeon Status Review Report.

1. In general, does the Status Review Report include and cite the best scientific and commercial information available on the species and its habitats, including threats to the species and to its habitat?
2. Where available, are opposing scientific studies or theories acknowledged and discussed?
3. Are the scientific conclusions sound and derived logically from the results?

Evaluate the recommendations made in the Shortnose Sturgeon Status Review Report.

1. Concerning distinct population segments, is the species delineation supported by the information presented and currently available?
2. Are the results of the Extinction Risk Analysis supported by the information presented?
3. Review the research recommendations made in the Status Review Report and make any additional recommendations, if warranted.

ANNEX 2

Format and Contents of CIE Independent Reports

The report should follow the outline given below. It should be prefaced with an Executive Summary that is a concise synopsis of goals for the peer review, findings, conclusions, and recommendations. The main body of the report should provide an introduction that includes a background on the purpose of the review, the terms of reference and a description of the activities the reviewer took while conducting the review. Next, the report should include a summary of findings made in the peer review followed by a section of conclusions and recommendations based on the terms of reference. Lastly the report should include appendices of information used in the review (see outline for more details).

1. Executive Summary
 - a. Impetus and goals for the review
 - b. Main conclusions and recommendations
 - c. Interpretation of the findings with respect to conclusions and management advice
2. Introduction
 - a. Background
 - b. Terms of Reference
 - c. Description of activities in the review
3. Review of Information used in the Status Review Report (as outlined in the table of contents in the Status Review Report)
4. Review of the Findings made in the Status Review Report
 - a. DPS considerations
 - b. Extinction Risk Analysis
 - c. Evaluation of Non-regulatory Conservation Measure: Non Regulatory Conservation Measures and refers to chapter 9 of the status review report. We are looking for an overview of programs described there that benefit shortnose sturgeon but are not mandated under the ESA. These are primarily efforts of NGOs for sturgeon conservation and/or education and outreach. Are the summaries provided for the organizations and programs listed there accurate? Is the reviewer aware of other non-regulatory efforts to conserve shortnose sturgeon that we have not included in this chapter?
 - d. Research Recommendations
5. Summary of findings made by the CIE peer reviewer
6. Conclusions and Recommendations (based on the Terms of Reference in Annex I)
7. Appendices
 - a. Bibliography of all material provided
 - b. Statement of Work
 - c. Other