

STATUS REVIEW OF SHORTNOSE STURGEON

Acipenser brevirostrum

Draft version 15 December 2008

By the

Shortnose Sturgeon Status Review Team
National Marine Fisheries Service
National Oceanic and Atmospheric Administration

External Independent Peer Review Report

By

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For the

Center for Independent Experts

Submitted

6 January 2009

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1. Executive Summary

This report is an evaluation of the shortnose sturgeon status review prepared in draft form by a team of Federal, state, academic, and other species experts. The status review presents and analyses the best available information on species ecology, status, and threats. New conclusions are presented on distinct population segments and the status of each following the Endangered Species Act listing criteria and risks of extinction. The draft status review also covers river population status, conservation efforts, and research needs. The quality and scope of scientific and technical information used in the status review was evaluated. Status review findings were judged for factual support, scientific validity, effective analyses, proper interpretation, and sound justification.

The life history and ecology reviews for shortnose sturgeon are well developed and detailed. The information on exchange of fish between rivers and the use of marine waters was not well supported and lacked a clear presentation of data and study findings. The conclusion that six DPSs should be used for recovery planning and actions is weak and inconsistent in presentation of data and information. Points of concern involve the mechanisms causing genetic patterns across the species range, lack of synthesis of genetic findings and data, river-to-river exchange of fish, and consideration of ESA DPS criteria 2 (importance of river populations). A justified and effective method was used for analyses of extinct risk but flaws in the structure of the analyses make the findings questionable and potentially biased. The review of threats, river populations, conservation measures, and research priorities is well developed and detailed.

This status review analyzed the best available information on the status and threats to shortnose sturgeon. However, in some key ways the information was not integrated well or used effectively in the analyses of distinct population segments (DPSs) and extinction risks for the identified DPSs. I judged the status review to be unclear about DPS discreteness, inadequate on significance of population segments, and improper in the analysis of extinction risks. My evaluation of the major conclusions, DPS designations and extinct risks by DPS, indicate the status review should be reconsidered and revised. My recommended changes could affect the final findings but would not require a major repeat of this status review.

2. Introduction

Background

The shortnose sturgeon (*Acipenser brevirostrum*) was listed as a species threatened with extinction under the Endangered Species Preservation Act of 1967, and was a charter member of the Endangered Species Act of 1973. The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) is the lead federal agency overseeing the protection and recovery of this species. The status of the shortnose sturgeon has been assessed by NMFS in the past (1987 and earlier), and for specific populations when needed (e. g., Androscoggin and Kennebec Rivers in 1996). A species recovery plan was completed in 1998. NMFS is charged under the ESA to conduct periodic assessments of the species' status and the current review was initiated in 2007.

This report is an evaluation of the current status review for shortnose sturgeon prepared in draft form by a team (status review team, SRT) of Federal, state, academic, and other species experts. The status review is to analyze the best available information on the status and threats. In addition, the SRT considered if shortnose sturgeon should be identified and assessed as distinct population segments (DPSs): subsets of the species that are discrete, significant, and at risk of extinction. When a species is managed as DPSs under ESA then each segment is considered individually under the ESA listing criteria. Because of this form of ESA management, DPSs can have different designations: endangered, threatened, and not warranted. The draft status review evaluated here proposed DPSs and reviews each for ESA status. The biology and conservation efforts for shortnose sturgeon are also detailed.

Scientific and technical information used in the status review is required to be the best available. In addition, status review findings are to be reasonable and well supported by valid information, proper analyses, and unbiased interpretation. NMFS conducts independent peer evaluations of draft status reviews as a check on factual information, scientific validity, effective analyses, proper interpretation, and sound conclusions and recommendations. This report is an evaluation of the 15 December 2008 version of the NMFS status review of shortnose sturgeon over its entire range.

Terms of Reference

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 following specific terms of reference aimed at ensuring the best available science are used for the National Marine Fisheries Service management decisions.

The primary assignment for each CIE reviewer is to conduct an impartial evaluation of a draft NMFS report. The evaluation considers the adequacy, appropriateness and application of data and analyses used in the status review report. Specific evaluation criteria include:

- ◆ Quality of the scientific and technical information
- ◆ Treatment of differing interpretations and theories
- ◆ Well developed basis and logic for findings

For this status review of shortnose sturgeon, additional criteria were assigned:

- ◆ Specified distinct population segments are supported by data and established facts
- ◆ Findings of the extinction risk analyses are supported by data and established facts
- ◆ Recommendations are sound and adequate in number and scope

This evaluation report follows a specified outline that includes a summary, review of purpose, and a review of findings, conclusions, and recommendations. The main body of the report comments on all sections of the status review. A listing of key findings by section, overview findings, and conclusions are included. A list of full citations for all information used is also provided.

Description of Activities

Contract arrangements	October 2008
Conflict reporting	October 2008
Final contract agreement	December 2008
Document reading with notes	2 days
Assembly of relevant information	1 day
Draft section by section comments	2 days
Summary of findings and other reporting	1 day
Proofing, formatting, and final report preparation	1 day
Report submission to CIE	January 2009

3. Review of Information

1. Introduction

I consider this section of the status review to be largely satisfactory. There are some findings in this section that I urge be reconsidered.

The species is labelled as 'anadromous' in the first sentence. Labeling shortnose sturgeon as an anadromous species has been traditional, common in National Marine Fisheries Service (NMFS; e. g., 1987, 1998, and others) and scientific publications, and likely related to the species being assigned to NOAA under the Endangered Species Act (ESA). However, I believe this is not proper and should be discontinued. The term anadromous is defined in common dictionaries and scientific literature (McDowall 1992) as: fish that live mostly at sea or in marine waters and return to freshwater for spawning. Some sturgeon biologists (e.g., Kynard 1997) and recent NMFS documents (NMFS 2003) have indicated the term anadromous does not properly describe the life history of shortnose sturgeon. There is more use of brackish and lower estuary waters in southern populations but this still does not fit the anadromous term for migrating between salt and freshwater for reproduction. This species should be termed an amphidromous fish; one that moves between fresh and salt water during some part of life cycle, but not for breeding. Contemporary life history and migratory behavior studies characterize shortnose sturgeon as an estuary and river species. As a key federal document on shortnose sturgeon, this status review should break the tradition of incorrect life history labeling and use the technically proper term of an amphidromous species.

2. Nomenclature and Taxonomy

I consider this section of the status review to be satisfactory and not in need of revision or expansion.

3. Species Description and Natural History

I consider this section of the status review to be lengthy and detailed but should be improved in a few ways.

In general, I found the content excessively oriented to northern populations and too dependent on work by Kieffer and Kynard. The section opens with a notice that the review by Dadswell et al. (1984) was used extensively and it is strongest on northern populations. It seems most of the citations in the second half of the section were to papers by Kieffer and Kynard with many in review, and in press. Section 11 - References - has 10 unpublished papers authored by either Kieffer and Kynard. The status review has information that could be used to make this section more encompassing. For more on southern populations, try augmenting the content with data from papers used in

other sections of the status review by southern fish biologists such as Collins, Moser, Smith, and the review by Gilbert (1989).

Variability in the color of shortnose sturgeon is described. A series of color photographs of the fish and its features would be desirable and practical. This status review and most other technical reports are distributed and read in digital form making color imagery reproduced and used. Please consider adding a series of body images and close up photos of morphological features.

On distribution (section 3.2.2), I recommend a table be inserted of all known inter-river exchanges of shortnose sturgeon. The few cases reported in the status review are raised sporadically in the text and some cases are not in this section. Therefore, a table that shows fish sizes, years, source river, and recapture river would consolidate this information. Assessing the rarity of this behavior is important to the argument of distinct population segments and the notion of this species using marine waters.

Also in Section 3.2.2 is the statement 'there is substantial evidence in the literature for shortnose sturgeon occurrence at sea' followed by six citations. I investigated these and do not find the evidence 'substantial' or convincing. The first citation is a general work from the time when much of the biology of shortnose sturgeon was unknown or judged incorrectly. The second citation was not included in the references (Section 11). The third and fourth appear to be limited to uncommon local accounts in waters associated with large shortnose sturgeon populations (Hudson and Kennebec R complex). Dadswell (1979) is cited but he later conclusively stated (Dadswell et al. 1984) that this species is largely restricted to its home river and estuaries except during high freshwater flows that disrupt the mixing of salt and freshwater. Finally, the last reference discusses a large stocking of shortnose sturgeon that resulted in a wide dispersion to several rivers. Additional support in this section also appears weak.

While two shortnose sturgeon I tagged in the Hudson River were recaptured in the Connecticut River, my view is consistent with the analysis of Dadswell et al. (1984) on use of marine waters: rare and often associated with freshwater flushing events. Gilbert (1989), who covers southern populations well and is a leading southern US ichthyologist, also states that shortnose sturgeon remain in coastal waters under the influence of home rivers. I will have more on this topic below since it is important relative to the distinctness of river populations.

A part of Section 3.2.3 on behavior of post yolk-sac larvae seems inconsistent. Larvae are described as preferring 'open bright habitat' and at the same time prefer the deepest channel waters. Deep river channels would be dark habitats. If substrates were light in color, would that be detectable by larvae in deep waters? I think the confusion here is due to terms used, or possibly inconsistent results of field and laboratory studies. Please clarify so that post yolk-sac larvae behavior is clear. This is likely an important life stage, and for many fishes it is the time of year class abundance formation (called the 'critical period'). Having the biology well explained will help and I realize this life stage is poorly understood for sturgeon.

The term 'social fish' under adult behavior should be re-termed. Social in biology typically refers to organized communities as in the social insects like ants. More accurate would be terms used by Dadswell (1984): grouping, shoaling, or congregations. The grouping of large numbers of shortnose sturgeon at overwintering sites is clear in many river systems but we do not have evidence of social organization among the congregations of fish. The descriptions of adult sturgeon aggregations appear correct but could be termed without the use of social.

References cited and not provided in Section 11: References:

Billard and LeCointre 2001
Damon-Randall et al. (in progress)
Schaefer 1967
Parker 2007

4. Species and DPS Considerations Under the ESA

I consider this section of utmost importance in the status review, a change from past NMFS decisions and policies, at odds with some established sturgeon biologists, poorly presented, and less than convincing.

The initial part of this section (prior to 4.1) can be used elsewhere in the status review - possibly the introduction. It seems to be general background here and does not help on this key section of the status review.

After careful study of Section 4, I am uncomfortable with it in the present form and the strength of the conclusions. Partly this is due to the section being poorly presented - order of information. I believe this section is also not convincing and has inconsistencies. I am not recommending that the conclusions be changed but instead reconsidered and better justified. My concerns follow on a point by point basis.

Genetic patterns and discreteness. The conclusion to declare six distinct population segments (DPS) is a departure from the 1998 Recovery Plan (NMFS 1998) that focused on each river population being distinct relative to the DPS policy (National Oceanic and Atmospheric Administration and the US Fish and Wildlife Service 1996). The basic argument presented is that some clusters of rivers have shortnose sturgeon that have relatively similar genetic composition in comparison to other river populations. This pattern can be a product of the development of the river population over many tens of thousands of years or by lack of reproductive isolation in current times. Both causes are invoked in the status review. The 'shallow' genetic differentiation of the St. John River fish from others in the Gulf of Maine was attributed to geologic youth of these populations and recent glaciation. In contrast, a high degree of gene flow in current times is reported for the Maine rivers and the Delaware-Chesapeake, citing the unpublished work of Wirgin and others. Then, the same source (Wirgin et al. unpublished) and Quattro et al. (2002) are cited as concluding glaciation during the Pleistocene explains the pattern. Finally, Wirgin et al.'s most recent published genetic

analyses (Wirgin et al. (2005) concludes there should be nine DPSs rather than the six declared in the status review. My concerns on linking genetic patterns to discreteness are that (1) the cause of genetic differentiation is not presented in a consistent manner, (2) the status review fails to present the case for discreteness in current times versus long-term zoogeographic processes, and (3) the different genetic study results are not synthesized to support one interpretation.

Discreteness by river-estuary system. The 1998 Recovery Plan (NMFS 1998) position on DPSs was based on clear evidence for river-estuary systems being distinct relative to reproduction. Much of the research and review work repeatedly cited in the status review holds this view: Dadswell et al. (1984), Gilbert (1989), Kynard (1997) and others. The status review states that 'there is significantly more information about rates of straying to adjacent rivers' but I do not see this information presented in a consolidated manner to make the point. Some fish have been documented to move among river systems and these rare cases are mentioned in the status review in different places. Apart from genetic analyses, the argument for river-to-river exchange of individuals in current times needs to be assembled and put forth.

Cases of river-to-river exchange. After making the argument that fish exchange among river systems need to be provided, I want to put caution on the cases used because I consider them to be atypical for the species. The rivers of Maine, often cited as an example of intra-river exchange and genetic relatedness, are unique in that shortnose sturgeon from multiple spawning groups share a common summer feeding zone. The Androscoggin, Kennebec, and Sheepscot Rivers contribute freshwaters and shortnose sturgeon to a complicated set of channels sometimes called an estuarine complex (Merrymeeting Bay; NMFS 1996a, 1996b). That is, fish from spatially distinct spawning sites commingle in the summer. This situation likely results in more mixing among river populations than would be seen normally. Similar situations may be found in parts of the coasts of South Carolina and Georgia where extensive marshes, river deltas, and barrier island form estuary complexes that may be commonly used for overwintering sites.

A somewhat similar situation occurs with the Hudson, Housatonic, and Connecticut Rivers where a few shortnose sturgeon have been recorded in multiple rivers. The Hudson discharges freshwater into the tidal straits of New York harbor (East River is one) with some flow going into Long Island Sound. While shortnose sturgeon do not normally occupy these tidal straits, fish that would enter the harbor area could easily go in different directions.

Finally, consider a perspective on the relatedness of shortnose sturgeon in the Delaware River and Chesapeake Bay rivers. It is very likely that many shortnose sturgeon in Chesapeake Bay are just Delaware River fish because of the Chesapeake and Delaware Canal that links the two waters at sea level across brackish areas of each. This artificial arrangement would contribute to fish moving south into the bay from the relatively large Delaware population. While the status review mentions this possibility in a few places, it should not be interpreted as evidence of reproductive mixing among river populations. For example, the situation is described as a metapopulation on page 55

when I believe it is one population. The last artificial situation to get out was the dispersion of fish stocked in the Savannah River that had no chance for natal river homing and dispersed widely among rivers (Smith et al. 2002).

I feel there is almost no information to show regional gene flow in current times by way of river-to-river exchange of individuals if the special cases described above are kept aside. As Kynard (1997) concludes, there is no evidence that shortnose sturgeon have recolonized rivers where they once existed despite causes of extirpation being alleviated.

Order of presentation. The portion of the status review focused on DPS discreteness (Section 4.2 and 4.3) can be organized for a more clear presentation of information and conclusions. The section now states the main conclusions (6 DPSs) up front with a few qualifications and then reviews work by the main investigators one by one. At the end the inconsistencies among Wirgin and King are listed, followed with reservations by the SRT: there could be as many as 12 discrete populations, and river populations may be most important and should be management units.

I recommend starting with a review of the genetic research by Wirgin, King, and others. Then, synthesize that into findings the SRT wants to use as a foundation for a six DPS conclusion. Add the differences from past NMFS positions and why new information calls for a reduction from 19 to six DPSs. Finally, make a clear set of statements on how the findings and conclusions support the criteria in Section 4.1. This part of the status review is key and sets up a further section for the overall outcome. I believe it needs to be convincing and that has not been achieved in my judgement. Finally, I would reconsider all the King figures and tables - use only what is needed to support the conclusions in a concise way.

References cited and not provided in Section 11: References:

Wirgin et al. unpubl. manuscript
Parker 2007

5. Analysis of ESA Listing Factors

I consider this section of the status review to be satisfactory but it could be reduced and simplified. The number of generic threats later become scores in an analysis, so I considered if each merits inclusion. The common threats are well reviewed and sound.

Section 5.1.4 Tidal Turbines. Tidal energy development clearly could have an impact on shortnose sturgeon. However, I believe this category of impact is too limited in cases to justify being singled out in a section of its own. Some cases discussed would not affect shortnose sturgeon and one presented as a sturgeon threat is incorrect. The East River is not shown in any papers on the Hudson River shortnose sturgeon as habitat for this species. Shortnose sturgeon almost certainly have been in the East River at times. For example, the few Hudson River tagged fish caught in the Connecticut River must have passed through the East River. Nevertheless, this tidal strait is not considered habitat

for the species and tidal power facilities in the East River would not be extensively considered relative to shortnose sturgeon. Likewise, the status review later reports that the presence of shortnose sturgeon in the Piscataqua River is unknown as is the case for the Housatonic River. This leaves tidal power a potential issue for Maine Rivers and Canada. Again, while the threat is real, I think this class of threat should be merged into one category for major coastal industrial development.

Section 5.1.5 LNG Facilities. My view of this section is similar as for tidal turbines - not pervasive enough to merit its own category. This too should be merged with other major coastal industrial development. Each would need its own impact analysis anyhow.

Water chestnut. This exotic plant does fill in shallow water habitats, but these are not the deep channel waters used by shortnose sturgeon. I think this need not be included in the status review. If kept, add the scientific name.

Federal environmental Acts. From pages 103 to 106 a synopsis is given of many federal environmental laws. While a wide array of laws could pertain to shortnose sturgeon in any given case, this listing is not useful enough to be included. Reduce the list to those laws and policies directly involved in most management decisions on the species. Acts like NEPA apply at times but not routinely.

Table 14 should be deleted: limited content and header puts caution on its use.

References cited and not provided in Section 11: References:

Galbraith 2008
CBS News 2006

6. River Summaries

I consider this section of the status review to be satisfactory but it could be edited for more consistency among rivers. This is a long section and appears to be written by SRT members with experience in some of the rivers that end up with the detailed accounts.

Some of my comments above relate to content in the river accounts but need not be repeated.

The most studied rivers have very long and detailed accounts in this section. Many others are very short and have little content. For ease of use, I recommend that the long accounts be reduced and some minimal accounts be combined into a table or multi-river summary.

The repeated comments on tidal turbines and LNG facilities could be replaced with comments on anticipated major coastal developments as suggested above.

A good map of each system discussed would be very helpful. Most can have notes on key habitats. Maps are provided in this status review for some river systems and have been used in other species review works like Dadswell et al. (1984) and NMFS (1998). I would like to see more of that here, especially for complex cases like the Kennebec complex.

References cited and not provided in Section 11: References:

Kieffer and Kynard in review-a
Kieffer and Kynard in review-b

7. Extinction Risk Analysis

This is a key section of the status review and I describe objections to some details of the analysis method. The analysis method employed – Patrick and Damon-Randall (2008) – is good. I request details of scoring threats be reconsidered.

Abundance scoring. Consider reducing scores for abundance by one, making a zero mean no presence or rare. That way summaries like Table 35 will have zeros for rivers where the SRT does not believe shortnose sturgeon exist as a population.

Population trend scoring. I see a problem with the score criteria here. If a population is large like the Hudson River population, it does not seem sensible that a stable trend produces a negative score. If the population is low then stability is not desirable. Consider changing the top score to be large and stable (abundance 4 and 5; Delaware and Altamaha Rivers), next best would be increasing, next would be reduced but stable, and then declining, and finally absent.

Assessment of threat. Here I disagree with the way the analysis has been structured. A viable population of fish needs both a place to live (habitat) and reproductive capability (adequate survival).

Fishing mortality from the start, and now bycatch mortality, has been central to the decline of this species. As reported in the status review, the original listing of shortnose sturgeon cited fishing mortality as a main factor. NMFS (1998) also highlights mortality from fishing (bycatch) as a key impediment to the recovery of several populations. Repeatedly in the river summaries (Section 6) of the status review, bycatch mortality was given as a major issue. Cases are reported in the status review where large losses of shortnose sturgeon are attributed to gill nets set for other species. Collins et al. (1996) assessment of bycatch loss of shortnose sturgeon makes estimates of annual mortality like 8, 16, and 20% — far too high to allow any kind of population increase or even stability (see Boreman 1997 for guidance on what would be excessive mortality).

By discounting Factor B (essentially bycatch mortality) to half the impact of Factor A (habitat) the significance of bycatch mortality is diminished. Further, mixing bycatch mortality with scientific collections in scoring (Table 36) further lessens the impact of

bycatch; both contribute equally yet are nowhere near similar in impact on the species. Combining the two is equivalent to averaging bycatch mortality and research use of fish.

I believe bycatch losses should be on par with habitat issues in influence. To do this the analysis needs to be changed: weight habitat 40%, bycatch 40%, and the rest as is now. Drop scientific collections from Factor B and count that in Factor E 'Other'. Also, make low or no risk be zero. Again, that will make rivers with consistently no/low risk have zero factor totals rather than values compared to the sum of other scores. While this last suggestion is not what was done by Patrick and Damon-Randall (2008), I still think it is an improvement on the method. Otherwise, my suggestions do not depart from the method guidance.

Consider revisions to scoring and inclusions in all factors along the lines I raise here.

The river-by-river review of scoring is good and helps justify the decisions and ratings employed.

The Connecticut and Potomac Rivers received the highest factor scores for scientific collections yet no explanation or comment was provided in the river-by-river scoring reviews.

Reference cited and out of date in Section 11: References:

Patrick and Damon-Randall 2008

8. Research

I consider this section of the status review to be satisfactory. The research objectives are worthwhile aims related to species conservation. I recommend two additional topics that address weaknesses in this status review:

1) Apply extinction risk modeling such as that in Appendix A to judge the magnitude of classes of threat to population survival. Simulation modeling can be useful for comparing threat scenarios so ratings used in Section 7 can be better justified.

2) Shortnose sturgeon river populations vary widely and many rivers may not support more than a couple hundred fish even in their original form. Knowing what constitutes a large population for each river is the same as setting conservation targets. This could guide the status and progress of species recovery on a river basis. Dadswell et al. (1984), Oakley and Hightower, and others have attempted this in some way. I believe a serious effort to correlate river attributes with population sizes in the best rivers could succeed in setting conservation targets by river. My hypothesis is that the size of the summer foraging range sets maximum population size rather than miles undammed, freshwater discharge, and other attempted measures.

The need for additional genetic and river-to-river migrations data is a critical need to resolve some of the concerns I raised in this review. These topics are already highlighted in the research priorities.

9. Non-regulatory conservation measures

I consider this section of the status review to be satisfactory and not in need of revision or expansion.

10. Conclusions

I have commented extensively on the main findings of this status review. These are repeated in this section.

I disagree that a persuasive presentation was made to support this finding: “more information about rates of straying to adjacent rivers and there are several genetic studies (both mtDNA and nDNA) that show that coastal migrations and effective movement (with spawning) is occurring between adjacent rivers in some areas”.

I disagree that a convincing presentation was made to support the finding that six DPSs are warranted.

I found flaws with the structure of the four-step extinction risk analysis and I am not ready to accept the findings from this analysis.

I agree that each river population is important for conservation of the species as concluded at the very end of the status review. The statement that each river population ‘should be considered a separate management/recovery unit’ seems to undermine the value of DPSs and the argument presented for declaring six of these units.

** EXTRA **

In section 4.1 the ESA criteria for DPSs are given. The first and the third are clearly covered in dedicated sections of the status review: section 4.3 with 38 pages, and section 5 with 31 pages. The second criterion seems underdeveloped:

The significance of the population segment to the species

Section 4.4 covers this criteria but it is superficial in content and is less than one page long. This is also the point where the SRT returns to rivers as management/recovery units. I do not see that criterion 2 is well explained and supported in the status review. This is an important deficiency in the review.

11. References

The citations in this section need to be reviewed for consistent format, complete information, and accuracy. I could see errors readily scanning over the listing.

Some corrected citations are:

Patrick, W. S., and K. Damon-Randall. 2008. Using a five-factored structured decision analysis to evaluate the extinction risk of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). *Biological Conservation* 14(1):2906-2911.

Haley, N. J. 1999. Habitat characteristics and resource use patterns of sympatric sturgeons in the Hudson River Estuary. Master Thesis, Wildlife and Fisheries Conservation, University of Massachusetts, Amherst, MA.

Gilbert, C.R. 1989. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Mid-Atlantic Bight)--Atlantic and shortnose sturgeons. U.S. Fish and Wildlife Service, Biological Report 82(11.122) and U.S. Army Corps of Engineers TR EL82-4.

4. Review of Findings

Life History and Ecology of Shortnose Sturgeon

Life history (anadromous) and behavioral (social) characterizations of the species are incorrect.

Natural history review (Sec 3) is too oriented to northern populations and the work of a couple of co-workers. Many of these sources are unpublished and not widely available.

Improved recognition of coastal movements among rivers is important to the primary conclusions of this status review. However, this information is not organized and presented in a way that supports this conclusion.

Support for occurrence at sea was investigated and not found convincing. More evidence is in the status review for the counter viewpoint that the species is primarily a river-estuary fish.

The description of habitat use by actively feeding larvae is inconsistent in the Status Review.

DPS Considerations

The argument for six distinct population segments (DPSs) is weak and inconsistent in presentation of data and information.

My concerns on linking genetic patterns to discreteness are that: (1) the cause of genetic differentiation is not presented in a consistent manner; (2) the status review fails to present the case for discreteness in current times versus long-term zoogeographic processes; and (3) the different genetic study results are not synthesized to support one interpretation.

The argument for river-to-river exchange of individuals in current times needs to be assembled and put forth. Cases used are not typical of distinct river-estuary systems.

The sections covering DPSs is not well organized and can be confusing.

The second ESA criterion for DPS designation was barely addressed: the significance of the population segment to the species. The SRT instead emphasizes the importance of all river populations as management units.

ESA Listing Factors and River Reviews

The analysis of ESA listing factors is mostly well developed and sound. Two sections appear too speculative and can be merged into one class of threat.

The river by river reviews are well developed but could be revised for brevity and easier use.

Extinction Risk Analysis

The extinction risk analysis method used is sound and documented in the scientific literature.

Some scoring methods could be modified for more clear results and this would not change the findings.

Population trend scoring was considered to be misleading.

The judgement to discount survival threats relative to habitat disruptions is considered unfounded and should be reconsidered.

Mixing bycatch mortality with scientific collections in scoring further discounts a well established threat to the species.

Conservation Measure, Research Recommendations, References

I consider these sections of the status review to be satisfactory and only minor suggestions are made.

5. Summary of Findings

The life history and ecology syntheses for shortnose sturgeon are well developed and detailed. The information on exchange of fish between rivers and the use of marine waters is not well supported and lacks a clear presentation of data and study findings.

The conclusion that six DPSs should be used for recovery planning and actions is weak and inconsistent in presentation of data and information. Points of concern involve the mechanisms causing genetic patterns across the species range, lack of synthesis of genetic findings and data, river-to-river exchange of fish, and consideration of ESA DPS criterion 2 (importance of river populations).

While a good method was used for analyses of extinct risk, flaws in the structure of the analyses make the findings questionable and potentially biased.

The review of threats, river populations, conservation measures, and research priorities is well developed and detailed.

6. Conclusions and Recommendations

This status review analyzed the best available information on the status and threats to shortnose sturgeon. However, in some key ways the information was not integrated well or used effectively in the analyses of distinct population segments (DPSs) and extinction risks for the identified DPSs. I judged the status review to be unclear about DPS discreteness, inadequate on significance of population segments, and improper in the analysis of extinction risks. Therefore, my evaluation of the major conclusions, DPS designations and extinct risks by DPS, indicate the status review should be reconsidered and revised. I did conclude that the best available information was included in the status review and many sections were satisfactory in their current form. My recommended changes could affect the final findings but would not require a major repeat of this status review.

7. Appendices

A. Bibliography

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B. Statement of Work for Dr. Mark Bain

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 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 shall provide the COTR with the CIE reviewer contact information, which will then be sent to the Project Contact	29 October
The Project Contact will send the CIE Reviewers the pre-review documents	17 November
Each reviewer shall conduct an independent peer review	8 December
CIE shall submit draft CIE independent peer review reports to the COTRs	19 January 2009
CIE will submit final CIE independent peer review reports to the COTRs	12 February
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 Shivlani, 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 via 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:

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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
 - 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