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Proceedings of the Pacific regional peer review on Recovery Potential Assessment – White Sturgeon, Lower Fraser Designatable Unit

September 22-24, 2020
Virtual Meeting

Chairperson: Nicholas Komick
Editors: Marlena McCabe, Maggie Boothroyd, Nicholas Komick

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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TABLE OF CONTENTS

SUMMARY

These Proceedings summarize the relevant discussions and key conclusions that resulted from a Fisheries and Oceans Canada (DFO), Canadian Science Advisory Secretariat (CSAS) Regional Peer Review meeting of September 22-24, 2020, held online using Zoom. One working paper originally entitled “Recovery Potential Assessment for Lower Fraser White 2020” was reviewed in support of the Recovery Potential Assessment.

Web-based participation included Fisheries and Oceans Canada (DFO) Science, Fisheries and Aquatic Management, and Species at Risk staff; and external participants from First Nations organizations, provincial government, recreational fishing sector, environmental non-governmental organizations, and academia.

The conclusions and advice resulting from this review will be provided in a Science Advisory Report (SAR) providing advice to DFO to inform *Species at Risk Act* listing and recovery planning processes. The SAR, Research Document and this Proceedings Document will be made publicly available via the CSAS Science Advisory Schedule.

INTRODUCTION

A Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat (CSAS), Regional Peer Review (RPR) meeting was held virtually using the Zoom platform on September 22-24, 2020 to review the working paper, which was originally titled “Recovery Potential Assessment for Lower Fraser White Sturgeon 2020”.

The Terms of Reference (TOR) for the RPR (Appendix A) were developed in response to a request for advice from DFO’s Species at Risk Program (SARP). Notifications of the RPR and conditions for participation were sent to representatives with relevant expertise from First Nations, provincial government, recreational fishing sectors, environmental non-governmental organizations and academia.

The working paper was modified and published as a research document under the following title (see Appendix B for working paper abstract):

> English, K.K., Challenger, W., Robichaud, D. and Korman, J. 2021. Recovery Potential Assessment for Lower Fraser River White Sturgeon (*Acipenser transmontanus*). DFO Can. Sci. Advis. Sec. Res. Doc. 2021/064. vii + 85 p.

The meeting Chair, Nicholas Komick, welcomed participants, reviewed the role of CSAS in the provision of peer-reviewed advice, and gave a general overview of the CSAS process. The Chair discussed the role of participants, the purpose of the various RPR publications (Science Advisory Report, Proceedings and Research Document), and the definition and process around achieving consensus decisions and advice. Everyone was invited to participate fully in the discussion and to contribute knowledge to the process, with the goal of delivering scientifically defensible conclusions and advice. It was confirmed with participants that all had received copies of the Terms of Reference, working paper, and two written reviews of the working paper prior to the CSAS RPR meeting.

The Chair reviewed the Terms of Reference and Agenda (Appendix C) for the meeting, highlighting the objectives and identifying the Rapporteurs for the review. The Chair then reviewed the ground rules and process for exchange, reminding participants that the meeting was a science review and not a consultation. Participants were provided a functioning microphone to allow remote participation by web-based attendees. Members were reminded that everyone at the meeting had equal standing as participants and that they were expected to contribute to the review process if they had information or questions relevant to the paper being discussed. In total, 27-29 people participated in the RPR (Appendix D). Marlena McCabe and Maggie Boothroyd were identified as the Rapporteurs for the meeting.

Participants were informed that two external reviewers had been previously selected: Ray Beamesderfer and Marten Koops. The two reviewers had been asked before the meeting to provide detailed written reviews for the working paper to assist everyone attending the peer-review meeting. Participants were provided with copies of the written reviews.

The conclusions and advice resulting from this review will be provided in the form of a Science Advisory Report to DFO Ecosystem Management Branch to update and consolidate existing advice regarding White Sturgeon listing and recovery. The single Science Advisory Report and single supporting Research Document will be made publicly available on the Canadian Science Advisory Secretariat (CSAS) website.

REVIEW

Working Paper: Recovery Potential Assessment for Lower Fraser River White Sturgeon 2020. CSAP Working Paper 2018SAR03.

Presenters: Karl K. English, Wendell Challenger, and David Robichaud

Formal reviewers: Ray Beamesderfer and Marten Koops

Rapporteurs: Maggie Boothroyd and Marlena McCabe

Outcome: Working paper accepted subject to revisions.

PRESENTATION OF WORKING PAPER

Paul Grant (DFO Science) gave a brief presentation on the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) process that re-assessed the Lower Fraser White Sturgeon designatable unit (DU) as Threatened in 2012, and how this links to the *Species at Risk Act* (SARA) process. In 2006, the Lower Fraser population was declined for listing as Endangered under SARA legislation. Following COSEWIC's latest re-assessment, the Lower Fraser River DU of White Sturgeon is once again being considered for listing under SARA. DFO Science was asked to undertake an updated Recovery Potential Assessment (RPA), based on the National RPA Guidance, to support the SARA listing process. The science advice generated via this process will update and/or consolidate existing advice regarding White Sturgeon in the Lower Fraser DU.

Karl English presented an overview of the working paper outlining the 22 RPA elements that were broken down into 7 sections with a large focus on a modelling effort to discuss different recovery targets, and then handed the floor to Wendell Challenger to provide details on the model.

Wendell Challenger presented detailed background on the ISAMR (integrated spatial age-structured mark recapture) model that has been used for three years to estimate the abundance of White Sturgeon in the lower Fraser River. This model has also been used for projecting both backwards and forwards in time and providing the framework for the population projections included in the working paper. He briefly discussed past limitations with the BMR24 model (Sequential Bayesian Mark-Recapture Model) including lack of adjustments for size/age and specific gear selectivity. Researchers familiar with these models have concluded that the best tool for estimating White Sturgeon abundance in the lower Fraser River using PIT (passive integrated transponder) tag mark recapture data is the ISAMR model.

The ISAMR model uses a demographic model where 58 cohorts are tracked by age over the assessment period (1999-2019) by explicitly modelling recruitment, deaths, tag application, and movement between the regions in the lower Fraser River. The ISAMR model incorporates a selectivity-at-age relationship and age-specific mortality rate that are estimated from the data. Annual sampling effort in each region, and all captures within the assessment period are considered in a single analysis framework to produce accurate population projections. The dataset used for the model included 165,524 sampled fish, 74,167 tagged fish, and 84,724 recapture events. The ISAMR model is broadly built upon whether an individual is tagged or untagged, their age class, recruitment information, and study region (i.e. movement patterns). The ISAMR model was validated through retrospective analyses and comparisons with the results from other mark recapture models. It was emphasized that the current model will need to be periodically updated to deal with uncertainties such as shifts in angler behaviours and the addition of new juvenile sturgeon sampling data.

POINTS OF CLARIFICATION

It was asked why the ISAMR model didn't account for in-between cohort variation in survival. The authors of the working paper indicated that this has been identified as a potential future model enhancement but has not been a sufficiently high priority to receive the necessary funds. Currently the observational data shows strong agreement with age-7 projections from the ISAMR model. Further clarification was asked for the accuracy of predictions for sturgeon below age-7 and the juvenile sampling program recently initiated will allow the authors to validate projections for younger fish with observational data.

There were a series of questions regarding the selectivity curve and whether it accounts for average fishery behaviour as opposed to individuals. Specifically, it was asked how accurate recruitment projections are based on more recent data. Authors reiterated here that recruitment projection were cross validated using retrospective analysis where different portions of the available data are used to project future abundance levels and compare those with the estimates derived using all the available data.

Final comments highlighted the shift in fishery behaviour in the past three years associated with fishing guides targeting larger sturgeon. The authors have examined this issue and agreed this will need to be further considered in the near future, but the current paper focuses on age-7 fish (2013 cohort) and so angler behaviour shifts in the most recent (seven or fewer) years would not impact the present model results.

PRESENTATION OF WRITTEN REVIEWS

REVIEWER: RAY BEAMESDERFER

The reviewer stated that the working paper was rigorous and comprehensive. He also noted the stock assessment data from the Lower Fraser White Sturgeon sampling program was robust resulting in high confidence for the model projections.

The Lower Fraser White Sturgeon population is moderately viable based on the US Endangered Species Act (ESA), although the decline in recruitment is concerning and the cause needs to be identified quickly. To identify causes of decline, a juvenile sampling program that aims to associate recruitment with environmental drivers was suggested (e.g. Columbia reservoir cohort strength driven by high flow conditions). The authors responded that the Fraser River is unregulated (e.g. natural annual freshets) and likely would not reflect regulated flow conditions for other impounded White Sturgeon populations.

The reviewer also highlighted that White Sturgeon growth rates are variable in early years, which may have implications for correlating environmental variables with strong cohorts if ages are incorrectly estimated. The authors noted from previous research, using von Bertalanffy growth curves, that there is less growth than expected at older ages. The authors also noted although there is little data on young-of-year fish, size/age selectivity by angler and age-specific mortality have been incorporated into the ISAMR model to estimate abundance for Age 7 and older sturgeon.

The reviewer communicated concerns regarding sea lion and seal predation on the Lower Fraser White Sturgeon population and their prey, suggesting future studies aim to assess the impacts of predation to the population. The authors noted that within the Lower Fraser, it is more likely that Harbour Seals are impacting the population, since other pinnipeds are less present, but that more data are needed to estimate pinniped abundance related to sturgeon declines.

Reductions in recruitment and growth overtime were highlighted by the reviewer and the unidentified causes of these declines are a critical uncertainty in the document. The reviewer discussed several potential causes (including a high number of White Sturgeon resulting in density-dependence; reduced prey availability) and raised questions regarding the implications for the recovery goals. The author's agreed the incorporation of juvenile sampling data would strengthen the model as current data relies on size selective angling which does not allow for accurate estimations of younger fish. A juvenile sampling program was recently initiated, and the data will eventually be used in the model.

The reviewer conveyed that the 10,000 and 20,000 recovery targets lacked reasoning and the text should be expanded to provide detailed rationale behind these values. The reviewer suggested the working paper would be strengthened by adding a recovery target directly related to the recruitment objectives. The authors agreed moving the recovery target from 10,000 to 20,000 could help with a higher potential for recovery to the abundance levels seen in the mid-2000s. The reviewers agreed to provide a more detailed rationale for the recovery target numbers.

The potential implications of sublethal effects of fishery captures, particularly multiple catches/years on individuals in the catch-and-release fishery, on White Sturgeon were highlighted. High percentages of the population are handled annually and research into the effects of the catch and release fishery on White Sturgeon energetics and spawn periodicity (e.g. fecundity of mature female) may underrepresent the impact of this threat and should be an area of future research. The authors referred to Appendices C and D of the working paper, which includes catch estimates for the recreational fishery, and bycatch and mortality estimates related to food, social, ceremonial (FSC) fisheries.

The reviewer conveyed that there is a need to quantify the amount of habitat effected by the current tidal flood gates and the amount White Sturgeon use these areas. The authors agreed that more information needs to be developed on how, or if, habitat availability would change given the introduction and use of sturgeon friendly flood gates.

REVIEWER: MARTEN KOOPS

The reviewer focused his comments on covering key questions that Ray Beamesderfer had not addressed in his initial review. He first suggested a minor addition to the working paper wherein he believed it would be helpful to present a concise summary of the ISAMR modeling at the start of the working paper to set the stage for the report. The authors said they were willing to add information on how the model itself works suggesting this information could be included as an Appendix in the final Research Document (i.e. final version of the working paper).

Discussion was directed to Figure 2 of the working paper which showed annual sturgeon growth rates for six different size categories across time. Marten brought attention to how the figure showed the relationship between declining growth trends overtime but did not show the trends for each size category or cohort. He suggested that it would be good to link stressors to changes in growth (i.e. providing rationale for what could be driving growth declines). The authors agreed to change the figure into a six-panel plot that shows the annual growth estimates and linear regression lines for each size category. There was consensus that this approach would be effective.

The reviewer then discussed fishery mortality estimates, noting that the fishery mortality estimates for First Nations FSC fisheries were extensive but that the working paper left out information on why this detailed approach was not taken for other fisheries (specifically recreational and commercial fisheries). The reviewer suggested it could be beneficial to apply this same mortality data to the other fisheries to estimate impacts of other threats that could be

built into other population models. The authors referred to Appendices C and D of the working paper which includes catch estimates for the recreational fishery, and bycatch and mortality estimates related to FSC fisheries.

Life history parameters were then discussed by the reviewer. It was suggested that the working paper's Table 1 should list more data since it only shows survival as a single value. The reviewer noted that a single value for the annual survival rate was from Whitlock and McAllister (2012) and was only provided for comparison with the maximum value parameter used to define the age-specific survival rates used in the ISAMR model. It was suggested that this table needs to be refined further to update the single value approach. The authors clarified that this table was a requirement of the RPA and it will be modified to separate the parameters used in the ISAMR model from parameters used in other sturgeon life history models.

Regarding recruitment data, the reviewer emphasized that authors could have gone into more detail. Specifically, the reviewer detailed how food availability has an impact on recruitment and that recruitment is a function of environmental variables. The reviewer stressed that food availability is a strong driver of recruitment and that it should be considered further in order to consider population response to different management actions. It was reiterated that it would be important to explore building recruitment data into the population model to explore recovery targets among other actions. The authors agreed that juvenile abundance looks to be associated with food availability and the relationship between juvenile White Sturgeon abundance and prey availability (e.g. Eulachon and Chum Salmon) has been explored. The authors stressed that these are not the primary food sources for juvenile sturgeon, but they are a significant source of nutrients for the lower Fraser River ecosystem.

Allowable harm was discussed by the reviewer who noted that there should be an analysis done to show how different levels of harm will affect the Lower Fraser DU and whether (based on this analysis) any amount of harm could be allowed. It was also noted that consideration of harm will impact listing decisions and SARA regulations. The authors did not address allowable harm until Day 3 discussions.

The reviewer noted that key uncertainties were not considered in the working paper and that they should be, especially given the various analyses that are being presented (e.g. what is being assumed and how these assumptions effect the results). It was noted that this potential addition does not have to go into large amounts of detail but should be included in the working paper. Key uncertainties and future directions were compiled to be included in the Science Advisory Report (SAR).

AUTHOR RESPONSE

The authors prepared a series of slides providing a summary of their responses to the written reviews. Direct responses are outlined above for each reviewer comment(s), but the overall direct consensus was that reviewers' comments will be addressed in the research document.

GENERAL DISCUSSION

INTRODUCTION

Participants provided written comments regarding COSEWIC and SARA terminology, no further discussion. The language will be updated to be consistent, but otherwise consensus was reached that the introduction was accepted as is.

BIOLOGY

Age and Growth

Participant discussion focused on age estimation concerns, specifically on how identified growth declines would impact the accuracy of age assignments. The authors reiterated that the ages were assigned at first catch when individuals were smaller which should reduce the probability of incorrect age assignments. The lack of recent ageing data for the Lower Fraser White Sturgeon population was identified as a knowledge gap; the research document should state this uncertainty and identify it as a candidate for future research.

Participants raised concerns on whether reduction in growth rates would result in smaller maximum size (and therefore potential impacts to fecundity). It was decided that maximum size for a given population tends to be arbitrary (revised each time a new and bigger individual is captured), and anecdotal evidence suggests White Sturgeon growth is continuous. This evidence suggests White Sturgeon continue to grow after they reach maturity. Although growth may continue after maturity, growth declines after maturity as a portion of the energy reserves are allocated to reproduction. Potential impacts of smaller size to female fecundity were discussed including effects on lifetime fecundity and annual fecundity. Impacts of growth declines are currently unknown and in-text edits will be added to highlight this uncertainty.

Participants raised concerns that the working paper's Figure 2 was unclear, the authors agreed to replace it with a six-panel graph that more clearly shows cohort growth rates.

Life History Parameters

Participants raised concerns regarding life history values within the working paper's Table 1; specific concerns included the single 0.96 value for survival which was used over the entire White Sturgeon lifespan (2-200 years). The authors clarified that this value was not used for modelling and that the model survival changed based on age (e.g. age-7 was 76% survival rate). The 0.96 value was included in the table only because the RPA required that life history values from other studies be compiled and presented. To improve the table clarity, the authors will identify values from other studies and values used in the ISAMR model.

There were additional concerns regarding the life history parameter values used in the ISAMR model. Discussion focused around ISAMR model structure which produces a survival curve based on the extensive mark-recapture data for the Lower Fraser White Sturgeon DU. It was stated that recent behavioural changes in the recreational fishery (i.e. more focus on catching larger sturgeon) may have implications for the model. The authors explained that the projections are based on age-7 recruitment, therefore the behavioural changes will not affect the current model projections and there are plans to incorporate the new juvenile sampling data into the ISAMR model soon.

Concerns were raised regarding lack of increase in the working paper Figure 4 despite the fishery closures, the authors explained the increase in Age 7 abundance from 1987 to 1998 was consistent with the 1980 closure of the commercial fishery for sturgeon and limits on recreational fishing that may have improved recruitment and/or survival. However, the changes to the recreational fishery (sturgeon non-retention) and First Nation (voluntary moratorium) in the early 1990s was not sufficient to off-set the other factors responsible for the estimated decline from 2001 to 2012.

Further discussion on the mortality curve and life history parameters used in the ISAMR model prompted the authors to further clarify the working paper's Table 1. The authors stated the age-specific mortality curve will be included in the appendices and stated that the curve is derived

using all the historical information. To clarify the document, the authors agreed to qualify the graph by describing the assumptions used to reconstruct historical abundances.

Consensus

- Consensus on edits included qualifying the basis for historical projections of the ISAMR model, including additional text on the assumptions, life parameters, and some background on spawning periodicity as a source of uncertainty.
- Table 1 will be updated to identify which values were used in the model and which values are sourced from other publications.
- The potential effect of changes in flow rates on sturgeon will be added as a future research direction for White Sturgeon habitat.

THREATS

Prior to discussion of threats, the background information on the COSEWIC threats table was discussed extensively (i.e. likelihood, level of impacts, causal certainty, etc.) and how this understanding will help participants build consensus on proper use and interpretation of threats assessment. After this background information was shared there was some discussion on threat projections. There was emphasis that the threats section should be discussed separately from mitigation and recovery targets. The chair confirmed that all participants understood threat occurrence, frequency, and extent before a discussion on Table 2 began (working from the bottom of the threats table to the top).

Table 2: Climate change and severe weather

The threats of climate change and severe weather were discussed at length given a 10-year time frame. Questions were raised about high or extreme flow events and potential for these events given climate change. The authors suggested that there is the potential for climate-driven events to affect fishing and spawning. Attention was also drawn to the importance of temperature related to flow rates, especially when temperatures rise above 25°C. There was further discussion that references should be updated (regarding temperature thresholds) based on scientific literature as opposed to personal communication. In addition to these comments, participants also discussed the significance of trends regarding observed mortalities and peak temperatures but that no direct management measure could come of this. Given the discussion above, consensus was reached that the threat categories in this section are accepted as is with the caveat that extreme/high flow rates and their impacts can be discussed in uncertainties and the future directions section.

Table 2: Geological Events

At the beginning of this discussion there were questions raised on why the effects of the Big Bar land slide were not considered here. It was noted by authors that the degree of impacts of this landslide on White Sturgeon is currently unknown. Related to the fish species affected by the landslide, there was some discussion on food availability as it relates to Pacific salmon and how this will impact White Sturgeon feeding, but the exact threats with the level of impact are currently unknown. Consensus was reached that the authors will add information into the text about Big Bar while noting there is no direct threats related to it.

Table 2: Pollution

The impacts from runoff and runoff remediation were discussed in this section, particularly how different types of runoff produce a variety of toxic effects. There were opinions raised that there was not enough detail on toxic effects discussed in the text. There was also further discussion on different types of pollution but that certain threats will not necessarily affect the table rankings and therefore might not need to be included. Consensus was reached to change the level of impact for all three threat risks (household sewage & urban wastewater, industrial & military effluents, and agricultural & forestry effluents) to 'unknown'. Participants agreed that more monitoring data from pollution affects would need to be collected to address threat risk as low, medium, or high. Consensus was further reached that text should be added into the working paper to account for this uncertainty around pollution.

Table 2: Invasive & other problematic species & genes

The discussion began with how potential pathogens may have affected White Sturgeon in the past but with the caveat that there was no known timeframe for why or when this had happened. There were some comments about having a line added to the text to discuss White Sturgeon die off events related to pathogens. The authors did not agree with this addition given that there is no scientific peer-reviewed evidence to suggest a link between pathogens and sturgeon die-off. Consensus was reached to approve this section as is, no concern was raised on reclassifying the threat risk of introduced genetic material.

Table 2: Natural system modifications

Initial discussion started with dialogue about food availability and why the working paper focused on Eulachon and Chum as opposed to other species of salmon, including Pink and/or Sockeye. There was also some discussion on which sources of food are known to be more consistent and would therefore contribute more nutrients. There was general agreement that more information should be added to the working paper that discusses other food sources (besides Eulachon and Chum) and their potential declines. There was also some back and forth between participants about predation threats, but it was determined that this would be beyond the scope of the working paper. Overall, consensus was reached to change the threat extent for food availability from broad to extensive while adding language about other food sources that could affect sturgeon growth and survival.

There was no objections or discussion on modification to catchment surfaces and consensus was reached that 'unknown' is the appropriate classification for the threat risk.

Shoreline modifications, including tidal and flood gates were discussed as the last component to the natural system modifications section. There were suggestions to add more information into the text to help qualify the medium threat risk. Participants and authors discussed reaching out to other groups (including Tides Canada and Watershed Watch) who might provide more information that could be used to make this section stronger. Consensus was reached that references will be provided in these sections without the identification of definite conclusions and that there will be follow up with the appropriate groups to get this information included in the text (there were no objections to the threat rating in the table).

Table 2: Human intrusions & disturbance

There was a brief discussion about noise pollution, however there was no further discussion from participants on this. Consensus was reached to accept this section as is given that there were no objections to the values in the Table or in the text.

Table 2: Biological resource use

Fishing & Harvesting Aquatic Resources (recreational fishing) was the first point of discussion for this section. Concern was raised by one of the reviewers about handling stress. This started the discussion on causal certainty and how capture effects could potentially affect both fecundity and reproductive success. Acute and latent mortality was also raised as one reason to change the threat risk in the table to unknown since there are limited data on sublethal effects. Causal certainty was then discussed at length with participants calling for causal certainty to be changed to 'medium' as well. Authors provided rebuttals to this section by calling participants to refer to the working paper appendices for estimated numbers of fish caught each year and how there appears to be little change to the population (i.e. 'low' level of impact from 1-10%). Participants discussed changing the recreational fishing threat category to 'unknown' given that the definition of unknown might be more fitting than either 'medium' or 'low'. There was further discussion on this point with participants debating angling data and non-guided catch data versus total catch on recreational fisheries. The chair noted that for this section minority descent would have to be captured in the SAR. Most participants were concerned with the threat risk being changed to 'unknown' given the amount of data that is currently available for recreational fisheries. Minority consensus was reached to leave this section as is, but with the caveat that more details on sublethal effects should be added to future directions and uncertainties.

Both commercial fishing and FSC fishing were then discussed by the participants. For commercial fishing, it was agreed that the likelihood of occurrence is known. There was some discussion about the accuracy of the level of impact for commercial fishing to be classified as 'medium' given that commercial fishing normally uses lower mortality gear as opposed to that used in FSC fisheries. There was also further discussion on different types of gear/nets and how their deployment/use strongly influences mortality. It was also suggested that the level of impact could be changed to 'low' for both commercial and FSC fisheries because the sturgeon caught in these nets are taken out of the nets and placed into the water quickly after (minimizing impact). There were notes left in the chat section suggesting that the wording to describe commercial fisheries should be updated to include Economic Opportunity, Demonstration and Treaty Harvest Agreement fisheries. Comments were also raised on how each reviewer had mentioned that a more thorough assessment of the fisheries data (for both commercial and FSC fishing) would be helpful. The authors noted that they had data available but couldn't accomplish the level of detail needed given the timeframe. The chair emphasised that this level of significant detail cannot be added to this RPA. Given the participants discussion above, consensus was reached to both update the level of impact for commercial fishing to 'low' and add wording to Table 2 to reflect that low levels of impact were determined based on current fishing practices and level of effort over the last ten years. It was agreed that the text will not need to be updated to reflect this.

After the first consensus was reached, participants wanted to circle back to COSEWIC threat category 5.0 in Table 2. There was initial discussion on adding another threat category to discuss prey to reflect the uncertainty surrounding illegal harvest or poaching in the context of

all fisheries. Unauthorized harvest, poaching, and incidental catch were all discussed. Concern was also drawn over the public fishing without permits, long lines being used at night, and ghost nets. Most participants agreed that these events are occurring, but the magnitude of these activities is unknown. Consensus was reached that a new line be added under biological resource use to reflect illegal harvest (i.e. poaching) to include a likelihood of occurrence of known, level of impact of unknown, and causal certainty was low. It was agreed among participants that it would be at the authors discretion to fill in the other categories.

Table 2: Transportation & service corridors

During this section, one participant began the conversation by noting how different bridges in the Lower Mainland have been built in a way to allow shipping traffic (i.e. The Golden Ears Bridge). Participants then raised questions about dredging, there was also some discussion on the relationship between dredging and the abundance of prey species. It was initially proposed that dredging be given its own section given that it can have a significant effect on habitat/food resources and therefore could increase causal certainty. However, this idea was not incorporated since it was noted that it would not be possible to add another section based on the IUCN categories listed in the COSEWIC assessment (which the RPA is based on). One participant then suggested changing the wording around dredging to include dredging and other associated impacts. There was then general agreement across participants that more should be added to the text to address the impacts of dredging. Further discussion on dredging continued as participants discussed past and present dredging effects and their potential impact on causal certainty listed in Table 2 (and whether it could be changed from very low to low). There were also a few conversations held on shipping traffic related to White Sturgeon mortality and the uncertainty surrounding the effect of wakes on habitat and sedimentation. Consensus was reached that additional literature on dredging (to include effects of prey, habitat, etc.) will be added to the text and that causal certainty will be changed from ‘very low’ to ‘low’. Consensus was also reached on updating the wording for specific threats in Table 2 to read “Dredging, boat strikes, wakes”.

Table 2: Energy Production and Mining

There were no comments or discussion for this section as no concerns were brought up from participants. Consensus was reached to accept the section as is.

Element 10: Assess any natural factors that will limit the survival and recovery of White Sturgeon

After participants completed discussion on Table 2, the conversation shifted to discussion of predation on sturgeon. Participants discussed how element 10 had briefly described predation by seal species but that there was no reference to predation by sea lions in this section. One participant suggested that cannibalism by White Sturgeon could be a larger threat than the authors considered. This point resulted in a large discussion about how cannibalism could be framed as a threat and why it would not just be considered natural mortality given that many fish exhibit cannibalism. There was further discussion on how scutes found during gut content analysis could indicate that sturgeon cannibalism was occurring. Despite this point, it was generally agreed upon that scutes found in the bellies of White Sturgeon is not evidence of predation (e.g. could simply be scavenging). It was discussed that extensive diet studies would need to be conducted to confirm cannibalism and that there is currently not enough data to

support this claim. Cormorants were then briefly brought up as a potential predator for juvenile sturgeon. Given the conversation regarding cannibalism and cormorants above, some participants indicated issues on having predation speculations included in the RPA. These participants reiterated that these forms of predation could possibly be included as a source of uncertainty or future research direction but that they were very uncomfortable including this information otherwise (especially given that there is no substantial evidence to suggest cannibalism is a significant source of mortality). Consensus was reached that predation could be both a limiting factor and a source of uncertainty but that the key with limiting factors is acknowledging what directly affects population abundance. Participants reached consensus that text in the biology section would be updated to include information on investigating the possibility of cannibalism and that this could be referenced in the future directions section.

Element 9: Identify the activities most likely to threaten (i.e., damage or destroy) the habitat properties identified in elements 4-5 and provide information on the extent and consequences of these activities

The final point of discussion for the threats section was brought up by one participant to update the wording in element 9. It was proposed to remove the wording "(2) commercial and FSC gillnet fisheries that have resulted in substantial bycatch of juvenile sturgeon in fisheries targeting salmon". The authors provided rebuttal noting that they intended to use this section to cover the impacts of ghost nets and how fishing gear can contribute to specific bycatch. Consensus was reached that the information regarding FSC gillnet fisheries and specific bycatch pieces would be removed from element 9 and moved into an illegal fishing section with its own section about ghost gear as the uncertainties surrounding the sources it is coming from are unknown.

Consensus

- Threat categories in the climate change and severe weather section are accepted as is with the caveat that extreme/high flow rates and their impacts can be discussed in the uncertainties and future directions section.
- Authors will add information into the text about Big Bar while noting there is no direct threats related to it.
- All three threat risks (household sewage & urban wastewater, industrial & military effluents, and agricultural & forestry effluents) will be changed to 'unknown' in Table 2 and text will be added into the working paper to account for the uncertainty around pollution.
- The invasive & other problematic species & genes section will be approved as is
- No concern was raised on reclassifying the threat risk of introduced genetic material and the threat risk defined in work paper should stand.
- Threat extent for food availability will be changed from broad to extensive while adding broad language about other food sources that could affect sturgeon growth and survival.
- There were no objections or discussion on modification to catchment surfaces, and consensus was reached that 'unknown' is the appropriate classification for the threat risk.
- References will be provided in natural systems modifications sections without the identification of definite conclusions and that there will be follow up with the appropriate

groups to get this information included in the text (there were no objections to the values in the table itself which will be kept the same).

- The human intrusions & disturbance section will be accepted as is, given that there were no objections to the values in Table 2 or in the text.
- Minority consensus was reached to leave the fishing & harvesting aquatic resources (recreational fishing) section as is, but with the caveat that more details on sublethal effects will be added to future directions and uncertainties.
- The level of impact for commercial fishing will be updated to 'low' and new wording will be added to Table 2 to reflect that low levels of impact were determined based on current fishing practices and level of effort over the last ten years. It was agreed that the text will not need to be updated to reflect this.
- A new line will be added under biological resource use to reflect illegal harvest (i.e. poaching) to include a likelihood of occurrence of known, level of impact of unknown, and causal certainty was low. It was agreed among participants that it would be at the authors discretion to fill in the other categories.
- Additional literature on dredging (to include effects of prey, habitat, etc. will be added to the transportation section text and causal certainty will be changed from 'very low' to 'low'. Additionally, the wording for specific threat in Table 2 to read "Dredging, boat strikes, wakes" will be updated.
- The energy and mining section was accepted as is.
- Text will be added to the natural factors section to outline predation as a potential limiting factor and a source of uncertainty but that the key with limiting factors is acknowledging what directly effects population abundance.
- The information regarding FSC gillnet fisheries and specific bycatch pieces would be removed from activities that destroy habitat (element 9) and moved into an illegal fishing section with its own section about ghost gear as the uncertainties surrounding the sources it is coming from are unknown.

RECOVERY TARGETS

Target Justification

Several participants expressed concerns over the lack of rationale for the 10,000 adult threshold sturgeon, and the recovery abundance target of 20,000 adult sturgeon, in Table 4. It was discussed that these survival and candidate recovery thresholds may be okay, but the associated text must be expanded to provide justification (e.g. the basis for the 10,000 abundance survival threshold used in the National Recovery Strategy was not provided). The 20,000 candidate recovery threshold may be based on the Lower Fraser habitat recently supporting 20,000 adults, but this needs to be communicated in the text. Rationale for the candidate total abundance threshold of 60,000 was provided in Table 4, but should also be provided and expanded in the text. Participants also discussed the need to add a target regarding a positive trend in juvenile abundance, as the major concern for the Lower Fraser White Sturgeon DU is that there has been declining recruitment (see below for further discussion). Discussion moved towards terminology, as these are candidate targets not the population and distribution targets that will be developed for the recovery strategy if the Lower Fraser White Sturgeon DU is listed (context regarding the SARA process continued below).

Changing the terms from recovery target to “recovery threshold” was discussed, concerns were raised over whether the element of recovery targets will be addressed with the terminology changes. Extensive discussion prompted a short presentation on government advice for setting Recovery Targets on Day 3 of the meeting, various reasons for setting targets was discussed including historical abundance, demographic sustainability, and allowable harm (discussed further below). Further discussions landed on that terminology change to Survival Threshold and Candidate Recovery Threshold is required, with the caveat that the text must explain rationale behind these numbers (e.g. the National Recovery Strategy indicated that 10,000 mature individuals are needed to ensure the medium to long-term persistence of the population).

SARA Listing Context

Participants asked for context of the targets with regards to the listing process. It was stated RPA targets are only potential candidate targets. The SARA program will look at these targets when developing the population and distribution targets for the Recovery Strategy. The implication for listing is the feasibility of recovery target may influence allowable harm and the resulting potential socio-economic impacts.

Allowable Harm Context

Allowable Harm in the context of candidate targets was briefly discussed, ideally allowable harm would be above the minimum threshold or could be accepted with the caveat it may delay threshold achievement (i.e. 100 years to reach threshold achievement rather than 50 years). Further discussions on the Survival Threshold, and minimum viable population size highlighted participants’ concerns with the authors’ rationale for their 10,000 adults target which could have implications for allowable harm. It was reiterated that the authors must provide rationale for current targets and additional targets (e.g. 60,000 age 7-55 sturgeon is an abundance level that should be attainable under current environmental conditions). CSAS reminded participants that the RPA process is supposed to provide science advice to managers, not align with management scenarios and refrain from basing comments on potential management actions.

Juvenile Target

The importance of adding a juvenile target was discussed at length, many participants were eager to see this addition as declining recruitment is currently the main cause of concern for the Lower Fraser White Sturgeon DU. The authors communicated hesitation to add a juvenile target (defined as fish 60-99 cm FL in the working paper), because they are unsure of the numbers of juveniles needed to maintain the candidate recovery target of 20,000 adults, although 60,000 total number of White Sturgeon was recently sustainable in the Lower Fraser. Participants reiterated that a positive trend for juvenile abundance should be quantified in some way and added to the candidate recovery targets. The authors referred participants to look at Table 7 and Figure 12 (pages 42 & 43 in the working paper). Participants agreed this does meet primary needs with regards to juvenile targets, but there is a need to add the objectives to Table 4 and expand the emphasis on the importance of juvenile targets in Table 4 as well as the information in the text. The authors highlighted the slope being above 0, again the participants asked for a more explicit definition of the increasing trend. The authors rebutted that the overall target of 60,000 would include juveniles (i.e. you can’t have juveniles without adults) and reiterated that they are willing to change the terminology and could classify the overall abundance target

further (i.e. 22-29,000 juveniles based on the 60,000 total abundance target). The authors referred participants to Table 6 for an estimate of the level of recruitment required to rebuild to a Candidate Recovery Threshold of 60,000 Age 7-55 sturgeon over the next 20-50 years as shown in Figure 12 of the working paper. The authors reiterated that the ageing and age-7 recruitment was based on the growth curve and the potential for variability in the age and size relationship will be added as an uncertainty in the text.

Consensus

- The consensus was that the authors would adopt reviewer Marten Koops comments with regards to candidate recovery targets, including the terminology switch to survival threshold and candidate recovery threshold.
- The authors also agreed to add a candidate recovery threshold that addressed positive juvenile trends.

ALLOWABLE HARM

Participants raised concerns over the Allowable Harm section, stating the current text will not be useful to the forthcoming SARA listing process. Allowable harm has been framed based on current conditions and participants encouraged the authors to draw information from the previous sections of the research document to inform Allowable Harm. Participants discussed the definition of allowable harm; it was stated that it is generally expressed as mortalities, but not specifically defined as mortality. It was stated that unquantified cumulative impacts are not dealt with in RPAs but should be mentioned as future research directions. Participants pushed for clearer statements (e.g. to explicitly state adult harm is not allowable). The authors proposed a modified Allowable Harm section based on issues raised. After subsequent discussion and modifications, the updated section was accepted for incorporation into the Research Document and SAR.

MITIGATION SCENARIOS

Rational for Percentages

Participants raised concerns regarding the lack of in-text explanation for the percentages in the working paper Table 5, stating that a worked through example may help readers better understand the basis for these percentages. The authors indicated that the text in Section 6.4 (page 36 & 37 in the working paper) provides a detailed explanation of Table 5 along with examples of the rationale for specific percentage values in Table 5. Concerns were raised over the number of 0% entries in Table 5 and it was noted that uncertainties would better be denoted by N/A or unknown or removed from Table 5 altogether. It was highlighted by participants that Table 5 does not include all possible mitigation measures and suggested that perhaps changing the heading to “Examples of Mitigative Measures”, or adding text explicitly stating that the "potential actions" are not exhaustive. The authors were receptive to indicating that Table 5 just provides examples and changing many of the zero values to “ne” where the potential effect was “not estimated”.

Rationale for Fishing Levels

Participants expressed general confusion over the 1-3 range of levels for fishing. The authors stated that the levels related to a range of fisheries management options. There were some

concerns over Level 3 which would result in the closures of each fishery, it was agreed that it should be explicitly stated in the text what the levels pertain to. It was recommended that for Level 2, the statement should be changed from “Seasonal closure to reduce effort” to "Reduce effort of fishery" to provide various management options (e.g. limiting licences).

General Edits

Some participants inquired into whether their written edits will be taken into consideration, the chair stated that you can provide suggestions, but they may not be incorporated, and there will be no major changes after acceptance in the RPA meeting. The authors stated that they are committed to correcting critical errors in the research document.

Consensus

The participants accepted the Mitigation Scenario section with the following edits:

- Threats with consistent 0% across the table in Table 5 will be denoted by “ne” (not estimated).
- Changes to ensure this section reflects changes in Table 2.
- Language is added to text and captions to indicate that the mitigation actions are just examples and not an exhaustive list.
- Critical errors will be corrected in the research document.

CONCLUSIONS

Consensus was reached that the working paper be accepted pending the minor revisions suggested by participants (and agreed upon by the authors) within the sections above. The chair noted that participants can also send in comments to the authors for consideration by September 30, 2020 but that they will not necessarily be accepted unless brought up directly within the RPA meeting. The authors noted that they agree to update references as needed (e.g. updating personal communication references in Table 3). There were also suggestions that more information should be added on the strength of the 20,000 recovery target, the chair agreed that this change would be possible for the authors to address. The authors reiterated that only critical errors should be sent to them at this point for consideration.

DEVELOPMENT OF THE SCIENCE ADVISORY REPORT

The Science Advisory Report (SAR) was discussed at length and participants had the opportunity to contribute to editing each summary point. The chair informed participants that the SAR is authored by the committee and each participant will have an opportunity to review the document and provide comments subsequent to the meeting.

ACKNOWLEDGEMENTS

We appreciate the time contributed to the RPR process by all participants. In particular, we thank the reviewers, Ray Beamesderfer and Marten Koops, for their time and expertise. The CSAP office thanks Nicholas Komick as Chair and the wonderful support of Marlena McCabe and Maggie Boothroyd as Rapporteurs.

REFERENCES CITED

Whitlock, R., and McAllister, M. 2012. Incorporating spatial and seasonal dimensions in a stock reduction analysis for lower Fraser River White Sturgeon (*Acipenser transmontanus*). Canadian Journal of Fisheries and Aquatic Sciences 69: 1674-1697.

APPENDIX A: TERMS OF REFERENCE

RECOVERY POTENTIAL ASSESSMENT – WHITE STURGEON, LOWER FRASER DESIGNATABLE UNIT

Regional Peer Review Process – Pacific Region

September 22-24, 2020
Virtual Meeting

Chairperson: Nicholas Komick

Context

After the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses an aquatic species as Threatened, Endangered or Extirpated, Fisheries and Oceans Canada (DFO) undertakes a number of actions required to support implementation of the Species at Risk Act (SARA). Many of these actions require scientific information on the current status of the wildlife species, threats to its survival and recovery, and the feasibility of recovery. Formulation of this scientific advice has typically been developed through a Recovery Potential Assessment (RPA) that is conducted shortly after the COSEWIC assessment. This timing allows for consideration of peer-reviewed scientific analyses into SARA processes including recovery planning.

Within Canada, White Sturgeon occur only in British Columbia. In 2003 they were divided into six populations, based on geography and genetics: the lower, middle and upper Fraser River; Nechako River; Columbia River; and, Kootenay River. All populations were designated as endangered by COSEWIC, but only the latter four are legally listed under SARA. Following their listing a RPA (Wood et al. 2007) was undertaken followed by advice on the identification of critical habitat (Hatfield et al. 2013). A Recovery Strategy has been in development since 2009 and is currently under consultations.

In 2012, COSEWIC re-assessed White Sturgeon and found there to be four populations, or designatable units (DU); Lower Fraser, Upper Fraser, Upper Columbia, and Upper Kootenay White Sturgeon (COSEWIC 2012).

In support of listing recommendations for Lower Fraser White Sturgeon DU by the Minister, DFO Science has been asked to undertake an RPA, based on the national RPA Guidance. The advice in the RPA may be used to inform both scientific and socio-economic aspects of the listing decision, development of a recovery strategy and action plan, and to support decision making with regards to the issuance of permits or agreements, and the formulation of exemptions and related conditions, as per sections 73, 74, 75, 77, 78 and 83(4) of SARA. The advice in the RPA may also be used to prepare for the reporting requirements of SARA s.55. The advice generated via this process will update and/or consolidate any existing advice regarding this White Sturgeon.

Objectives

To provide up-to-date information, and associated uncertainties, to address the following elements:

Biology, Abundance, Distribution and Life History Parameters

Element 1: Summarize the biology of White Sturgeon.

Element 2: Evaluate the recent species trajectory for abundance, distribution and number of populations.

Element 3: Estimate the current or recent life-history parameters for White Sturgeon.

Habitat and Residence Requirements

Element 4: Describe the habitat properties that White Sturgeon needs for successful completion of all life-history stages. Describe the function(s), feature(s), and attribute(s) of the habitat, and quantify by how much the biological function(s) that specific habitat feature(s) provides varies with the state or amount of habitat, including carrying capacity limits, if any.

Element 5: Provide information on the spatial extent of the areas in White Sturgeon distribution that are likely to have these habitat properties.

Element 6: Quantify the presence and extent of spatial configuration constraints, if any, such as connectivity, barriers to access, etc.

Element 7: Evaluate to what extent the concept of residence applies to the species, and if so, describe the species' residence.

Threats and Limiting Factors to the Survival and Recovery of White Sturgeon

Element 8: Assess and prioritize the threats to the survival and recovery of the White Sturgeon

Element 9: Identify the activities most likely to threaten (i.e., damage or destroy) the habitat properties identified in elements 4-5 and provide information on the extent and consequences of these activities.

Element 10: Assess any natural factors that will limit the survival and recovery of the White Sturgeon.

Element 11: Discuss the potential ecological impacts of the threats identified in element 8 to the target species and other co-occurring species. List the possible benefits and disadvantages to the target species and other co-occurring species that may occur if the threats are abated. Identify existing monitoring efforts for the target species and other co-occurring species associated with each of the threats, and identify any knowledge gaps.

Recovery Targets

Element 12: Propose candidate abundance and distribution target(s) for recovery.

Element 13: Project expected population trajectories over a scientifically reasonable time frame (minimum of 10 years), and trajectories over time to the potential recovery target(s), given current White Sturgeon population dynamics parameters.

Element 14: Provide advice on the degree to which supply of suitable habitat meets the demands of the species both at present and when the species reaches the potential recovery target(s) identified in element 12.

Element 15: Assess the probability that the potential recovery target(s) can be achieved under current rates of population dynamics parameters, and how that probability would vary with different mortality (especially lower) and productivity (especially higher) parameters.

Scenarios for Mitigation of Threats and Alternatives to Activities

Element 16: Develop an inventory of feasible mitigation measures and reasonable alternatives to the activities that are threats to the species and its habitat (as identified in elements 8 and 10).

Element 17: Develop an inventory of activities that could increase the productivity or survivorship parameters (as identified in elements 3 and 15).

Element 18: If current habitat supply may be insufficient to achieve recovery targets (see element 14), provide advice on the feasibility of restoring the habitat to higher values. Advice must be provided in the context of all available options for achieving abundance and distribution targets.

Element 19: Estimate the reduction in mortality rate expected by each of the mitigation measures or alternatives in element 16 and the increase in productivity or survivorship associated with each measure in element 17.

Element 20: Project expected population trajectory (and uncertainties) over a scientifically reasonable time frame and to the time of reaching recovery targets, given mortality rates and productivities associated with the specific measures identified for exploration in element 19. Include those that provide as high a probability of survivorship and recovery as possible for biologically realistic parameter values.

Element 21: Recommend parameter values for population productivity and starting mortality rates and, where necessary, specialized features of population models that would be required to allow exploration of additional scenarios as part of the assessment of economic, social, and cultural impacts in support of the listing process.

Allowable Harm Assessment

Element 22: Evaluate maximum human-induced mortality and habitat destruction that the species can sustain without jeopardizing its survival or recovery.

Expected Publications

- CSAS Science Advisory Report
- CSAS Proceedings
- CSAS Research Document

Participants

- Fisheries and Oceans Canada (Science, Fisheries Protection and Ecosystems Management Branches)
- Province of BC
- Academia
- Nations Industry (Recreational fishing and hydroelectric)
- Other invited experts (environmental non-government organizations)

References

COSEWIC. 2012. COSEWIC assessment and status report on the White Sturgeon (*Acipenser transmontanus*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxvii + 75 pp.

DFO. 2007a. Revised Protocol for Conducting Recovery Potential Assessments. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/039.

DFO. 2007b. Documenting habitat use of species at risk and quantifying habitat quality. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/038.

Hatfield, T., Coopper, T. and McAdam, S. 2013. Scientific Information in Support of Identifying Critical Habitat for SARA-listed White Sturgeon Populations in Canada: Nechako, Columbia, Kootenay and Upper Fraser (2009). DFO Can. Sci. Advis. Sec. Res. Doc. 2012/153. viii + 103 p.

Wood, C., D. Sneep, S. McAdam, J. Korman, and T. Hatfield. 2007. Recovery potential assessment for white sturgeon populations listed under the Species at Risk Act. DFO Can. Sci. Advis. Sec. Res. Doc. 2007/003

APPENDIX B: ABSTRACT OF ORIGINAL WORKING PAPER

The Lower Fraser White Sturgeon (*Acipenser transmontanus*) population is genetically and spatially isolated from fish upstream of Hells Gate, and is without genetic structure within its range. The population inhabits a wide range of habitats within its range.

The population is undergoing declines in abundance, both overall and specifically in the juvenile and subadult size/age classes. The adult size/age class has been gradually increasing over the past 20 years , but is expected to start to decline within 5 years. Interim recovery targets are set to 60,000 sturgeon in the 60-279 cm FL size range (Age 7-55) and 20,000 adult sturgeon (160-279 cm FL, Age 23-55). We have also evaluated the potential for the abundance of adult sturgeon to remain above the previously defined threshold level of 10,000 adults.

The biggest threats to recovery include: the food available for all life stages of sturgeon; further reduction in the habitat available for sturgeon, bycatch mortalities associated with in-river gillnet fisheries; and sub-lethal factors that affect the spawning frequency and spawning success for adult sturgeon.

Potential and realized mitigation actions, in the order in which they are presented in the report, include: maintaining the current moratorium on gravel extraction from the lower Fraser River; managing dredging to minimize the impacts on sturgeon; reducing the effects of angling, commercial fisheries, and food, social and ceremonial fisheries on sturgeon; replacing old tidal/flood gates with “fish friendly” gates; and reducing fisheries (or fishery related impacts) on important species that directly or indirectly support the food supply for sturgeon (e.g. Fraser Chum Salmon, *Oncorhynchus keta*, and Eulachon, *Thaleichthys pacificus*).

Population projections suggest that the both large natural improvements to survivorship and recruitment and substantive management actions will be required in order to reverse the declining trends for the population and to meet the interim recovery target of 60,000 Age 7-55 sturgeon within a 50 year horizon.

Physical habitat availability had declined over the past century, but should be sufficient to support the interim recovery target of 60,000 Age 7-55 sturgeon, an abundance level that was observed as recently as the early 2000’s. Food resources available to Lower Fraser White Sturgeon, such as Eulachon and Chum Salmon, have declined in a way that matches the observed declines in juvenile White Sturgeon, and the prey base may need to be recovered in order to support White Sturgeon at the abundance levels targeted for recovery.

APPENDIX C: AGENDA

Canadian Science Advisory Secretariat - Centre for Science Advice Pacific

Regional Peer Review Meeting (RPR)

Recovery Potential Assessment for Lower Fraser River White Sturgeon 2020

September 22 - 24, 2020
Virtual meeting

Chair: Nicholas Komick

DAY 1 – Tuesday, September 22

Time	Subject	Presenter
0900	Introductions Review Agenda & Housekeeping CSAS Overview and Procedures	Chair
0915	Review Recovery Potential Assessment (RPA) purpose and expectations	SARA Science Coordinator
0930	Presentation of Working Paper (Overview)	Authors
1030	***Break***	
1045	Written Reviews and Authors Response	Chair + Reviewers & Authors
1200	***Lunch Break***	
1300	Completion of discussion of written reviews Discussion & Resolution of Issues: Sections 1 (Introduction) & 2 (Biology) & Sections 3 (Habitat and Residence Requirements)	Reviewers and authors RPR Participants
1430	***Break***	
1445	Introduction of Section 4 (Threats and Limiting Factors) and identification of issues.	RPR Participants
1600	**Adjourn for the Day**	

DAY 2 - Wednesday, September 23

Time	Subject	Presenter
0900	Review Status of Day 1 (*As Necessary*)	Chair
0915	Discussion & Resolution of Issues: Section 4 (Threats and Limiting Factors) *continued*	RPR Participants
1030	***Break***	
1045	Discussion & Resolution of Issues: Section 5 (Recovery Targets)	RPR Participants
1200	***Lunch Break***	
1300	Discussion & Resolution of Issues: Section 5 (Recovery Targets) *continued*	RPR Participants
1445	***Break***	
1500	Discussion & Resolution of Issues: Section 6 (Scenarios of Mitigation)	RPR Participants
1600	***Adjourn for the day***	

DAY 3 - Thursday, September 24

Time	Subject	Presenter
0900	Review Status of Day 2 (*As Necessary*)	Chair
0915	Discussion & Resolution of Issues: Section 7 (Allowable Harm)	RPR Participants
1030	***Break***	
1045	Consensus on the acceptability of the working paper	RPR Participants
1115	Introduction of the Science Advisory Report • Preliminary list of conclusions (bullets)	Chair
1200	***Lunch Break***	
1300	*Science Advisory Report (SAR)* Develop consensus on the following for inclusion: • Results & Conclusions • Sources of Uncertainty Additional advice to Management (as warranted)	RPR Participants
1445	***Break***	

Time	Subject	Presenter
1500	SAR/ Finalization • SAR review/approval process and timelines • Research Document & Proceedings timelines • Other follow-up or commitments (as necessary) Other Business arising from the review	Chair and Participants
1600	***Adjourn the Regional Peer Review Meeting***	

APPENDIX D: PARTICIPANTS

Last Name	First Name	Affiliation
Allan	Dean	DFO Fisheries Management
Andrews	Trevor	Vancouver Fraser Port Authority
Ashley	Ken	BC Institute of Technology
Beamesderfer	Ray	Fish Science Solutions Inc.
Boothroyd	Maggie	DFO Ecosystem Management Branch (SARP)
Burnett	Karen	DFO Fisheries Management
Challenger	Wendell	LGL Ltd.
Davies	Trevor	Province of BC
English	Karl	LGL Ltd.
Estrada	Kevin	Fraser Valley Angling Guides Association
Gertzen	Erin	DFO Ecosystem Management Branch (SARP)
Grant	Paul	DFO Science
Hassan	Ahdia	DFO Ecosystem Management Branch (SARP)
Komick	Nicholas	DFO Science
Koops	Marten	DFO Science
Korman	Josh	Ecometric Research
Laynes	Mark	Sport Fishing Advisory Board (SFAB)
Magnan	Al	DFO Science
McAdam	Steve	Province of BC
McCabe	Marlena	DFO Ecosystem Management Branch (SARP)
Mueller	Barbra	DFO Resource Management
Nelson	Troy	Fraser River Sturgeon Conservation Society
Potyrala	Mark	DFO Fish & Fish Habitat Protection Program
Prevost	Ashlee	Lower Fraser Fisheries Alliance
Rhodes	Trevor	Province of BC
Robichaud	Dave	LGL Ltd.
Rosenau	Marvin	BC Institute of Technology
Schreier	Sarah	Fraser River Sturgeon Conservation Society
Schwindt	Colin	Province of BC
Werk	Dean	Sport Fishing Advisory Board (SFAB)
Witt	Andy	Province of BC

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The population is undergoing declines in abundance, both overall and specifically in the juvenile and subadult size/age classes. The adult size/age class has been gradually increasing over the past 20 years , but is expected to start to decline within 5 years. Interim recovery targets are set to 60,000 sturgeon in the 60-279 cm FL size range (Age 7-55) and 20,000 adult sturgeon (160-279 cm FL, Age 23-55). We have also evaluated the potential for the abundance of adult sturgeon to remain above the previously defined threshold level of 10,000 adults.

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Physical habitat availability had declined over the past century, but should be sufficient to support the interim recovery target of 60,000 Age 7-55 sturgeon, an abundance level that was observed as recently as the early 2000’s. Food resources available to Lower Fraser White Sturgeon, such as Eulachon and Chum Salmon, have declined in a way that matches the observed declines in juvenile White Sturgeon, and the prey base may need to be recovered in order to support White Sturgeon at the abundance levels targeted for recovery.