Fisheries and Oceans Canada | Pêches et Océans Canada
Science | Sciences

C S A S | ***S C C S***

Canadian Science Advisory Secretariat | **Secrétariat canadien de consultation scientifique**

Proceedings Series 2007/013 | **Compte rendu 2007/013**

Proceedings of the PSARC meeting on white sturgeon populations listed under the Species at Risk Act

Compte rendu de l'examen du CEESP de l'évaluation du potentiel de rétablissement de l'esturgeon blanc

February 21, 2007 | **Le 21 février 2007**

Alan Cass | **Alan Cass**

Fisheries and Oceans Canada
Pacific Biological Station
Nanaimo, BC V9T 6N7

June 2007 | **Juin 2007**

Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting. Proceedings 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.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenus dans le présent rapport puissent être inexacts ou propres à induire en erreur, ils sont quand même reproduits aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considéré en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

Proceedings of the PSARC meeting on white sturgeon populations listed under the Species at Risk Act

February 21, 2007

Alan Cass

Compte rendu de l'examen du CEESP de l'évaluation du potentiel de rétablissement de l'esturgeon blanc

Le 21 février 2007

Alan Cass

Fisheries and Oceans Canada
Pacific Biological Station
Nanaimo, BC V9T 6N7

June 2007

Juin 2007

ISSN 1701-1272 (Printed / Imprimé)

Published and available free from:
Une publication gratuite de :

Fisheries and Oceans Canada / Pêches et Océans Canada
Canadian Science Advisory Secretariat / Secrétariat canadien de consultation scientifique
200, rue Kent Street
Ottawa, Ontario
K1A 0E6

http://www.dfo-mpo.gc.ca/csas/

CSAS@DFO-MPO.GC.CA

Printed on recycled paper.
Imprimé sur papier recyclé.

Correct citation for this publication:
On doit citer cette publication comme suit :

DFO, 2007. Proceedings of the PSARC meeting on white sturgeon populations listed under the Species at Risk Act. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2007/013.

PACIFIC SCIENTIFIC ADVICE REVIEW COMMITTEE (PSARC)

SUMMARY

The Pacific Scientific Advice Review Committee (PSARC) met February 21, 2007 at the Pacific Biological Station in Nanaimo, B.C. One working paper titled, “Recovery potential assessment for white sturgeon populations listed under the Species at Risk Act” was reviewed.

Working Paper: Recovery potential assessment for white sturgeon populations listed under the Species at Risk Act

The paper provided a description of critical habitat and used a simulation model to predict population trajectories over a 50- and 100-year horizon for the four SARA listed populations. The working paper was accepted with revisions. The Subcommittee concluded the following: 1) the Upper Fraser population is likely naturally small and near its historical equilibrium abundance and age distribution; 2) the Nechako, Kootenay and Columbia populations have undergone severe and persistent recruitment failure. Without human intervention to restore natural recruitment, these populations are expected to decline to extinction within 70 to 80 years; 3) full restoration of the Nechako, Kootenay and Columbia historical natural recruitment rates will be necessary to achieve recovery objectives for these populations; restoration of historic rates of natural recruitment would be sufficient to achieve abundance objectives within 100 years, but not within 50 years; 4) hatchery supplementation will be necessary to achieve abundance objectives, and to reduce genetic risks associated with extremely low abundance of mature fish projected over the next 30 years. By itself, however, hatchery supplementation would not be sufficient to achieve recovery objectives; and, 5) simulated scenarios with full habitat restoration and low level, short-term hatchery releases indicate that recovery objectives could likely be achieved in the face of continuing incidental mortality not exceeding twice the current estimated level in each of the three non-recruiting populations.

SOMMAIRE

Le Comité d'examen des évaluations scientifiques du Pacifique (CEESP) s'est réuni le 21 février 2007 à la Station biologique du Pacifique de Nanaimo, en Colombie-Britannique. Il a examiné un document de travail intitulé « Évaluation du potentiel de rétablissement des populations d'esturgeons blancs inscrites en vertu de la *Loi sur les espèces en péril* ».

Document de travail : Évaluation du potentiel de rétablissement des populations d'esturgeons blancs inscrites en vertu de la *Loi sur les espèces en péril*

Le document offre une description de l'habitat essentiel et s'appuie sur un modèle de simulation pour prédire les trajectoires des quatre populations inscrites en vertu de la LEP dans un avenir de 50 et de 100 ans. Le document de travail a été accepté avec des modifications. Le sous-comité a énoncé les conclusions suivantes : 1) la population du haut Fraser est probablement naturellement de faible importance, et son abondance de même que sa structure par âges atteignent presque leur point d'équilibre historique; 2) les populations des rivières Nechako et Kootenay et du fleuve Columbia ont connu un échec grave et constant sur le plan du recrutement. En l'absence d'une intervention humaine visant à restaurer le recrutement naturel, on s'attend à ce que ces populations déclinent et s'éteignent en 70 ou en 80 ans; 3) la restauration pleine et entière des taux historiques de recrutement naturel dans la Nechako, la Kootenay et le fleuve Columbia sera nécessaire si l'on veut atteindre les objectifs du rétablissement pour ces populations; la restauration des taux historiques de recrutement naturel serait suffisante pour permettre l'atteinte des objectifs relatifs à l'abondance dans un délai de 100 ans, mais non dans un délai de 50 ans; 4) l'ajout de poissons de pisciculture sera nécessaire si l'on veut atteindre les objectifs relatifs à l'abondance et réduire les risques génétiques associés à l'abondance extrêmement faible de poissons matures projetées pour les 30 prochaines années. En soi, cependant, l'ajout de poissons de pisciculture ne sera pas suffisant pour que l'on puisse atteindre les objectifs du rétablissement; 5) les scénarios de simulation reposant sur une restauration pleine et entière de l'habitat et l'ajout de poissons de pisciculture à un faible taux et à court terme indiquent que l'on pourrait probablement atteindre les objectifs du rétablissement avec une mortalité fortuite constante n'excédant pas deux fois le taux actuellement estimé dans chacune des trois populations qui ne connaissent pas de recrutement.

INTRODUCTION

The Pacific Scientific Advice Review Committee (PSARC) met on February 21, 2007 at the Pacific Biological Station in Nanaimo, B.C. to review a Working Paper titled “Recovery potential assessment for white sturgeon populations listed under the Species at Risk Act.” The meeting Chair, A. Cass welcomed the seventeen participants and a round of introductions was completed. There was good representation from industry, universities, and the province. The Chair outlined the purpose of the meeting; to review a Recovery Potential Assessment (RPA) for 4 subpopulations of sturgeon and to provide advice. The preparation of an RPA is a legal obligation under SARA. The objectives, procedure, and deliverables were also outlined.

The meeting participants reviewed one Working Paper which is summarized in Appendix 1. The meeting agenda appears as Appendix 2. The terms of Reference for the meeting is in Appendix 3. A list of meeting participants and reviewers is included as Appendix 4.

DETAILED COMMENTS FROM THE REVIEW

Recovery potential assessment for white sturgeon populations listed under the Species at Risk Act

C.C. Wood, D. Sneep, S. McAdam, J. Korman, and T. Hatfield

General Discussion

The Working Paper presented a Recovery Potential Assessment (RPA) for each of four populations of white sturgeon in Canada (Nechako, Upper Fraser, Kootenay, Columbia). These populations are currently listed as ”Endangered” under SARA. The paper provided a description of critical habitat and used a simulation model to predict population trajectories over a 50- and 100-year horizon. The model is an adaptation of an age-structured model previously developed to describe white sturgeon populations (CSAS Proceedings Series 2005/016). Model output was used to assess the objectives in the draft Recovery Strategy. The paper considered the current species status, potential for human-induced mortality, and examined various scenarios to mitigate harm and promote recovery. The Working Paper had two appendices: Appendix 1 described the potential critical habitat; Appendix 2 presented the methods and results of the simulation modeling. Participants acknowledged that a review of critical habitat is required before critical habitat can be legally designated as required under SARA after considering socio-economic factors.

The simulation analysis was designed to show the necessary and sufficient conditions for achieving the recovery objectives specified in the draft Recovery

Strategy and not to determine the best options for recovery. Meeting participants recognized therefore that the analysis was not intended to inform the Recovery Plan per se on the consequences of specific alternative actions but on the biological basis for recovery as currently stated in the draft Recovery Strategy. Quantitative recovery objectives specified in the draft Recovery Strategy and assessed in simulation scenarios are (1) to ensure no net loss of reproductive potential, (2) to achieve within 50 years (a) 1000 mature individuals, (d) ongoing natural recruitment, and (e) population growth when below the abundance target. Three formal reviews of the Working Paper were provided.

The reviewers and other meeting participants were supportive of the Phase I assessment of population abundance, range and trajectory. Participants acknowledged that the Nechako, Kootenay and Columbia populations are declining following decades of recruitment failure whereas the Upper Fraser population is likely a small population (185 mature animals estimated in 2006) but near the historical equilibrium abundance and age structure.

Reviewers and participants acknowledged that white sturgeon are data limited hence the use of common parameter inputs for all populations in the model. One reviewer questioned whether the more northern Nechako and Upper Fraser populations should be modeled with a lower productivity rate and delayed maturity rate compared to southern populations. The authors agreed to revise the sensitivity analysis in the working paper to explore the effects of reduced productivity (they had already explored the effect of increased productivity); this analysis would implicitly address the net effects of all factors that potentially reduce productivity including delayed maturity. One participant was concerned that incidental mortality over the last decade may have been higher than it is estimated to be now, in which case the initial (2006) number used for projecting Nechako sturgeon abundance would be too high, and the outcomes in simulated scenarios would be overly optimistic. The authors agreed to evaluate the implications of a lower initial number for the Nechako population in the simulated scenarios. In response to a reviewer's concern that the full range of uncertainty had not been explored, the authors also agreed to expand their sensitivity analysis to examine the effects of greater environmental variability in age-1 recruitment and subsequent survival, and of reduced survival of hatchery fish in the first year after release.

Considerable discussion ensued over an appropriate way to portray uncertainty in Tables 2 and 6 of the working paper in achieving recovery objectives. This was prompted by the concern of a reviewer that "Yes" or "No" descriptors of probabilistic model outcomes could be misleading without a statistical representation of the uncertainty. The authors explained that they had been concerned about the ease of interpretation of the results and noted that the numerical results were provided in Appendix 2; as an alternative, they offered to add the probability values to the summary tables with shading to highlight cases where objectives were achieved in more than 50% of simulation trials, and a

caveat that probability values were somewhat uncertain in that they vary with the choice of parameter values.

Several points of clarification were identified in reviews of Appendix 1 on critical habitat and the authors agreed to consider reviewers' comments in revisions to the working paper. The authors agreed to delete reference to specific Industry names in revisions to the working paper.

Several participants expressed discontent over the use of term "habitat restoration". To prevent confusion, the authors agreed to clarify that the scenarios labeled "habitat restoration" do not necessarily imply that habitat is restored, only that *natural* recruitment is restored and to explicitly refer to the restoration of natural recruitment rather than referring to it as habitat restoration.

The authors pointed out that the purpose of the simulation modeling was to assess recovery conditions necessary for meeting objectives and not to prescribe a specific course of action to meet objectives. Participants agreed that the latter will ultimately depend on evaluating a fuller range of alternatives that could be assessed using a simulation model.

Participants agreed with the authors that hatchery supplementation is needed as an interim measure to achieve numerical targets in 50 years, and to reduce genetic risks associated with the extreme decline in abundance of mature fish projected over the next 30 years (resulting from sustained recruitment failure over past decades). Participants also acknowledged that long-term hatchery supplementation would eventually undermine the chances of natural recovery by reducing fitness of the natural populations. Therefore there is limited time available to develop programs to increase the likelihood of natural recovery. Participants acknowledged that hatchery supplementation is experimental and therefore the success of hatchery programs cannot be evaluated at this time. One reviewer pointed out that there are logistical constraints to hatcheries such as acquiring adequate brood-stock in a given year.

The authors did not determine the "residence requirements" as defined under SARA noting that policy for designation and protection of residences is still being developed.

A participant asked why recruitment has failed in the Nechako, Kootenay and Columbia populations. The authors responded that recruitment failure is linked to human-induced degradation of habitat but that the details remain unclear. Recruitment beyond the egg stage has not been observed for any of these populations in recent years with the exception of limited recruitment to the Columbia River population in the US portion.

A participant asked if survival of young hatchery sturgeon could be improved by releasing them at a larger size. The authors responded that the young are

currently released at a size that is large enough to avoid most sources of mortality affecting wild juvenile sturgeon.

A participant asked why sturgeon in the US section of the Columbia River upstream of Grand Coulee Dam were not included in the population projections for the Columbia population. The authors responded that the potential for rescue from the US was likely low, although they acknowledged that some cross boundary movement and genetic mixing does occur; they also noted that including US sturgeon would change the initial number, but not the trends or major conclusions drawn from the simulations.

Participants agreed, based on the simulated population projects, that all the recovery objects for Upper Fraser white sturgeon except 2a (1000 mature individuals in 50 years) could be met. Participants further agreed that the Upper Fraser population is likely naturally limited to <1000 mature individuals. Meeting participants agreed with the authors' conclusion that unless human intervention can restore natural recruitment for the Nechako, Kootenay, and Columbia populations, extinction in the wild is inevitable, even in the absence of further human-induced mortality. Participants acknowledged that the recovery of the Nechako, Kootenay and Columbia populations depends on successful habitat restoration deemed sufficient to increase natural recruitment to historic levels, and a hatchery supplementation strategy that avoids future genetic bottlenecks. Simulation results for the impounded populations indicate that recovery objectives could be achieved in 100 years but not in 50 years as identified in the draft recovery strategy.

The reviewers and participants agreed with the authors' assessment of Phase II dealing with scope for human induced mortality. For the Nechako, Kootenay and Columbia populations, the principal threats are indirect through impacts on habitat and include river regulation; instream activities such as dredging for gravel or sand; linear development; alterations or development of riparian, foreshore, or floodplain areas; upstream use of land and water; and effluent discharge from both point and non-point sources. Sources of direct harm include targeted or incidental capture in recreational fisheries, bycatch in salmon gillnet fisheries, passage through dams, and sampling for research and hatchery broodstock. Participants supported the estimates for total annual mortality of 0.01% in the Upper Fraser to 0.07% in the Columbia presented in the working paper for small sturgeon (ages 2 to 10). Estimates for large sturgeon (ages >10) range from 0.02% in the Upper Fraser to 0.3% in the Nechako population.

Simulated scenarios with full habitat restoration and low level, short-term hatchery releases indicate that recovery objectives could likely be achieved in the face of continuing incidental mortality not exceeding twice the current estimated level in each of the three non-recruiting populations. Participants therefore agreed with the authors that perhaps it is reasonable to allow some continuing incidental harm during the recovery process.

Conclusions

- The working paper was accepted with revisions.

- The Upper Fraser population is likely naturally small and near its historical equilibrium abundance and age distribution.

- The Nechako, Kootenay and Columbia populations have undergone severe and persistent recruitment failure. Without human intervention to restore natural recruitment, these populations are expected to decline to extinction within 70 to 80 years.

- Full restoration of the Nechako, Kootenay and Columbia historical natural recruitment rates will be necessary to achieve recovery objectives for these populations. Restoration of historic rates of natural recruitment would be sufficient to achieve abundance objectives within 100 years, but not within 50 years.

- Hatchery supplementation will be necessary to achieve abundance objectives, and to reduce genetic risks associated with extremely low abundance of mature fish projected over the next 30 years. By itself, however, hatchery supplementation would not be sufficient to achieve recovery objectives.

- Simulated scenarios with full habitat restoration and low level, short-term hatchery releases indicate that recovery objectives could likely be achieved in the face of continuing incidental mortality not exceeding twice the current estimated level in each of the three non-recruiting populations.

Recommendations

No specific recommendations were developed but the next steps toward a white sturgeon recovery action plan should include an assessment of the feasibility of alternative options for restoring natural recruitment through improvements to spawning, incubation, or larval rearing habitat.

APPENDIX 1. Working Paper Summary

Recovery potential assessment for white sturgeon populations listed under the Species at Risk Act

C.C. Wood, D. Sneep, S. McAdam, J. Korman and T. Hatfield

We assessed recovery potential for each of four populations of white sturgeon now listed as Endangered under the Species At Risk Act by considering current status, potential sources of human-induced mortality, and various strategies to mitigate harm and promote recovery. We used a simulation model to evaluate scenarios that span the range of plausible human activities that cause mortality or change the quantity or quality of important habitat.

Best estimates of the abundance of mature fish in each population in 2006 are 185 in the Upper Fraser River, 305 in the Nechako River, 455 in the Kootenay River and 1000 in the Canadian portion of the Columbia River. Habitat is believed to limit current abundance in all populations. The Nechako, Kootenay, and Columbia populations are declining following decades of recruitment failure related to extensive habitat changes, primarily associated with dams and river regulation. Critical habitats (but not residences) have been proposed for all populations and include key areas for spawning, larval and juvenile rearing, adult feeding and staging prior to spawning migration. Threats to habitat include river regulation; instream activities such as dredging for gravel or sand; linear development; alterations or development of riparian, foreshore, or floodplain areas; upstream use of land and water; and effluent discharge from both point and non-point sources. Specific sources of harm or mortality to individual white sturgeon include targeted or incidental capture in recreational fisheries, bycatch in salmon gillnet fisheries, passage through dams, and sampling for research and hatchery broodstock. Best estimates for total annual mortality for small sturgeon (ages 2 to 10) range from 0.01% in the Upper Fraser to 0.07% in the Columbia population; estimates for large sturgeon (ages >10) range from 0.02% in the Upper Fraser to 0.3% in the Nechako population.

The recovery goal specified in the draft national recovery strategy for white sturgeon is to ensure the long-term viability of naturally-reproducing populations throughout the species' natural range, and restore opportunities for beneficial use, if and when feasible. Specified quantitative recovery objectives that could be assessed in simulation scenarios include (1) to ensure no net loss of reproductive potential, (2) to achieve within 50 years (a) 1000 mature individuals, (d) ongoing natural recruitment, and (e) population growth when below the abundance target.

For the Upper Fraser population, simulation model projections suggest that all recovery objectives except 2a can be achieved if total human-induced mortality does not exceed twice the estimated status quo level. Simulation results based on our assumptions about historic abundance lead us to question the necessity

of achieving 1000 mature fish (recovery objective 2a) and continued population growth (recovery objective 2e). An alternative approach is to recognize that the naturally small size of the Upper Fraser population makes it inherently vulnerable to extinction, and to seek to maintain its current viability by preventing further deleterious impacts. Concerns about the potential loss of genetic diversity over the longer term that motivate recovery objective 2a might be addressed by intervention to manage gene flow with other populations.

For the Nechako, Kootenay, and Columbia populations, simulation model projections indicate that unless human intervention can restore natural recruitment, extinction in the wild is inevitable, even in the absence of further human-induced mortality. Our simulation results indicate first, that (full) restoration of the historic rates of natural recruitment will be necessary to achieve recovery objectives, and second, that restoration of historic rates of natural recruitment would be sufficient to achieve abundance objectives within 100 years, but not within 50 years. Hatchery supplementation will also be necessary to achieve abundance objectives, but would not be sufficient by itself. Hatchery supplementation should be viewed as experimental, but supported as a calculated risk to reduce the serious risk of genetic bottlenecks in natural spawning expected over the next 30 years. Given that the very feasibility of recovery depends upon successful human interventions to increase natural recruitment, it might be reasonable to allow some continuing incidental harm contingent on a *commitment to engage in habitat restoration that is deemed sufficient to increase natural recruitment to historic levels*, and to hatchery supplementation that is deemed sufficient to avoid future genetic bottlenecks. Simulated scenarios with full habitat restoration and low level, short-term hatchery releases indicate that recovery objectives could likely be achieved in the face of continuing incidental mortality not exceeding twice the current estimated level in each of the three non-recruiting populations.

APPENDIX 2: PSARC Meeting Agenda, February 21, 2007

PACIFIC SCIENTIFIC ADVICE REVIEW COMMITTEE
RPA WHITE STURGEON REVIEW

Wednesday, February 21, 2007
Pacific Biological Station, Nanaimo, B.C.
Seminar Room

WEDNESDAY– February 21	
Introduction and procedures	9:00 – 9:15
"Recovery potential assessment for white sturgeon populations listed under the Species At Risk Act" by Chris C. Wood, Dan Sneep, Steve McAdam, Josh Korman, and Todd Hatfield	9:15 – 10:00
Reviewers comments	10:00 – 11:00
General discussion and formulation of advice	11:00 – 12:00
Lunch Break	*12:00 – 1:00*
General discussion and formulation of advice cont'd	1:00 – 4:00
Adjournment	4:00

APPENDIX 3. List of Attendees

Subcommittee Chair: Al Cass

External Participants	
Name	**Affiliation**
Bill Duncan	Teck Cominco Metals Ltd.
Josh Korman	UBC
Paul Higgens	BC Hydro
Llewellyn Mathews	Columbia Power Corporation
Carl Schwartz	SFU
Ted Downs	Ministry of Environment, Victoria
Justus Benckhuysen	ALCAN
Frank Kwak	Lower Fraser Sport Fish Advisory Board
Steve McAdam	Ministry of Environment, UBC
DFO Participants	
Bill Franzin	DFO Winnipeg
James Kristmanson	DFO Ottawa
Chuck Parken	
Bridget Ennevor	
Al Cass (Chair)	
Chris Wood	
Dan Sneep	
Tom Brown (Rapporteur)	

The reviewers for the PSARC paper presented at this meeting are listed below. Their assistance is invaluable in making the PSARC process work.

Schwarz, Carl	SFU
Spence, Colin	Ministry of Environment
Williamson, Cory	Ministry of Environment