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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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SUMMARY

These proceedings summarize the relevant presentations and discussions of the national science advisory meeting titled “Jeopardy Assessment Framework for Permitting under the *Species at Risk Act*”, held on November 6-8, 2018, in Ottawa, Ontario. The conclusions and advice resulting from this meeting will be provided in the form of a Science Advisory Report that will be made publicly available on the CSAS website. Meeting participants included experts from various sectors and regions of Fisheries and Oceans Canada, as well as external participants from Environment and Climate Change Canada, University of Toronto, University of Alberta, Memorial University, and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The purpose of this meeting was to assess components of a proposed framework that builds upon and complements the Department’s existing approaches to assess allowable harm in order to assist the Department in making scientifically defensible decisions about the impacts of an activity to a listed aquatic species. One working paper was distributed prior to the meeting, in addition to background documents. The paper described the Science-based Framework for Assessing the Impact of Development Activities under Section 73 of Canada’s *Species at Risk Act* and was reviewed at the meeting for publication as a Research Document.

INTRODUCTION

Keith Clarke (Chair) opened the meeting by welcoming the participants, providing a brief overview of the Canadian Science Advisory Secretariat (CSAS) peer-review process, and requesting that everyone consider, throughout the course of the meeting, whether there are any common aspects between the paper and how science advice can be extracted from the discussions of the meeting. Participants introduced themselves via roundtable; meeting participants included DFO Science, DFO Species at Risk Program as well as participants from Environment and Climate Change Canada, University of Toronto, University of Alberta, Memorial University and COSEWIC (Appendix 1). The purpose of this meeting, as indicated in the Terms of Reference (Appendix 2), was to assess proposed components for a framework that can determine if an activity will jeopardize the survival or recovery of an aquatic species at risk for the Species at Risk Program. The chair reviewed the agenda (Appendix 3) and Terms of Reference for the meeting, discussed deadlines for the expected publications, and verbally determined that there was consensus for the Terms of Reference.

PRESENTATION AND DISCUSSION

The working paper that was distributed prior to the meeting was split into sections that were presented and then discussed by the participants (Drake et al. 2022). Emphasis was placed on clarifying terms, science advisory outcomes, and policies throughout the discussions.

OVERVIEW: A SCIENTIFIC FRAMEWORK FOR ASSESSING THE IMPACT OF DEVELOPMENT ACTIVITIES ON AQUATIC SPECIES AT RISK IN CANADA

An description of the need for science advice was presented, including how the current framework builds upon DFO's approach to assessing Allowable Harm for listed species. An overview of the different methods that were used to assess Allowable Harm and their implications in Recovery Potential Assessments (RPA) since 2004 was provided. The presenter highlighted the fact that RPA's focus only on one species at the time whereas the proposed framework aims to be used to assess a wide range of aquatic species.

With regard to the current framework, a participant asked for clarification on why the impact of a project on the habitat would need to be assessed as the link between fish mortality and the harm induced by a project seems quite direct and obvious. It was explained that because the source of harm comes from the changes that occur in the habitat, it needs to be linked to population metrics in order to see the impact of the activity on the population. The authors added that although mortality is a very direct way of affecting a population, a given project could also jeopardize fish survival indirectly by having impacts on the habitat, and these indirect factors must be assessed. A participant asked for clarifications on the level at which a population would be assessed. The presenter explained that freshwater species are usually assessed at the population level and marine fishes at the fish stock level. It was mentioned that marine mammal populations are often composed of many stocks/sub-populations and that structure might complicate the assessment.

A participant asked for clarifications regarding the link between offsetting and the proposed framework. The presenter explained that it is necessary to know the population state prior to an individual work/undertaking/activity (W/U/A) to determine how or if offsetting may be incorporated. There were lengthy discussions regarding the recovery and survival policy. It was clarified that the goal of the meeting was not to answer policy related questions, but to assess components of the proposed framework. A participant asked how climate change is incorporated into the framework. The lead author explained that it was not directly included in

the framework. The presenter added that density dependence effects and carrying capacity habitat were not included in the proposed framework in order to avoid harm overestimation.

The proposed framework was introduced, which was built on three parts: a) a relationship between vital rates and population growth; b) a relationship between habitat conditions and vital rates; and, c) a relationship between the individual W/U/A/ and habitat conditions. It was clarified that the proposed framework does not aim to replace any existing population/assessment models and that it could be used with any population model. The shortcomings of the Recovery Potential Assessment were identified, and participants briefly discussed how the proposed framework could address these issues.

SECTION 1: RELATIONSHIP BETWEEN VITAL RATES AND POPULATION GROWTH RATE

Population models were presented that described the response of different at-risk species to vital rate shifts. Participants had discussions on the methods presented for group sorting within the population model and on the link between lambda and vital rates. Participants raised concerns regarding the potential circularity of the methods as data were manipulated (i.e., adjusted first-year survival) and then used to make predictions. The authors assumed that the methods they used were realistic and wanted to confirm those methods with the participants. Participants then discussed the potential gaps in the dataset and the population state criteria. Participants agreed that information on species-specific parameters should be added to the research document. Concerns were also raised by participants about the model and the results for individual species. It was clarified that the model was not intended to replace existing, species-specific population models, but rather provides an approach for data-limited species when existing models are lacking. It was also clarified that the goal of the meeting was to agree on whether the proposed framework would be applicable (or not) in those situations where a more detailed population model did not exist. The authors and the participants discussed the different rules that were used to build the model. The group agreed that the term “elasticity” needs to be clearly defined in the research document. Participants also raised concerns about the potentially low sensitivity of the model as only data-limited species were considered. The group suggested adding not at-risk species data in the analysis to address this issue.

The group agreed that although the proposed framework needs to be refined and could not be directly used as proposed, it would provide a foundation to potentially be used by the department for Permitting under the *Species at Risk Act* process. The group agreed on the importance of this proposed framework for data limited species. The authors clarified that the elasticity analysis was done in order to be able to link the change in habitat to a given population growth rate; it was suggested to clarify this objective in the research document. A participant mentioned that the ultimate objective of developing a tool to assess how much a given project would delay species recovery would be helpful to the department.

SECTION 2: RELATIONSHIPS BETWEEN AQUATIC HABITAT CONDITION AND VITAL RATES

Information was presented on a meta-analysis to describe the relationship between changes in habitat condition and changes in vital rates, focusing on freshwater fishes and freshwater mussels given the literature availability for these species. During the discussion, concerns were raised by participants regarding the applicability of the results (e.g., patterns of vital rate responses) to other species groups (marine mammals; anadromous fishes). The presenter agreed that determining general response shapes among different groups of SARA species would help improve the ability to link habitat changes to vital rate responses, and that more work was required for sub-lethal effects, especially for marine mammals. The presenter also clarified

that the freshwater results indicated that non-linear responses were common, and these patterns were likely to occur in other species groups. It was clarified that “habitat quality” was taken into account in the proposed framework instead of “habitat loss” in order to address the complexity of the habitat. Finally, the difficulty of determining the nature of interactions (e.g., synergistic; additive) between multiple shifting habitat variables was discussed, with participants agreeing that this would be important to fully capture that impact of a W/U/A on a listed species.

SECTION 3: EFFECTS OF WORKS/UNDERTAKINGS/ACTIVITIES ON AQUATIC HABITAT

Information was presented on how DFO’s Pathways of Effects could be used to determine the habitat changes resulting from a W/U/A, which primarily focused on the identity of affected habitat variables. Additional information would be needed about the intensity, duration, periodicity (if applicable), and spatial footprint of habitat change, which would then allow the relationship between habitat condition and vital rate shifts to be assessed. There were few participant questions about the application of DFO’s PoEs.

Information was then presented on the potential role of offsetting in reducing habitat impacts. There were very few studies on the effectiveness of offsetting for species at risk; in the few examples where offsetting was shown to be effective, the level of the offset was much higher than the level of the habitat impact, and long-term monitoring data was required to demonstrate effectiveness. The three main criticisms around offsetting were highlighted: Lack of empirical evidence for effectiveness; concern that eventual opportunity to offset relaxes rigor of mitigation hierarchy; and, concern that offsetting involves “the exchange of certain losses with uncertain gains”.

A presentation was given on different situations in which offsetting could be implemented, including scenarios where offset failure could lead to an inability to achieve the desired gain in population growth for the species.

Concerns were raised regarding the general application of offsetting for species at risk. Participants highlighted the fact that very few studies showed effectiveness of offsetting for species at risk and that it does not always seem possible to recreate specific habitat for species at risk. A participant asked for clarifications regarding the application of offsetting in critical habitat. The authors explained that the proposed framework was developed for species at risk whether or not they are not found in a critical habitat area. Concerns were raised by the participants regarding the application offsetting in general. Since offsetting for species at risk appears to be risky based on uncertainty in the eventual function of the offset, it was suggested that applying offsets in advance of the W/U/A would allow offset function and species response to be assessed prior to the initiation of project impacts. Ultimately, it was determined that there is considerable uncertainty and debate regarding how offsetting should be addressed or implemented.

FINAL CONSIDERATIONS

The participants agreed that the components of the working paper provided a foundation to assess the impact of W/U/A for SARA-listed species Canada, with the approach building on previous science advise in Allowable Harm assessments. However, participants described that considerable additional work will be required to operationalize the components into a decision-making tool, which should be addressed in future work. In the absence of this additional work,

the framework provides a core set of principles that can provide guidance when assessing the impact of W/U/A on listed species.

CONCLUSIONS

The working paper was accepted with revisions. The group agreed on a list of modifications that must be addressed in the Research Document and the list was shared with the authors. The group agreed that the meeting Chair would review the paper to determine that the comments had been addressed. Following the meeting the document was revised and the Chair determined that the authors had addressed the comments.

The participants had lengthy discussions to agree on draft summary bullets.

REFERENCES CITED

Drake, D.A.R., van der Lee, A.S., and Koops, M.A. 2022. [Components of Science-based Framework for Assessing the Impact of Development Activities under Section 73 of Canada's Species at Risk Act](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2022/052. v + 58 p.

APPENDIX 1

LIST OF MEETING PARTICIPANTS

Name	Affiliation
Keith Clarke (Chair)	Freshwater Habitat Research Biologist- DFO Science Newfoundland and Labrador
Karine Robert	Science Advisor - DFO Science Ottawa
Justine Mannion	Science Advisor - DFO Science Ottawa
Shannan May-McNally	Science Advisor - DFO Science Ottawa
Andrew Drake	Research Scientist - DFO Science Central and Arctic
Daphne Themelis	Aquatic Science Biologist - DFO Science Maritimes
Heather Bowlby	Aquatic Science Biologist - DFO Science Maritimes
Jenni McDermid	Biologist - DFO Science Gulf
Jim Kristmanson	Science Advisor, Canadian Science Advisory Secretariat - DFO Science Ottawa
Mark Simpson	Section Head of Marine Fish Species at Risk - DFO Science Newfoundland and Labrador
Marten Koops	Research Scientist - DFO Science Central and Arctic
Mike Bradford	Research Scientist - DFO Science Pacific
Paul Grant	SARA Science Coordinator - DFO Science Pacific
Kristina Makkay	Senior Policy Advisor - DFO Species at Risk Program Ottawa
Robyn Forrest	Research Scientist - DFO Science Pacific
Shelley Lang	Aquatic Science Biologist - DFO Science Maritimes
Daniel Duplisea	Research Scientist - DFO Science Québec
Adam Van der Lee	Aquatic Science Biologist - DFO Science Central and Arctic
Cathryn Murray	Senior Aquatic Biologist, Ecosystem Stressors - DFO Science Pacific
Carolyn Seburn	SARA Policy and Program Guidance Specialist - Environment and Climate Change Canada
Nick Mandrak	Associate Professor - University of Toronto
Brett Favaro	Research Scientist - Memorial University
Mark Poesch	Associate Professor - University of Alberta
David S. Lee	COSEWIC Marine mammal subcommittee co-chair

APPENDIX 2

TERMS OF REFERENCE

Science Advice to Support the Jeopardy Assessment Framework for Permitting under the *Species at Risk Act*

National Science Advisory Process – National Capital Region

November 6-8, 2018

Ottawa, Ontario

Chairperson: Keith Clarke

Context

Sections 73 and 74 of the *Species at Risk Act* (SARA) state that the competent Minister may enter into an agreement authorizing an activity affecting a listed wildlife species, any part of its critical habitat or the residences of its individuals, if the Minister is of the opinion, among satisfying other conditions, that the activity will not jeopardize the survival or recovery of the species¹. An activity is considered to jeopardize the survival or recovery of a species if the activity would prevent the attainment of the population and distribution objectives described in a recovery strategy for the species. Making a determination about whether a proposed activity places species in jeopardy relates to the expected residual harm after the implementation of avoidance and mitigation measures, and the extent to which offsets and recovery measures provide a net balance or gain in survival or recovery potential. If an activity is accompanied by measures (i.e., avoidance, mitigation, offsetting, and/or recovery measures) that prevent, reduce or counterbalance the effects on the species such that the survival or recovery is not jeopardized, a permit may be issued by the competent Minister, under the assumption that all other conditions under subsection 73(2) to (7) have also been met.

In order to assist the Department in making scientifically-defensible decisions about the impacts of an activity to a listed wildlife species, its critical habitat, or its residence; a framework that builds upon and complements the department's existing approaches to assess allowable harm is required. Allowable harm assessments are conducted as part of the species at risk recovery potential assessment process, and seek to look at how increases in human-induced mortality or habitat destruction alter recovery or survival probabilities and recovery timelines. This framework would be used to:

- evaluate the impact of a proposed activity in terms of direct (e.g., mortality) and indirect (e.g., habitat degradation) effects on the probability of attaining population and distribution objectives; and,
- inform the estimated level of residual harm expected as a result of an activity, along with the extent to which offsetting and/or recovery measures are required to provide a net balance or gain in survival or recovery potential.

Following this peer review, it is expected that the resulting components for a framework would be operationalized into a tool to be used by departmental biologists in determination of whether or not a proposed activity will jeopardize the survival or recovery of a species at risk.

¹ In addition to determining that an activity will not jeopardize survival or recovery of the species, other conditions found under subsections 73(2) to (7) of SARA must be met for a permit to be issued.

Objective

The overarching objective of this National Advisory Process is to assess proposed components for a framework that can determine if an activity will jeopardize the survival or recovery of an aquatic species at risk. A series of working papers will be reviewed and will provide the basis for discussion on the specific objectives outlined below:

1. Determine the suitability of metrics (e.g., change in a species' population growth rate) to evaluate losses (i.e., residual harm) and gains (i.e., offsets, recovery measures); and, determine if the proposed metrics are appropriate for a wide-range of taxonomic groups including marine mammals, marine fishes, diadromous fishes, freshwater fishes, marine invertebrates, and freshwater invertebrates;
2. Determine if the following are well-founded in ecological theory: criteria to evaluate baseline population status for data-poor species; criteria to evaluate direct and indirect effects; criteria to evaluate population responses to offsetting and/or recovery measures; and, proposed approach to account for uncertainty (i.e., data and knowledge gaps) in the application of the criteria;
3. Identify the primary assumptions associated with objectives 1 and 2;
4. Determine if the proposed components for a framework are a complement to the department's existing approaches to assess allowable harm; and,
5. Determine the information needs to operationalize the framework into a tool for use in the species at risk permitting process.

Expected Publications

- Science Advisory Report
- Research Document(s)
- Proceedings

Expected Participation

- Fisheries and Oceans Canada (DFO)
- Other government departments
- Other invited experts

APPENDIX 3

AGENDA

Note: All times tentative and subject to change depending on progress of discussions.

Day 1 – Tuesday, November 6th, 2018	
Time	Items
8:30 am 90 min	<ol style="list-style-type: none"> 1. Welcome and context 2. Introduction of participants 3. Overview of CSAS policies 4. Review Terms of Reference 5. Meeting process / agenda 6. Research document 1: A Scientific Framework for Assessing the Impact of Development Activities on Aquatic Species at Risk in Canada <ol style="list-style-type: none"> a. <i>Overview of SARA legal framework and of request for science advice</i> b. <i>Precautionary principle; error structure in decision-making</i> c. <i>Allowable harm for SARA species</i> d. <i>Reference and decision points for SARA species</i> e. <i>Overview of the proposed framework: Population status; i. probability and magnitude of project consequences to habitat and vital rates; vital rate elasticities; offsetting in a recovery framework</i>
10:00am – 10:20am	Mid-morning Break
10:20am 100 min	<ol style="list-style-type: none"> 7. <i>Continued</i> - Research document 1: A Scientific Framework for Assessing the Impact of Development Activities on Aquatic Species at Risk in Canada 8. Research document 2: Relationships between Habitat Condition and Vital Rates in Fishes and Mussels <ol style="list-style-type: none"> a. <i>Methods to estimate population status</i> b. <i>Methods to estimate the probability and magnitude of project consequences to habitat and vital rates</i>
12:00pm – 1:00pm	Lunch break (Lunch not provided)
1:00pm 120 min	<ol style="list-style-type: none"> 9. <i>Continued</i> - Research document 2: Relationships between Habitat Condition and Vital Rates in Fishes and Mussels <ol style="list-style-type: none"> a. <i>Methods to estimate the probability and magnitude of project consequences to habitat and vital rates (continued)</i> 10. <i>Continued</i> - Research document 1: A Scientific Framework for Assessing the Impact of Development Activities on Aquatic Species at Risk in Canada
3:00pm – 3:20pm	Mid-afternoon Break
3:20pm 100 min	<ol style="list-style-type: none"> 11. Research document 3: Vital Rate Elasticities for Aquatic Species at Risk in Canada

Day 1 – Tuesday, November 6th, 2018	
	<ul style="list-style-type: none"> a. <i>Stage-based population models for SARA species</i> b. <i>Methods to estimate vital rate elasticities</i> c. <i>Patterns of vital rate elasticities for SARA species</i> 12. Review of draft summary bullets
5:00pm	Adjourn (day 1)

Day 2 – Wednesday, November 7th, 2018	
Time	Items
8:30 am 90 min	13. Recap of day 1 14. <i>Continued</i> - Research document 1: A Scientific Framework for Assessing the Impact of Development Activities on Aquatic Species at Risk in Canada <ul style="list-style-type: none"> a. <i>Offsetting Development Impacts in a Recovery Framework</i> b. <i>Case study</i>
10:00am – 10:20am	Mid-morning Break
10:20am 100 min	15. <i>Continued</i> - Research document 1: A Scientific Framework for Assessing the Impact of Development Activities on Aquatic Species at Risk in Canada <ul style="list-style-type: none"> a. <i>Case study</i>
12:00pm – 1:00pm	Lunch break (Lunch not provided)
1:00pm 120 min	16. <i>Continued</i> - Research document 1: A Scientific Framework for Assessing the Impact of Development Activities on Aquatic Species at Risk in Canada <ul style="list-style-type: none"> a. <i>Case study</i> b. <i>Final considerations: Cumulative effects; Operationalization of the Framework</i>
3:00pm – 3:20pm	Mid-afternoon Break
3:20pm 100 min	17. <i>Continued</i> - Research document 1: A Scientific Framework for Assessing the Impact of Development Activities on Aquatic Species at Risk in Canada <ul style="list-style-type: none"> a. <i>Final considerations: Cumulative effects; Operationalization of the Framework</i> 18. Review of draft summary bullets
5:00pm	Adjourn (day 2)

Day 3 – Thursday, November 8th, 2018	
Time	Items
8:30 am 90 min	19. Recap of day 2 20. <i>Continued</i> - Research document 1: A Scientific Framework for Estimating the Impact of Development Activities on Aquatic Species at Risk in Canada

Day 3 – Thursday, November 8th, 2018	
	a. <i>Final considerations: Cumulative effects; Operationalization of the Framework</i>
10:00am – 10:20am	Mid-morning Break
10:20am 100 min	21. Review of draft summary bullets
12:00pm – 1:00pm	Lunch break (Lunch not provided)
1:00pm 120 min	22. Review of draft summary bullets 23. Review of Terms of Reference to ensure meeting objectives have been met 24. Next steps (after meeting): review of science advisory report and proceedings
3:00pm	Meeting Close