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Proceedings of the Pacific Regional Peer Review on the Biophysical and Ecological Overview of the Pacific Region Offshore Haida Gwaii Network Zones

**November 8-9, 2022
Vancouver, BC**

**Chairpersons: Gudt'aawt'is Judson Brown and Janet Lohead
Editor: Yvonne Muirhead-Vert**

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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 discussions and key conclusions that resulted from a Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat (CSAS) Regional Peer Review meeting on November 8-9, 2022 at DFO Regional Headquarters in Vancouver, British Columbia (BC). Virtual participants attended using the online meeting platform Zoom. A working paper to provide the biophysical and ecological overview of the Offshore Haida Gwaii Network Zones, as a first step in the regulatory process for Marine Protected Area (MPA) designation under the *Oceans Act*, was presented for peer review. The analysis and information presented in the working paper reflect a collaborative process between the Government of Canada and the Council of the Haida Nation.

Due to the COVID-19 pandemic, the number of in-person gatherings has been restricted. With the recent relaxing of regional health orders and mandates, it was decided a hybrid meeting format would be adopted for this meeting to strengthen partnerships. Participation included DFO Science, DFO Oceans, Council of the Haida Nation (CHN), Fisheries Management (Marine Conservation Targets; MCT), Gwaii Haanas Parks Canada, Canadian Wildlife Service, Marine Protected Areas Technical Team, Environment and Climate Change Canada, Natural Resources Canada - Geological Survey, Canadian Wildlife Service, and the University of Victoria.

The meeting participants agreed the working paper met the Terms of Reference objectives and was accepted with minor revisions. The conclusions and advice resulting from this review will be provided in the form of a Science Advisory Report (SAR) to assist managers in refining conservation objectives and area boundaries and will inform subsequent steps of the *Oceans Act* MPA designation process. The report will also inform subsequent advice on monitoring indicators, protocols and strategies, identification of information gaps requiring further research, and the development of management and monitoring plans for the sites. The Science Advisory Report and supporting Research Document will be made publicly available on the [Canadian Science Advisory Secretariat](#) (CSAS) website.

INTRODUCTION

A Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat (CSAS) Regional Peer Review (RPR) meeting was held on November 8-9, 2022, at DFO Regional Headquarters in Vancouver, British Columbia (BC). Virtual participants attended the meeting using the online meeting platform Zoom. A working paper (WP) focusing on the biophysical and ecological overview of the offshore Haida Gwaii slope network zones was presented for peer review. The RPR was co-chaired, and the WP was co-authored and co-produced with the Council of the Haida Nation.

The Terms of Reference (TOR) for the science review (Appendix A) were developed in response to a request for advice from DFO Oceans Program. Invitations to the science review and conditions for participation were sent to DFO Science and Fisheries Management and external participants from First Nations, the Marine Protected Areas Technical Team, commercial fishing sectors, governmental organizations, the Province of BC, environmental non-governmental organizations, and academia.

The following working paper was prepared and made available to meeting participants prior to the meeting (working paper abstract provided in Appendix B):

Bannar-Martin, Katherine H. Skil Jáada Vanessa Zahner, Kil Hltaanuwaay Tayler Brown, Burke, Lily, Hannah, Charles G., Hilborn, Andrea, Iacarella, Josephine C., Lok, Erika K., McDougall, Chris, Proudfoot, Beatrice, Robb, Carolyn K., Sastri, Akash R., Stacey, Cooper and Rubidge, Emily M. 2022. Biophysical and Ecological Overview of the Offshore Haida Gwaii Slope Network Zones. 2016OCN04a.

The meeting Chairs, Janet Lohead and Gudt'aawt'is Judson Brown, welcomed participants, provided a territorial acknowledgement, reviewed the role of CSAS in the provision of peer-reviewed advice, and gave a general overview of the CSAS process. The Chairs 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, the working paper, and the two formal reviews (Appendix C).

The Chairs reviewed the agenda (Appendix D) and the Terms of Reference (Appendix A) for the meeting, highlighting the objectives and identifying Yvonne Muirhead-Vert as the Rapporteur for the meeting. Kerri Kosziwka was identified to capture the agreed upon working paper revisions for the authors. The Chairs then reviewed the ground rules and process for exchange, reminding participants that the meeting was a science review and not a consultation. 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, 36 people participated in the RPR (Appendix E).

Prior to the meeting, Cherisse Du Preez (DFO Science) and Lynn Lee (Gwaii Haanas Parks Canada) were asked to provide detailed written reviews of the working paper to assist everyone attending the peer review meeting. Participants were provided with copies of the written reviews ahead of the meeting, with additional information provided during the meeting.

The conclusions and advice resulting from this review will be provided in the form of a Science Advisory Report that will assist managers in refining conservation objectives and area boundaries (if required) and will inform subsequent steps of the *Oceans Act* MPA designation

process. The report will also inform subsequent advice on monitoring indicators, protocols and strategies, identification of information gaps requiring further research, and the development of management and monitoring plans for the sites. The Science Advisory Report and supporting Research Document will be made publicly available on the [Canadian Science Advisory Secretariat](#) (CSAS) website.

GENERAL DISCUSSION

The client provided a presentation on the MPA and its mandates and commitments to provide context for the meeting. The authors then presented the biophysical and ecological overview of the Offshore Haida Gwaii Network Zones. The two reviewers, Cherrisse Du Preez (DFO Science) and Lynn Lee (Gwaii Haanas Parks Canada), shared their comments and questions regarding the working paper. The authors were given time to respond to the reviewers before the discussion was opened to all participants. The Proceedings document summarizes the discussions that took place by topic, including points of clarification by the authors. Questions and comments raised by the reviewers and participants are captured within the appropriate topics. Both reviewers agreed that the paper met the TOR's objectives, and their formal reviews are in Appendix C.

TERMS OF REFERENCE OBJECTIVE ONE

Evaluate, describe, and map, where possible, the identified key biophysical and ecological features of the selected sites, including:

- *predominant and/or unique physical and biological oceanographic characteristics;*
- *predominant, unique, and/or sensitive habitat features with a specific focus on habitats selected as conservation priorities for the MPA Network; and*
- *ecologically and/or culturally significant species, and species of conservation concern with particular focus on species that occur in the area that were identified as cultural and/or ecological conservation priorities for the MPA Network process.*

Haida Eddies: Gangxid kun sgaagiidaay: The Haida Eddies are mobile oceanographic features of high ecological importance in Zone 505. The centre of the eddy typically contains slightly warmer, nutrient rich waters that result in areas of high productivity that support biological growth. A member of the group asked the authors to provide more linkages in the text for this section. It is important that the region where the eddies occur is protected since breeding animals are located there. For example, the area near Cape St. James provides habitat to 23 bird species, which is the highest number of all Haida Gwaii network zones.

A reviewer suggested that more ecological linkages should be included between SGaan Kinghlas-Bowie (SK-B) Seamount and Haida Gwaii network zones. The Haida Eddies are likely 'seeding' various species of benthic fish, corals, sponges, and other benthic invertebrates.

Learmonth Bank: The area surrounding Learmonth Bank is close to the United States of America (USA) border and includes a disputed area. It would require a bilateral conversation for the protection of this ecological unit. Currently, this network zone boundary only partially covers the bathymetric feature. A bilateral agreement related to a transboundary protected area with the USA (especially within the border disputed region) would be needed to provide complete protection of this feature. However, the participants recommended that the boundaries should be changed on the Canadian side regardless to encompass the important biological features associated with Learmonth Bank. There are erratic boulders and glacial till in the surrounding basin that provide ideal coral and fish habitat, which are of ecological importance.

The bottom of the basin is heavily fished by trawlers. The fishing equipment scours the sea floor resulting in dead sponges and debris being pushed around. The increase in sedimentation from the trawling impacts the sponges, so a buffer is recommended to minimize this impact. One of the authors noted that a boundary around Learmonth Bank was designed in 2012 and early boundaries were initially drawn in 2006. There is an additional 1 km buffer in the southern portion of the Ecologically and Biologically Sensitive Area (EBSA). This boundary should be included in both the paper and the SAR. It was suggested a map of Learmonth Bank could be included in the paper along with the multibeam tiles.

TERMS OF REFERENCE OBJECTIVE TWO

Identify known areas of overlap with potential anthropogenic stressors and species and habitats of interest within the selected sites. Include sensitivity of species of known conservation concern, if available.

Human activities: It is important that the paper provides advice or a recommendation on human activities in the area. It was suggested that the human use section could be changed to Haida use since there is significance in terms of Haida values. A participant noted that what is deemed of high cultural value to the Haida may be considered outside the science perspective. Following this statement, a discussion occurred where the importance and opportunities of co-management were highlighted.

Another participant suggested that scoping the human activities section and the activities of concern should align so it can inform and mitigate the potential risks. For example, the impacts associated with bottom contact fisheries should be considered in risk assessments for the area or potential impacts of future industrial developments.

Commercial fishing: It was noted that typically, more species of fish are caught than the target species during fishing activities. For mid-water trawlers, the trawl gear sometimes contacts the sea floor and benthic species may therefore be bycatch of this fishery. It was suggested that the authors add text to clarify the different impacts for mid and bottom trawlers.

The Marine Planning team received feedback from the harvesters who provided comments by zone. Significant commercial fisheries occur in the area, and it would be useful to identify the locations of hot spots for species such as prawns. Commercial fisheries typically don't fish the rocky outcrops, but it would be informative to have future discussions with industry. Another participant suggested that it would be helpful for this area to provide a socio-economic overview and to look at the offshore area in the future work section.

Recreational fishing: The area adjacent to Zone 501 is a popular area for recreational fisheries for salmon and some groundfish (i.e., halibut, Lingcod and rockfish) since this area has a number of fishing lodges and charter boats. There may not be a lot of deep-sea fishing occurring in the area. It was noted that salmon data are summarized by Pacific Fisheries Management Areas (PFMAs) which is too broad to be ecologically relevant.

Tourism: From the 2019 tourism survey, the west coast of Haida Gwaii has a lot of recreational fishing, whale watching, and cultural tourism occurring in the area. It was noted there are no dedicated boats for whale watching on the south to northwest side of Haida Gwaii.

TERMS OF REFERENCE OBJECTIVE THREE

Identify key uncertainties and knowledge gaps as they pertain to the current understanding of the existing environment and species of interest within the selected sites, and recommend measures to address these gaps, where possible.

Knowledge gaps: It was noted that knowledge gaps could be improved in the paper and recommended as research priorities. A participant suggested that knowledge gaps be prioritized by considering what would be most necessary to support MPA designation and management of the zones. This prioritization could then be compared to existing MPA and network monitoring, informing decisions on allocation of funds. Some of the data gaps were identified in the following subheadings:

Glider survey: It was suggested that repeated glider surveys could be made as a future work recommendation.

Multibeam data: Multibeam work could reveal additional important bathymetric features.

Deep Depth Profiles: There are knowledge gaps due to the deep depth profiles of these zones. It is important to have the appropriate baseline information to monitor MPA effectiveness. The prioritization of missing data is helpful for the allocation of funds to address these gaps.

Seamounts: It was suggested that the Tuzo Wilson Seamounts could be included in the Research Document and SAR, although they are just outside the Northern Shelf Bioregion. There are two seamounts on the continental slope close to Zone 505. It was recommended that seamounts be fully protected instead of partially protected. There is little existing knowledge of the Sea Around Us Project (SAUP) 5494 Seamount and it is unique since it is covered in mud. Due to the partial protection and lack of knowledge on the seamounts, it is likely that important ecological linkages are being missed within these network zones.

Cold seeps: The cold seeps are located on the continental slope and are considered to be Ecologically or Biologically Significant Areas (EBSAs). There are no known seeps in any of the zones, but as more data are collected it is thought that seeps may be discovered. Cold seeps are areas of high primary productivity, chemosynthesis, and are important for fish. The USA recognizes cold seeps as important features and are protected since they are essential to fish habitat.

Data sets: It was suggested that the authors might consider the inclusion of a larger dataset from the Global Biodiversity Information Facility (GBIF) which collates data from institutions around the world. The authors agreed to consider including this dataset. It was also suggested that the GBIF data could be reviewed to update the species list and improve the determination of the priority species for all zones.

Data from benthic dive surveys should be included in the paper to provide additional data on species of known conservation concern, ecologically and/or culturally significant species, and species of interest within selected sites.

The dive annotations and the 2022 Northeast Pacific Seamount expedition videos about SAUP 5494 in Zone 502 should be included as well as publications from deep-sea surveys. A reviewer suggested that the data on seamount species from Du Preez and Norgard (2022) and the data about SK-B in Du Preez et al. (2024) should be included in the WP.

Benthic-pelagic coupling: It was suggested that a section be added on benthic-pelagic coupling to link sea floor processes to pelagic ecosystems. Describing the links between species within the water column could provide guidance on three-dimensional zoning in future management decisions.

Zone 504: Only 3% of zone 504 has been surveyed. The data are limited due to challenges associated with monitoring at depth (e.g., the maximum depth for multibeam is 1500 m).

Maps: A reviewer noted that there are some maps that may not be perfectly aligned. This could be a potential uncertainty since the alignment could be off. It was mentioned that the boundaries

do not line up between the USA and Canada. The disputed boundary is also positioned at the wrong angle.

It was suggested that maps be included in the fish and marine mammals sections. Spawning and rearing areas for herring could be overlaid on some maps. It was also recommended to include maps that show temperature and chlorophyll characteristics along the boundaries of each zone.

Offshore Haida Gwaii Network Zones (OHGNZ) overall and Northern Shelf Bioregion

(NSB) MPA: It was suggested that a short summary section should be included to synthesize the characteristics and their relevance to connectivity among the OHGNZ between existing and proposed MPAs, and their contributions to the NSB MPA network objectives.

A reviewer suggested that the paper should provide detail on the key biophysical, ecological and cultural attributes of the overall area, potential conservation objectives and priorities, and linkages to the MPA network goals and objectives. It would also be beneficial to describe each network zone and the zones' specific contributions to the MPA network as a whole. The importance of having appropriate baseline information to monitor MPA effectiveness was also noted.

A participant mentioned that Killer Whale migrations show large scale connectivity between zones and that oceanographic processes drive the movement of individuals through them.

The authors noted that they purposely did not include linkages between OHGNZ and other MPAs, or the overall MPA network, since the OHGNZ are unique and they wanted the paper to stand alone. However, they agreed that they could integrate more linkages to the MPA network.

Conservation: There was discussion about whether more connections should be made between zone conservation objectives and those in the NSB MPA network plan. It was determined that more connections should be made to identify species listed as conservation priorities for the NSB MPA network. A reviewer suggested conservation priorities should be recommended to protect the habitats in each of the seven zones. The inclusion of Haida knowledge should be an integral component to all conservation priorities and objectives in Haida Gwaii.

It would also be helpful to clearly state what the zone-specific conservation priorities are that make each zone unique and worthy of protection, both in terms of the zone as a stand-alone entity (e.g., contains seamount), and its contribution to broader MPA network objectives.

Network Action Plan (NAP): There were concerns raised when linking back to the Network Action Plan (NAP) process as the process was not complete. The importance of data collection efforts supporting MPA connectivity, monitoring and research (between offshore sites, offshore to nearshore and the NSB more broadly) could be referenced instead. Recent and ongoing research in the area would complement data sources highlighted in the report. For example, recent zooplankton/glider surveys in Zone 505 will contribute to baseline information of the area.

Biological community: It was suggested that the level of synthesis provided for the taxonomic sections on fish and marine mammals be consistent with what is provided for in the marine bird section. A reviewer suggested that ecological and cultural sections could be linked to Haida values and asked if the level of detail provided in the marine bird section could be a template for other sections in the paper. A participant asked if the *Species at Risk Act* (SARA) listing could be added as another column within the summary table in Appendix E for easy reference. It was suggested that the section on the protection of animals (Section 3.1.4) could be strengthened and expanded on. A reviewer has offered to provide the authors with references on this topic.

A participant asked the authors to include more information on cold water sponges. It was unclear whether the sponges were inside and outside the zones. Species were identified based on the existing data and if they were found in the zone on the slope. It is noted that if there are data gaps due to water depth, then the list of species found in these areas would be incomplete.

Fish section: There is a lot of information in this section and it would be helpful for the authors to restructure it. A reviewer suggested that the authors should review the marine bird section and place the same level of detail in this section, such as grouping species by pelagic, benthic, etc., and provide ecological linkages between zones, where possible. Some of the zones are migration corridors and spawning areas for various fish species. Many of the species of fish identified in the fish section have cultural value and significance to the Haida Nation.

Pollution: It was noted that section 4.6 on pollutants mentioned the chronic toxicity of pipelines to fish. A participant asked what the process was and what was causing chronic toxicity to fish. The authors indicated that there are cumulative effects from seepage where old tenures exist, however, no pipelines exist in the area. Leeching of pipelines could be a future pressure. It was suggested that more wording could be added in this section to provide some more context for the cumulative and chronic impacts to the surrounding environment. A participant indicated that the impacts of future development and light pollution could be described and included in this section as well.

Climate change section: Two regional models and two climate change scenarios (Representative Concentration Pathway (RCP) 4.5 and 8.5) were used to compare projected climate change conditions across the OHGNZ and their impacts on groundfish community richness. The authors are adding analyses to include for the RCP 4.5 projections of changes in climate variables (temperature, aragonite, and oxygen), which were previously missing.

Revision table: The revision table was reviewed by the group and clarification was sought for some of the suggested revisions.

A participant noted that the review has revealed weakness in the proposed boundaries. Specifically:

- Cold seeps are identified as essential fish habitat in the USA. A reviewer will provide references to the authors to strengthen this section.
- Partial protection of ecological features such as seamounts is not part of the global best practice. Thus, the partial protection of the seamount in Zone 502 does not provide protection consistent with global best practice. References will be provided to the authors for this section.
- The Learmonth Bank proposed network zone does not protect the fish and coral habitat adjacent to the bank.
- The Tuzo Wilson Seamounts are not currently included in the OHGZ since they are just outside (3-5 nm) the boundaries of Zone 500.
- Prioritize the use of the high-resolution multibeam to collect bathymetric data in data poor zones.

Meeting demographics: Participants made the observation that there was a lack of participation from industry and environmental non-governmental organizations at the meeting. Members of the Centre for Science Advice Pacific (CSAP) office informed the group that a total of 52 participants (13 external participants including industry and ENGOs, 9 CHN partners, and 30 DFO participants) had been invited to the meeting. There was a discussion about the lack of

external participants attending the meeting. It was suggested that more diverse opinions from individuals working on the East Coast could be sought for future meetings.

Haida authorship: There was a lengthy discussion on how best to reflect the Haida partnership within the RPR process and its associated documents. The Research Document and the Proceedings are co-authored by DFO and CHN. In addition, participants would like co-authorship of the Science Advisory Report (SAR). The group decided that the first summary bullet of the SAR would provide the overarching tone to describe the co-creation and co-authorship of this co-lead project.

Haida logo: There was unanimous support to request co-authorship for the SAR and also the inclusion of the CHN logo on the co-produced publications. The members of the CSAP office agreed to forward this request to the national CSAS office. The Razor Clam co-management plan (DFO 2001) was provided as an example of a published document containing the Haida logo and co-authorship with DFO. The Haida Nation and DFO participants agreed that the Haida Nation should be equally recognized for their contribution to this project, and the inclusion of the CHN logo on the CSAS documents would be a step towards reconciliation from their perspective.

Haida language: It was requested by members of the CHN that the language authority review the report before it is submitted. Members of the CHN clarified that “Haida traditional knowledge” should be removed and replaced simply with “Haida knowledge”. It was also stated that the knowledge in this paper does not represent the sum of Haida knowledge. A member of the CHN explained the importance of the inclusion of the Haida language. To the Haida Nation, the inclusion of the Haida language in these documents is a form of reconciliation.

CONCLUSIONS

Meeting participants agreed the working paper satisfied all Terms of Reference objectives. The working paper was accepted with minor revisions.

RECOMMENDATIONS AND ADVICE

DRAFTING OF THE SCIENCE ADVISORY REPORT

One of the authors agreed to track changes on the draft Science Advisory Report (SAR) while it was being discussed with participants during the meeting. The SAR was discussed at length and participants had the opportunity to contribute to key sections. At the end of the meeting, a draft SAR was completed. The meeting Chairs will work with the authors to finalize the draft SAR. Once completed, the Centre for Science Advice Pacific (CSAP) office will circulate the draft SAR and draft Proceedings to all participants for final review and input.

REFERENCES CITED

- DFO. 2001. [Razor Clam](#). DFO Science Stock Status Report C6-15 (2001).
- Du Preez, C. and Norgard, T. 2022. [Identification of Representative Seamount Areas in the Offshore Pacific Bioregion, Canada](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2022/042. viii + 136 p.
- Du Preez, C., Skil Jáada (Zahner, V.), Gartner, H., Chaves, L., Hannah, C., Swan, K., and Norgard, T. In press. A Monitoring Framework for Sqaan Kinghlas-Bowie Seamount Marine Protected Area, British Columbia, Canada. DFO Can. Sci. Advis. Sec. Res. Doc.

ACKNOWLEDGEMENTS

The Centre for Science Advice Pacific (CSAP) congratulates the authors on a successful paper and appreciates the contribution from all participants. It is with deep respect and gratitude that we acknowledge the collaboration, the sharing of Indigenous Knowledge, and co-authorship of the Research Document with the Council of the Haida Nation. We thank the formal reviewers, Cherrisse Du Preez (DFO Science) and Lynn Lee (Gwaii Haanas Parks Canada) for their time and expertise for providing their formal reviews of the working paper. We would also like to thank Gudt'aawt'is Judson Brown and Janet Lochead for their support throughout the process as Chairs of the meeting.

APPENDIX A: TERMS OF REFERENCE

Biophysical and Ecological Overview of the Pacific Region Offshore Haida Gwaii Network Zones

Regional Peer Review – Pacific Region

November 8-9, 2022

Vancouver, British Columbia

Chairpersons: Janet Lohead and Gudt'aawt'is *Judson Brown*

Context

As a signatory of the Convention on Biological Diversity (CBD), Canada has committed to safeguarding biodiversity through "...equitably managed, ecologically representative and well-connected systems of protected areas..." (CBD 2011) and planning processes are currently underway in five priority bioregions. The Council of the Haida Nation (CHN) is responsible for the stewardship of "the lands and waters of the Haida Territories on behalf of the Haida Nation, and to perpetuate Haida culture and language for future generations" (CHN 2021). As signatories of [Reconciliation Framework Agreement for Bioregional Oceans Management and Protection \(RFA\)](#), the Council of the Haida Nation and Government of Canada, "...wish to advance a collaborative, coordinated and efficient approach to the governance, management, restoration and protection of oceans in the Pacific North Coast, including marine ecosystems, marine resources and marine use activities" (RFA 2018). The Northern Shelf Bioregion (NSB), located off the coast of British Columbia (BC), has been the focus of multiple marine planning initiatives over the past several years. Planning initiatives in the NSB include the [Pacific North Coast Integrated Management Area \(PNCIMA\)](#) plan, the Marine Plan Partnership (MaPP) and most recently the NSB Marine Protected Area (MPA) Network planning process. The MPA Network process is co-led by the Government of Canada, the Province of British Columbia, the CHN, and 17 other partner First Nations.

The boundaries of the seven zones (numbered 500 through 506) representing the Offshore Haida Gwaii Network Zones are a subset of the NSB MPA Network scenario sites and therefore contribute to the overall MPA Network goals and objectives. This makes this Biophysical Overview Report unique among most Biophysical Reports for several reasons:

1. these areas were identified as individual zones that work in complement with other potential individual MPAs to contribute to conservation objectives at the MPA Network scale (the first MPA Network at this stage in Canada);
2. network level ecological conservation priorities (E-CPs; Gale et al. 2019), cultural conservation priorities (C-CPs), and zone-specific conservation objectives have already been identified, a step that usually follows the Area of Interest Biophysical Report in an Oceans Act MPA establishment process; and
3. "activities of concern" or activities that may affect conservation objectives have already been identified by the MPA Network technical team. This allows this report to focus more specifically on these areas' contribution to the overall MPA Network, while also highlighting any zone-specific, or locally important ecological, cultural and physical components.

Potential Network Zones, including the Offshore Haida Gwaii sites, were identified by the Marine Protected Area Technical Team (MPATT) as part of the draft MPA Network scenario during the summer of 2021. These sites encompass offshore zones along the west coast of Haida Gwaii, running as far north as Fredrick Island down south to Cape St. James. The Offshore Haida

Gwaii Network Zones represent portions of the Dixon Entrance, Continental Slope, Transitional Pacific and Subarctic Pacific ecosections and capture portions of Ecologically and Biologically Significant Areas (EBSAs; Clarke and Jamieson 2006). EBSAs are areas within Canada's oceans that have special biological or ecological significance, as identified through formal scientific assessments (DFO 2004). This area also has high spiritual and cultural value, providing key seascapes and habitat for species significant to the Haida Nation, including groundfish and rockfish (Haida Marine Traditional Knowledge (HMTK) Participants *et al.* 2011). Some of the most notable features of the sites within the area are: high benthic heterogeneity (including trough, shelf, and slope habitats), a seamount, significant concentrations of coldwater corals, areas of high diversity and productivity for fish and invertebrate species, important foraging habitat for various seabird species, and distinctive oceanographic processes. The diversity of species and ecosystems contribute to the overall MPA Network objectives and help to ensure representation of all ecosystems in the NSB.

Fisheries and Oceans Canada (DFO) Oceans Program has requested that Science Branch provide a biophysical and ecological overview of the Offshore Haida Gwaii Network Zones as a first step in the regulatory process for MPA designation under the *Oceans Act*. The overview report will detail the key biophysical, ecological, and cultural attributes of the study area, especially as it pertains to potential conservation objectives and the overall MPA Network goals and objectives. A risk assessment will occur in a subsequent step in the process to establish a MPA under the *Oceans Act* (DFO 2022); therefore, it will not be part of this process.

The advice arising from this Canadian Science Advisory Secretariat (CSAS) Regional Peer Review (RPR) will assist managers in refining conservation objectives and area boundaries (if required) and will inform subsequent steps of the *Oceans Act* MPA designation process. The information contained within the report will also inform subsequent advice on monitoring indicators, protocols and strategies, identification of information gaps requiring further research, and the development of management and monitoring plans for the sites.

Objectives

The following working paper will be reviewed and provide the basis for discussion and advice on the specific objectives outlined below.

Bannar-Martin, Katherine H. Skil Jáada Vanessa Zahner, Kil Hltaanuwaay Tayler Brown, Burke, Lily, Hannah, Charles G., Hilborn, Andrea, Iacarella, Josephine C., Lok, Erika K., McDougall, Chris, Proudfoot, Beatrice, Robb, Carolyn K., Sastri, Akash R., Stacey, Cooper and Rubidge, Emily M. 2022. Biophysical and Ecological Overview of the Offshore Haida Gwaii Slope Network Zones. 2016OCN04a.

The objectives of the working paper are to:

1. Evaluate, describe, and map, where possible, the identified key biophysical and ecological features of the selected sites, including:
 - predominant and/or unique physical and biological oceanographic characteristics;
 - predominant, unique, and/or sensitive habitat features with a specific focus on habitats selected as conservation priorities for the MPA Network; and
 - ecologically and/or culturally significant species, and species of conservation concern with particular focus on species that occur in the area that were identified as cultural and/or ecological conservation priorities for the MPA Network process
2. Identify known areas of overlap with potential anthropogenic stressors and species and habitats of interest within the selected sites. Include sensitivity of species of known conservation concern, if available.

-
3. Identify key uncertainties and knowledge gaps as they pertain to the current understanding of the existing environment and species of interest within the selected sites, and recommend measures to address these gaps, where possible.

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document

Expected Participation

- Fisheries and Oceans Canada (Science, Fisheries Management, and Ecosystem Management)
- Council of the Haida Nation (Marine Planning Program, Haida Fisheries)
- Other governmental organizations (e.g., Environment and Climate Change Canada, Canadian Wildlife Service, Gwaii Haanas Parks Canada, Province of BC)
- Environmental Non-Government Organizations (e.g., Canadian Parks and Wilderness Society, World Wildlife Fund)
- Industry (e.g., Canadian Sablefish Association, Commercial Fisheries Caucus)
- Academia (e.g., University of Victoria)

References

- Clarke, C.L., and Jamieson, G.S. 2006. Identification of ecologically and biologically significant areas in the Pacific North Coast Integrated Management Area: Phase II – Final Report. Can. Tech. Rep. Fish. Aquat. Sci. 2686: v + 25 p.
- Convention on Biological Diversity (CBD). 2011. Strategic Plan for Biodiversity 2011-2020. IUNEP/CBD/COP/10/INF/12/Rev.1.
- Council of the Haida Nation (CHN). 2021. [Constitution of the Haida Nation](#).
- DFO. 2004. [Identification of Ecologically and Biologically Significant Areas](#). DFO Can. Sci. Advis. Sec. Ecosystem Status Rep. 2004/006.
- DFO. 2022. [Establishing new Marine Protected Areas](#).
- Gale, K.S.P., Frid, A., Lee, L., McCarthy, J., Robb, C., Rubidge, E., Steele, J., and Curtis, J.M.R. 2019. [A framework for identification of ecological conservation priorities for Marine Protected Area network design and its application in the Northern Shelf Bioregion](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2018/055. viii + 186 p.
- Haida Marine Traditional Knowledge (HMTK) Participants, J. Winbourne, and Haida Oceans Technical Team of the Haida Fisheries Program. August 2011. Haida Marine Traditional Knowledge Study Report Volume 2: Seascape Unit Summary. Council of the Haida Nation, Massett, B.C.

APPENDIX B: WORKING PAPER ABSTRACT

The Offshore Haida Gwaii Network Zones were delineated as part of the Northern Shelf Bioregion Marine Protected Area Network planning process and represent candidate areas of importance to protect by the network planning partners (Canada, the Province of BC, The Council of the Haida Nation and 16 other First Nations). This Biophysical and Ecological Overview summarizes the knowledge and existing data available on the ecosystems present within the seven zones. The report covers the physical and biological oceanography, ecological diversity, human use, and conservation value of the seven zones that make up the Offshore Haida Gwaii Network Zones. Data presented in this report incorporate information gathered in the data compilation step of the MPA network planning process, plus regionally specific data and knowledge. The information came from annual research surveys, expert opinion, ecological and oceanographic model outputs, published literature and local Haida knowledge. Key ecosystem components described within the report include complex benthic terrain, including one seamount, and high taxonomic diversity, including invertebrates, groundfish and elasmobranchs, **Xediit Siigaay xidid** *marine birds* and mammals. Furthermore, the report includes a synopsis of some predicted changes in the region under two climate change scenarios. The information presented here can be used further to inform the development of management and monitoring plans should the zones be established as a Marine Protected Area under Canada's Oceans Act.

APPENDIX C: WORKING PAPER REVIEWS

Written Review

Date: 31st October 2022

Reviewer: Cherisse Du Preez, Fisheries and Oceans Canada

CSAS Working Paper #: 2016OCN04a

Working Paper Title: Biophysical and Ecological Overview of the Offshore Haida Gwaii Network Zones

This is a knowledge review of the natural and human history of the seven Offshore Haida Gwaii Network zones. I commend the authors for the excellent co-production of the Research Document and the inclusivity of different ways of knowing.

To no fault of the authors, in my opinion, this Research Document is a perfect example of a CSAS process that could have been a technical report—especially if the work was supported by a workshop and/or survey for subject matter experts. There are no conservation priority recommendations or science advice provided/synthesized to review or debate. Pointing this out is part of a larger ongoing conversation. Still, it is an important piece of context because of how it affected my review: the only appropriate items I found I could genuinely review are questions related to data/information adequacy and accuracy.

1. Is the purpose of the working paper(s) clearly stated?

A specific statement of purpose for the Research Document is missing in that nothing is itemized that resembles the objectives provided in the Terms of Reference. The only place I could find a specific statement is in the abstract: “This Biophysical and Ecological Overview summarizes the knowledge and existing data available on the ecosystems present within the seven zones.”

2. Has the working paper fulfilled the ToR objectives?

The Research Document likely fulfills most of the ToR objectives, but as written, it is hard to assess this (see comment above re: missing ToR objectives). In addition, I found it difficult to find information on all the ecological considerations listed in the ToR, or the appropriate identification of “uncertainties and knowledge gaps” instead.

For example, information on uniqueness (related to the other zones, the region, and surrounding areas) is lacking as far as I can tell (ToR, Objective 1, points 1 and 2: “unique physical and biological oceanographic characteristics,” “unique sensitive habitat features,” and “ecologically... significant species” (which relates to uniqueness)). For example, SAUP 5494 Seamount is one of 65 seamounts in Pacific Canada but is ecologically unique for x, y, z (see below for details). Instead, Zone 502 is highlighted as the only one of the seven zones with a seamount; that is to say, the focus is the uniqueness of the zone in comparison to the other zones. If the objective is more to do with zone comparisons and not ecological uniqueness, it would be good to mention surrounding seamount MPAs (i.e., 3 seamounts offshore of Haida Gwaii in SGaan Kinglas-Bowies Seamount MPA and 47 seamounts south of Haida Gwaii in a future MPA).

3. Are the data and methods adequate to support the conclusions?

Yes, but there are some additional data sources the authors may want to consider adding.

- A. Benthic dive surveys (particularly valuable for addressing ToR objectives 1 and 2 re: “ecologically and/or culturally significant species, and species of conservation concern...” and “species and habitats of interest within the selected sites”).
- Adjacent to zones and within depth ranges of interest: 2000 DFO expedition ([Yamanaka 2005](#)). The expedition included video collection from a Delta submersible (Fig. 1), fishing sampling, oceanographic data, and marine seabirds and mammal observations. The [Yamanaka 2005](#) data report has a lot of information on fish species. The video of the benthic surveys is online through the DFO Pacific Region Biigle account (for online annotation).

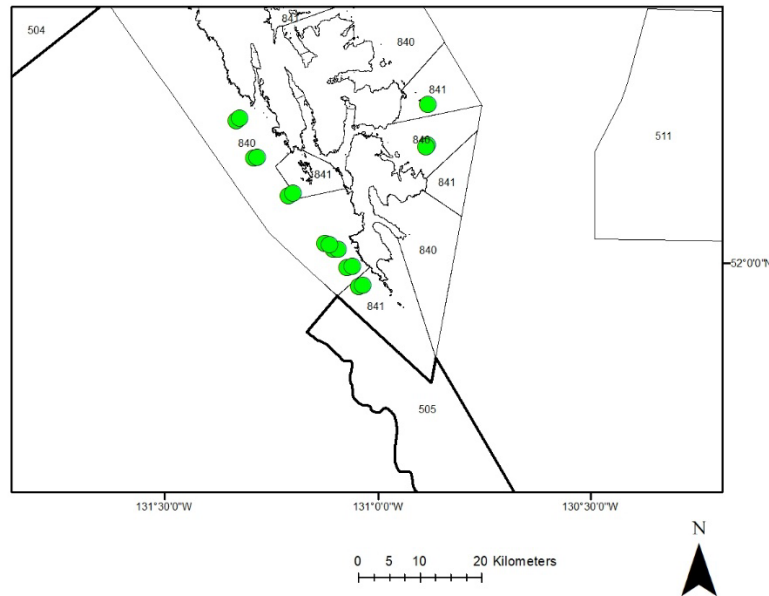


Figure 1. 2000 Delta submersible dives.

- Section 3.1.1 (Seamount) and Section 3.2.5 (2022 Observations at Sea): While the cruise report isn’t published yet, the 2022 Northeast Pacific Seamount expedition videos are openly available online, as are the dive annotations are. Key information about SAUP 5494 in Zone 502 should be summarized and added. For example, unlike almost all other seamounts DFO has explored in the past 5 years, SAUP 5494 was almost entirely covered in mud (Fig. 2) (i.e., little to no rocks, corals, or sponges, most of the transect). [This comes back to the uniqueness of the seamount; still more to come on this below]



Figure 2. Still frames from the first and only benthic survey on SAUP 5494 show the seamount is almost entirely covered in mud.

- While deep-sea surveys on the continental shelf and slope are rare, there have been several on the adjacent seamounts in recent years. Species on SGaan Kinghlas-Bowie (SK-B) and other offshore seamounts are a subset of those found on the continental slope. Several of the zones overlap the same depths as these seamounts. Therefore, the seamount species list can help fill knowledge gaps for the deep-sea areas within the zones (e.g., 771 taxa in [Du Preez and Norgard 2022](#); SK-B subset in [Du Preez et al. in process](#))
- B. The section on seamounts [3. Ecological setting: 3.1. Unique Ecosystems: 3.1.1. Seamounts]:
- [Du Preez and Norgard 2022](#) is the most up-to-date published information for Canadian Pacific seamounts, including details on SAUP 5494. This Research Document is not cited but it should be for information, including the shapefile and summit location (e.g., Figure 20). Ban et al. 2016 is very dated and the seamount count is wrong for multiple reasons. “Within the Pacific waters of Canada, 24 named seamounts (Ban et al. 2016) resulted from volcanic activity along the Cascadia subduction zone (Desonie and Duncan 1990).” There are 62 seamounts in Pacific Canada as of earlier this year ([Du Preez and Norgard 2022](#)), with another 3 discovered during the 2022 expedition. Therefore, 65 is our most recent count (the number (and names) officially submitted last month to the [ACUFN](#) and soon to be in the [CGNDB](#) and then GEBSCO).
 - SAUP 5494 was characterized in the Offshore Biophysical and Ecological Overview (DFO 2019). So this has been done before. However, little information from the 2019 report and the updated [Du Preez and Norgard 2022](#) CSAS are included here. For example, how unique SAUP 5494 is in Pacific Canada: one of the few “H2” seamounts (classification system), only one of 65 seamounts on the slope, the most nearshore...this has “stepping stone” implications (ecological importance); “flattest” of all the seamounts... implications for sedimentation and summit community... (makes sense why all the mud); relatively “threatened” (score: 7) with a low “existing knowledge (2); sablefish fisheries; inventory of species... seamounts effect (20 km EBSA boundary). In short, we know so much more about SAUP 5494 than summarized here.
 - There are no hydrothermal vents on SAUP 5494 seamount. There is no evidence of vents on any Canadian seamounts.
 - What is this citation to: “Northeast Pacific Deep-Sea Diversity Expedition Pac2022-035”? Suggestion: add linke to the online videos and dive annotations.
 - SAUP 5494 name = Sea Around Us Project. “SAUP 5494 Seamount” from an online seamount database (Census of Marine Life product) and was discovered as part of the “Sea Around Us Project (SAUP)” based at UBC, results published in Kitchingman et al.
 - The unusual situation of Zone 502 partially covering SAUP 5494 Seamount (Fig. 3): Protection of an entire seamount is more effective than partial closure (e.g., Clark and

Dunn 2012). A seamount ecosystem is an ecological unit with complex processes (e.g., self-recruiting limited habitat, spatially isolated, etc.). In addition, management measures for entire seamount features have higher compliance than partial features with fine spatial scale closures, especially in the case of deep-sea bottom fishing (e.g., setting trawl nets outside prohibited areas). Almost all seamount MPAs (in national waters and areas beyond national jurisdiction) protect entire seamount features.

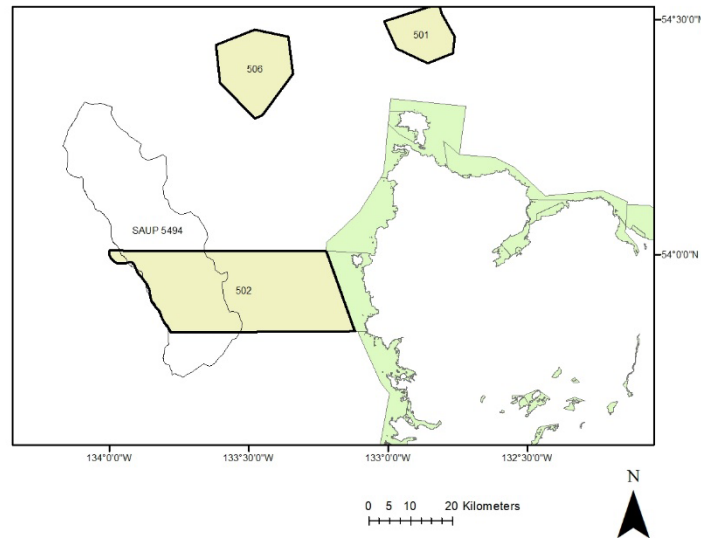


Figure 3. Unusual partial protection of a seamount, SAUP 5494 Seamount and Zone 502.

- C. The section on cold seeps [3. Ecological setting: 3.1. Unique Ecosystems: 3.1.2. Cold Seeps]:
- Mention depth range. Expected abundance and distributions (1000s on the continental slope and shelf) → not “rare” on our coast. And not just “deep sea” (as shallow as 100-200 m along our coast). Mention the types of chemosynthetic animals (e.g., the foundation species, tube worms, bivalves, etc.). Mention identified as EBSAs, important fish habitats, and areas of coral and sponge gardens.
 - Figure 21: misleading. Northern “confirmed cold seep” is in Alaska (show border?). Missing confirmed mud volcanoes (more information provided below). Mention the Hecate Strait confirmed seep (FY: the current polygons do not include this usually shallow-water and confirmed cold seep bioherm (with carbonate rocks; known impacts from bottom-contact fishing gear; [DFO 2018](#)).
- D. The section on Learmonth Bank [3. Ecological setting: 3.1. Unique Ecosystems: 3.1.3. Rocky Outcrops]:
- The current polygon for Zone 501 cuts off the southern tip of Learmonth Bank (Fig. 4).

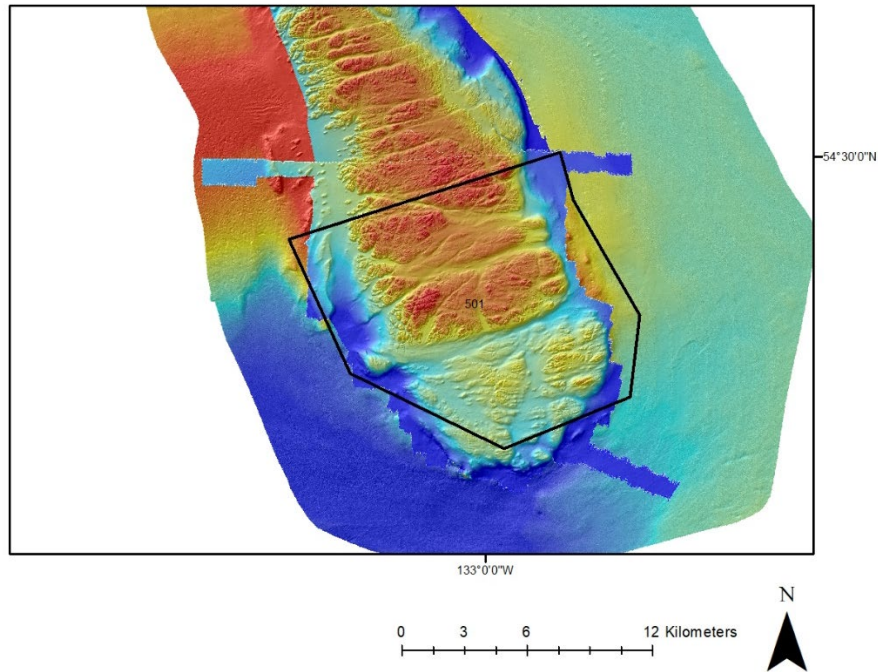


Figure 4. Learmonth Bank high-resolution multibeam and the Zone 501.

- The polygon has little to no buffer or representativity of the surrounding basin (Fig. 4) and, therefore, misses capturing the heavily fished basin (home to large erratics with massive coral that was shown to be the most ecologically important physical features, more so than the corals on the Bank itself; [Du Preez and Tunnicliffe 2011, 2012](#)) (Fig. 5).

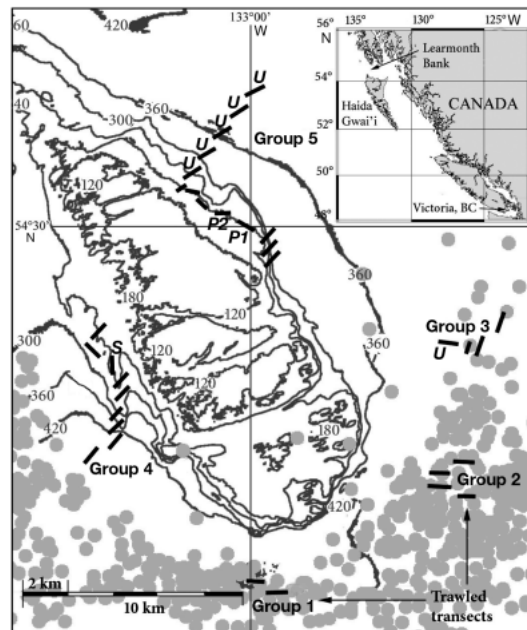


Figure 5. [Du Preez and Tunnicliffe 2011](#): trawl set locations (i.e., the bank is a natural refuge from fishing; rugged and avoided).

- An unresolved maritime boundary dispute (Gray 1997) results in almost zero fishing activity in the disputed area (Neves et al. 2014). Not according the bottom fishing map provided in this report (Figure 27). AND that's not the area within the Zone 501.
- Re: fishing: mention "sponge graveyard" (Neves et al. 2014) and entangled/lost fishing gear.
- Misleading: "fishing is limited in the area due to the ~~high density of corals and~~ rugose sea floor, which DFO-bottom trawl surveys avoid (Sinclair et al. 2005) [expensive damage to gear".
- Learmonth is characterized as a granite massif surrounded by large erratics and glacial till, that was exposed to glacial erosion and iceberg scour.
- "Using remotely operated vehicles to survey [Tsaan Kwaay Learmonth Bank](#), Du Preez and Tunnicliffe (2011) found that Shortspine thornyhead and rockfish species accounted for 78% of the demersal fish and randomly distributed over the sampled area with abundance decreasing with depth." Rockfish were not randomly distributed. Your very next sentence says otherwise (which is accurate).
- FYI: Du Preez and Tunnicliffe 2011 and Neves et al. 2014 is the same ROV research/annotation/database, which I created (I think the data is published and online too). On that note, I do have the 2008 video, full species annotation, and high-resolution multibeam and backscatter (should this not be part of Figre 9 map?).
- Include the habitat (biotope) map of Learmonth from [Neves et al. 2014](#)?

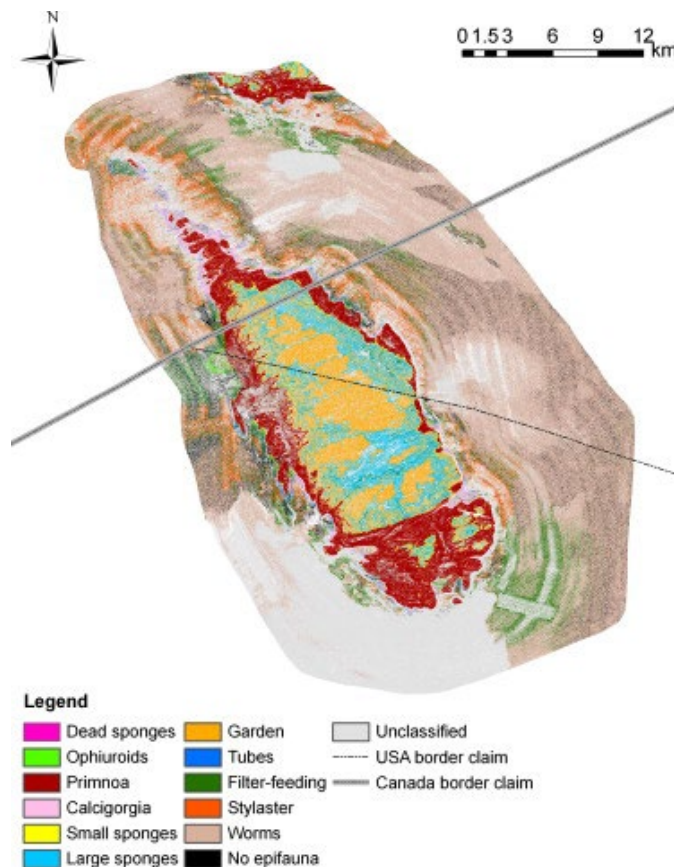
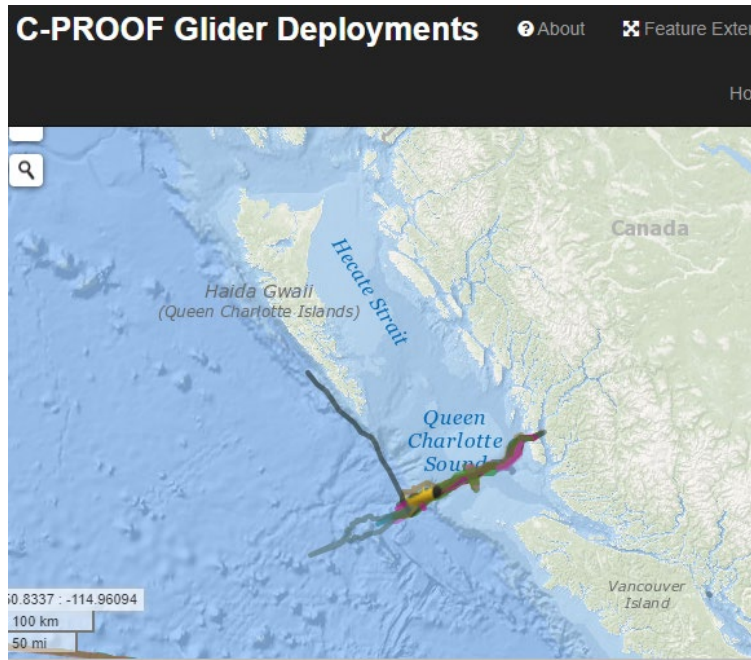


Figure 6. Biotope map of Learmonth Bank ([Neves et al. 2014](#)).

E. The section on High Rugosity Areas [3. Ecological setting: 3.1. Unique Ecosystems: 3.1.4. Biological...]:

-
- Seeking clarification: the rugosity metric used in this analysis was one of the metrics confounded by slope or not? The ACR rugosity metric is part of the ArcGIS BTM tool.
- F. Discuss the Ecological Importance of the Offshore Haida Gwaii Network Zones for offshore SGaan Kinghlas-Bowie Seamount MPA. While the Haida Eddies are listed as a feature of Zone 505, there is no discussion related to the likely connectivity of SGaan Kinghlas-Bowie and the Haida Gwaii (mechanisms: drift + Haida Eddies) and the ecological importance of the distant populations as part of the metapopulation (e.g., Southern Haida Gwaii populations are likely seeding the SK-B populations... implications for the MPAs related to “rescue” and “spillover” etc.). For example, SK-B Yelloweye rockfish are not genetically different from the coast ([Yamanaka et al. 2000](#)). This is a very important ecological feature of this zone.
- G. Glider Program as a data resource (particularly valuable for addressing ToR objectives 1 re: “physical and biological oceanographic characteristics”): There was a recent glider transect through zones 505 and 504—the data from which should help describe conditions (and/or ground-truthing satellite-based descriptions). Plus, there have been multiple glider missions just south of Zone 505 that could provide useful information (Fig. 7). Data openly available. For example, the deep scattering layer was so dense you can see the glider ascended detecting a false bottom (pers. comm. Tetjana Ross).



Figures

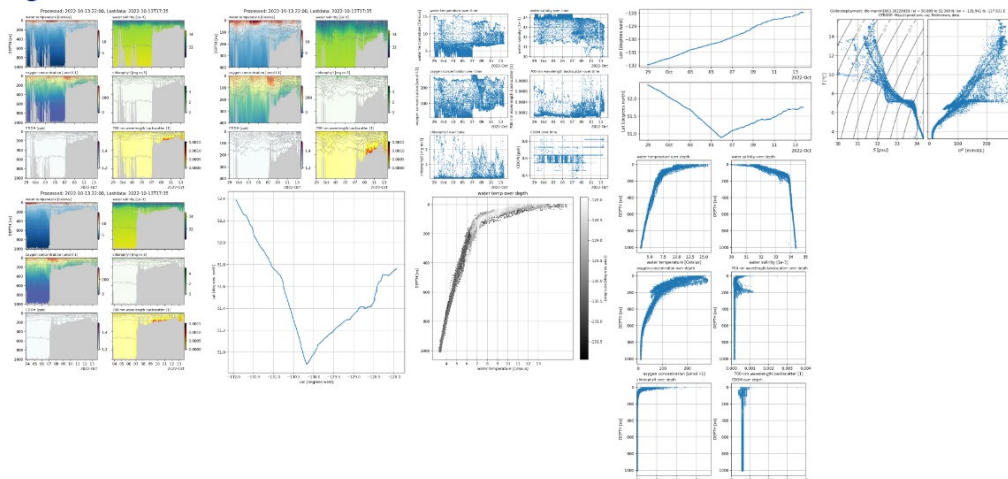


Figure 7. Map and data page for C-PROOF.

4. Are the data and methods explained in sufficient detail to properly evaluate the conclusions?

- A. I recommend providing a map of the NSB Network (inclusive of the seven zones) in the beginning for context.
- B. I personally regret not including any wildlife pictures in our “Overview... of the Offshore...”. I’d recommend adding at least one photo plate with examples of animals and biodiversity for the readers.

5. If the document presents advice to decision-makers, are the recommendations provided in a useable form, and does the advice reflect the uncertainty in the data, analysis or process?

There are no recommendations made in the Research document. The following are potential science recommendations in the SAR:

- A. The zones are not all mapped with high-resolution multibeam (see Figure 9).
Recommendation: prioritize mapping the zones.
- B. Very few visual surveys within the zones. Recommendation: prioritize visual surveys in the zones.
- C. Recommendation: repeated glider line?
- D. Recommendation: conservation considerations for cold seeps and Tuzo Wilson (see information below) (identify as missing in this network).
- E. If the intent of this overview really is to “Evaluate, describe, and map, where possible, the identified key biophysical and ecological... sensitive habitat features with a specific focus on habitats selected as conservation priorities... species of conservation concern” (i.e., ToR Objective 1) then this document should cover “important areas” and a descriptive version of the “ERAF” without the need for subsequent RSAs (similar to the Atlantic Region).
Recommendation: next steps for science.

6. Can you suggest additional areas of research that are needed to improve the working paper?

Other important areas adjacent to or within the region (add sections to the overview):

- A. Tuzo Wilson Seamounts: There are two seamounts on the continental slope, just **six km away** from the southern Zone 505 (Fig. 8). They are very likely (i) important ecological influences on the existing zones and (ii) stepping-stones (corridors) linking the zones to the Offshore Pacific Bioregion and its proposed MPA. In addition to their classification as Ecologically and Biologically Significant Areas (EBSAs; [DFO 2019](#)), the ecological importance and vulnerability of these seamounts were affirmed during the 2021 Northeast Pacific Seamount expedition. Benthic video surveys of these seamounts (B076 and B077 on SeaTube) revealed unique assemblages of carnivorous sponges, incredibly deep and dense forests of corals, and what appears to be an extremely productive nursery ground for the elusive Pacific White Skate (*Bathyraja spinosissima*). While there is an RSA in response to these findings, including these seamounts in the existing process would be a far more efficient method for protection. It is important to note that these seamounts are likely the only two left in Canada that have been fished and are still open to bottom-contact fishing, despite the intention that no seamounts in Canada are fished. The current fishing footprint overlaps the coral forest and skate nursery ground.

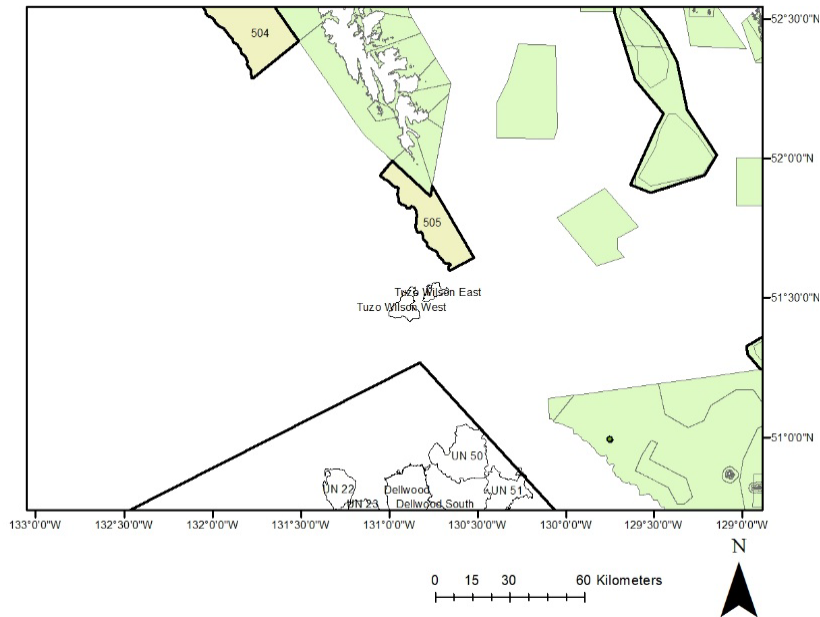


Figure 8. Tuzo Wilson seamounts in between the NSB MPA network and the offshore MPA (6 km south of Zone 505).

B. Mud volcanoes and other seeps: There is a visually confirmed mud volcano and multiple seep flare observations between Zone 504 and 505, and adjacent to Zone 502 and 506 (Fig. 9). With regards to representativity, the zones fail to capture any known or suspected cold seeps—chemosynthetic habitats with endemic animals ([EBSAs](#)) known to occur in the NSB, along the shelf and slope).

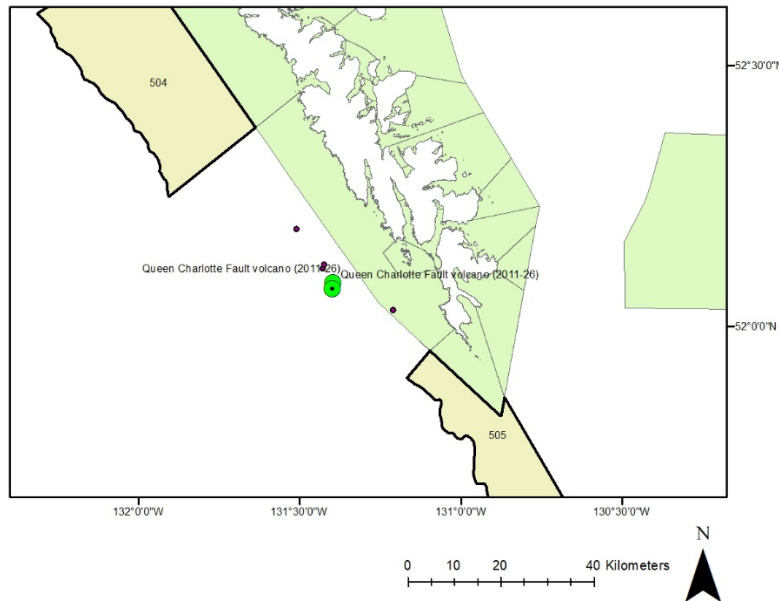


Figure 9. Zones fail to capture any confirmed seeps or observed flares.

Additional comments for authors

A. Incorrect or dated information:

- Do not cite a SAR for research information when the Research Document is published.
- 2.2.4. Water Properties: In the oceanography section, for the Ross et al. 2020 paragraph: add mention that these are climate change impacts.
- 4.6. Pollutants: add disregarded/lost fishing gear (ghost fishing and habitat alteration).

B. Formatting issues in the working paper word doc:

- In-text citations are replaced with “ERROR...”
- Spacing issues: large blank spaces and blank pages following open parentheses (I believe these are associated with in-text citations again)
- Figure 11 appears five times
- Figure 11: inset table of contents: black text over dark green is tough to read, especially when printed
- Figure 12 appears three times
- The information provided in Table 1 about the Haida names should be provided as a footnote the first time the formatting appears (i.e., Haida names are in bold, blue indicates *Xaad kil*, green indicates *Xaayda Kil*, and English names are in italics).
- The Haida name formatting (explained above) is not consistently used within the text (e.g., in table and figure captions and in Lists of Table and Figure)
- Clark and Jamieson **2066**
- “cold water coral” vs “**cold-water coral**”

Written Review

Date: 08 November 2022

Reviewer: Lynn Lee, Parks Canada Gwaii Haanas

CSAS Working Paper #: 2016OCN04a

Working Paper Title: Biophysical and Ecological Overview of the Offshore Haida Gwaii Network Zones

The authors and others involved have done a colossal amount of work pulling the background information together, and synthesis of that knowledge necessary to inform this work! Congratulations to all of the authors for that achievement!

Special kudos to the DFO-CHN team for a very collaborative effort between the CHN and DFO, and within DFO sections and among federal government organizations to develop and write the paper and to collaborate on delivering cooperatively at the CSAS process!

All of the comments following and in the document are meant to try and help improve readability and utility of the paper for providing evidence that supports the importance of the offshore network zones in relation to the MPA network for the NSB, and help provide information that is relevant to managers and decision-makers in planning for implementation, management, research and monitoring of these areas.

General overall comments:

- Much of the paper provides appropriate level and readability of information that would be necessary to support conclusions
- Overall more information needed in some taxonomic sections to support developing and including conclusions to address purpose of paper:
 - Why these offshore zones are particularly important to conservation priorities
 - Specific contributions of each zone to OHGNZ overall, and NSB MPA network structure and connectivity
- Excellent synthesis of climate change and conservation significance in Section 5 to wrap up overall bio-cultural-physical knowledge and potential implications of climate change
- Very helpful summary table at the end of the paper (needs additional human use highlights & more focus on ecological values that are particularly significant to the offshore network zones)
- Useful appendices

1. Is the purpose of the working paper(s) clearly stated?

The purpose of the paper should be more clearly stated up front in the document.

Suggest adding a short section succinctly describing the purpose of the working paper before the current Section 1.3 called something like 'Purpose of Report'. Include how the paper will address the following from the TOR, so that readers know what to expect:

- *Contribute to the overall MPA Network goals and objectives.* Which MPA network goals and objectives are these contributing to and how in a broad sense?

-
- *Detail the key biophysical, ecological, and cultural attributes of the study area, especially as it pertains to potential conservation objectives and the overall MPA Network goals and objectives.* What kind of information out of the mountain of available knowledge and data will be detailed and highlighted to meet the objectives?
 - *Focus more specifically on these areas' contribution to the overall MPA Network, while also highlighting any zone-specific, or locally important ecological, cultural and physical components.* How will values in the individual zones be evaluated to determine their contributions to the OHGNZ overall and to the larger MPA network in the NSB as a whole, in terms of ecological, cultural and physical components?

In addition to the primary purpose of the report, the summary of this section should also briefly highlight the utility of this report as a basis to inform management, research and monitoring, and any other potential uses.

2. Has the working paper fulfilled the ToR objectives?

The following key objectives are stated in the ToR. These objectives are copied below with comments on the extent to which they have been met.

In general, evaluation in the form of a synthesis by section of what all of this knowledge means, or can be extrapolated to mean, for connectivity among individual OHGNZ, and contributions of individual and collective OHGNZ to meeting conservation objectives for the MPA network as a whole should be included. For the most part, this seems to be missing from most sections of the report. These syntheses would arguably be some of the most valuable pieces of information that would contribute to communicating the importance of these zones to the larger network to managers, decision-makers and interest holders, and to informing future management, research and planning.

1. Evaluate, describe, and map, where possible, the identified key biophysical and ecological features of the selected sites, including:

- *predominant and/or unique physical and biological oceanographic characteristics;*

These characteristics have been well-described in terms of conditions and available trends for the area overall and specific to each zone where possible. Where possible, maps should show the characteristics along with boundaries of each zone to visualize what the zones each represent in the context of the larger area, similar to Figure 11. Other figures such as Figs. 8 and 9 would benefit from including the zone boundaries. More explicit evaluation of the information to provide a synthesis of the characteristics and their relevance and contributions to MPA network objectives as generally described above would be important to highlight.

See document for other specific comments.

- *predominant, unique, and/or sensitive habitat features with a specific focus on habitats selected as conservation priorities for the MPA Network; and*

Some of these characteristics are well-described (Seamounts, Cold Seeps, Rocky Outcrops) and others are not as well- described (Biological Communities of the Continental Shelf and Slope, High Rugosity Area). The overall organization of the latter sections is a bit less clear with inconsistent subsections and numbering that make it harder to follow. The Rocky Outcrops section would benefit from a map of these habitat areas with zone boundaries included.

In general for Section 3.1.4 Biological Communities of the Continental Shelf and Slope, this section is lacking in sufficient information and does not provide much support for why these areas generally are biologically important, and what the specific contributions of each zone are to network structure and connectivity. More specific rationale should be provided here.

See document for other specific comments.

- *ecologically and/or culturally significant species, and species of conservation concern with particular focus on species that occur in the area that were identified as cultural and/or ecological conservation priorities for the MPA Network process.*

In general, much of the Taxonomic Diversity section contains a lot of facts and information, but they are not necessarily expressed in a cohesive way that leads to understanding the importance of these zones individually or collectively to the significant species and species groups. The importance of these zones in linking to the overall ecological function of the network is also not clearly articulated.

To improve this, the writing overall could be more succinct and focus on the knowledge that is particularly relevant to linking the importance of the zone/OHGNZ/MPAnetwork in the NSB to the ecological and life history functions of the species and species groups being discussed. Some of the sections do a better job of focusing this information, such as the table in the cetacean section that highlights the ecological function/habitat use for each of the zones where this information is known. Suggest that where known, adding ecological function/habitat use for the similar table in other sections like for Fish would be very helpful.

Section highlights:

- Invertebrates section generally includes the relevant information, with specific comments/tracks in the document
- Marine birds section particularly good example for content and structure for this section that may be helpful for re-structuring how many Fish and Marine Mammal sections are written
- Reptile (Turtle) section also well-written with informative associated map, although with much less knowledge and data available
- Fish & Marine Mammal taxonomic sections are where the most significant revisions are recommended; A few maps of key features and overlap with zone boundaries would be very helpful to visualize relevance of zones to those features.

Fish section revision highlights:

- Consider whether document should use 'fish' or 'fishes' throughout when referring to plural of groups of fish that include more than one species (e.g., fish vs fishes generally, rockfish vs rockfishes, flatfish vs flatfishes)
- Suggest using the term 'population' instead of 'stock' wherever possible
- Recommend integrating data sources into the appropriate places in the text rather than as a separate section
- Simplify Fish groupings into (1) Groundfish, and (2) Pelagic Fish, with subgroupings under those (e.g., Groundfish subgroupings – Flatfish; Rockfish; Sharks, Skates & Ratfish; Other groundfish)
- Highlight relevant details for key fish species under the two broad subgroupings
- Focus on ecological significance of zones to species - spawning areas, rearing areas, connectivity corridors for life history stages, etc.
- Focus synthesis information on: (1) life history traits as they relate to habitat use in offshore zones, adjacent protected areas, and NSB overall, (2) roles and ecological use/contributions specific to different life stages and in relation to significance of habitats and features in the

zones and adjacent areas, and (3) particular knowledge gaps as they relate to species or species group conservation and the offshore zones

- Rockfish section generally needs more information about what is known and not known about range of rockfish movement, larval dispersal, and genetic diversity along the coast for different groups of species (based on life history traits), to highlight relevance of network to their conservation
- Suggest using marine birds section as model for 'Groundfish' and 'Pelagic Fish' groupings (or other preferred fish grouping)

Marine Mammal section revision highlights:

- Recommend integrating data sources into the appropriate places in the text rather than as a separate section
- Suggest Marine Mapping groupings into (1) Baleen Whales, (2) Toothed Whales, and (3) Pinnipeds
- Highlight relevant details for key cetacean and pinniped species under the three broad groups; Discussion of beaked whales should be included in toothed whales section since they use offshore habitats (even if there have been no observations of them in the zones, since beaked whale observations are rare and few surveys happen in most of the zones)
- Nice to have information on ecological significance of zones to species where available in the associated table
- Focus synthesis information on: (1) life history traits as they relate to habitat use in offshore zones, adjacent protected areas, and NSB overall, (2) roles and ecological use/contributions in relation to significance of habitats and features in the zones and adjacent areas, and (3) particular knowledge gaps as they relate to species or species group conservation and the offshore zones
- Suggest using marine birds section as model for each of the three groupings

Ecological Sensitivities, Resilience and Recoverability

- Add brief introductory paragraph to define these terms and how they should be interpreted for the purposes of this report, and how the section is organized, before getting into each species group
- It strikes me that most of the text included does not directly address sensitivities, resilience and recoverability. Most of the text is probably a better fit for the human use section below.
- Some of the information such as inherent life history characteristics of some groups that make them more sensitive to disturbance does fit here.
- This section and subsections generally need to address the topic of the section. If there is not much specific information about each of the species groups specific to sensitivities, resilience and recoverability, this section could more generally discuss the characteristics that make species, habitats and ecosystems more or less sensitive or resilient to different types of disturbance, and more or less recoverable after different types of disturbances.
- See comments about the marine bird paragraphs, which seem more in line with what is needed for this section.
- Be consistent in use of Fish grouping between this and taxonomic diversity section for Fish

See document for other specific comments.

2. Identify known areas of overlap with potential anthropogenic stressors and species and habitats of interest within the selected sites. Include sensitivity of species of known conservation concern, if available.

Objective met for most of Section 4 on Human Use; Maps of features with offshore zone boundaries are very useful

Section 3.2.6, Sensitivities, needs more work. Suggest that much of information here on impacts of human activities be moved into appropriate parts of Section 4.

Specific notes for Section 4:

- Add intro paragraph at start of section to cover scope of section
- Add brief intro to Fisheries Activities section - include traditional fisheries here?
- Add paragraph about expected impacts of potential future industrial developments
- Add light pollution issues
- Are conservation levels for mid-water and bottom trawl really the same?
- Add summary synthesis paragraph
- Errant PMZ Table in my version of the word document – recommend it gets placed in Section 1 of the report for context and close to context for Fig. 4B
- Include paragraph on future expected and potential vessel traffic increases from developments and expansions on the north and central mainland BC coasts, such as developing and potential LNG, shipping ports, oil refineries, etc, and what implications this might have for the OHGNZ

3. Identify key uncertainties and knowledge gaps as they pertain to the current understanding of the existing environment and species of interest within the selected sites, and recommend measures to address these gaps, where possible.

- Objective partially met
- Key uncertainties addressed throughout
- Some knowledge gaps identified
- Further identification of priority gaps that should be filled to advance understanding of zones for implementation, management, research, and monitoring still needed
- Recommendations for priority research to address key knowledge gaps would be helpful

3. Are the data and methods adequate to support the conclusions?

Very significant amount of background information compiled and presented!

Specific additional data synthesis required to support and develop conclusions more fully

- In many sections, evaluation in the form of information synthesis required to develop conclusions that consider:
 - Why are these offshore zones particularly important to various conservation priorities?
 - What are specific contributions of each zone to OHGNZ overall, and NSB MPA network structure and connectivity?

4. Are the data and methods explained in sufficient detail to properly evaluate the conclusions?

Yes, for most of the paper!

Specific additional explanations for data and methods required

- Specified throughout working paper as comments or tracked changes
- Additional work needed to support and develop conclusions more fully
 - Why are these offshore zones particularly important to various conservation priorities?
 - What are specific contributions of each zone to OHGNZ overall, and NSB MPA network structure and connectivity?

5. If the document presents advice to decision-makers, are the recommendations provided in a useable form, and does the advice reflect the uncertainty in the data, analysis or process?

Yes where recommendations provided, particularly in Section 5, Climate Change and Conservation

- Most sections present sufficient and appropriate knowledge that can support conclusions

Some sections need further work, such as the taxonomic sections for Fish and Marine Mammals

- Specific further recommended work highlighted in review of Taxonomic Groups section and throughout the paper and in comments above

6. Can you suggest additional areas of research that are needed to improve the working paper?

Comments and suggestions tracked throughout the paper!

APPENDIX D: AGENDA

DAY 1 - Tuesday, November 8, 2022

Time	Subject	Presenter
0900	Introductions & Territory Acknowledgements Review Agenda & Housekeeping CSAS Overview and Procedures Review Terms of Reference	Co-Chairs
0930	Oceans Presentation – Biophysical Overview Report Request for Science Advice and Information	Client
0940	Presentation of Working Paper	Co-Authors
1030	Break	
1045	Clarifying Questions	Authors
1115	Overview Written Reviews	Co-Chairs + Reviewers & Authors
12:00	Lunch Break	
1300	Overview Written Reviews continued	Co-Chairs + Reviewers & Authors
1330	Identification of Key Issues for Group Discussion	RPR Participants
1445	Break	
1500	Discussion & Resolution of Technical Issues	RPR Participants
1630	Discussion & Resolution of Results & Conclusions	RPR Participants
1700	Adjourn for the Day	

DAY 2 - Wednesday, November 9, 2022

Time	Subject	Presenter
0900	Introductions Review Agenda & Housekeeping Review Status of Day 1	Co-Chairs
0915	Develop Consensus on Paper Acceptability & Agreed upon Revisions (TOR objectives)	RPR Participants
1030	Break	
1045	<i>Science Advisory Report (SAR)</i> Develop consensus on the following for inclusion: <ul style="list-style-type: none">• Summary bullets• Sources of Uncertainty• Results & Conclusions• Figures/Tables• Additional advice to Management (as warranted)	RPR Participants
1200	Lunch Break	
1300	<i>Science Advisory Report (SAR) cont'd</i>	RPR Participants
1445	Break	
1500	Next Steps – Chair to review <ul style="list-style-type: none">• SAR review/approval process and timelines• Research Document & Proceedings timelines• Other follow-up or commitments (<i>as necessary</i>)	Co-Chairs
1645	Other Business arising from the review	Co-Chairs & Participants
1700	Adjourn meeting	

APPENDIX E: LIST OF PARTICIPANTS

Last or Indigenous Name	First or English Name	Affiliation
Anderson	Erika	DFO Centre for Science Advice Pacific
Ban	Natalie	University of Victoria
Bannar-Martin	Katherine	DFO Science
Bluteau	Cynthia	DFO Science
Gudt'aawt'is	Judson Brown	Council of the Haida Nation
Du Preez	Cherisse	DFO Science
Dunham	Jason	DFO Oceans
Gauthier	Stephane	DFO Science
Guujaaw	Niisii	Council of the Haida Nation
Hannah	Charles	DFO Science
Hilborn	Andrea	DFO Science
Iacarella	Josephine	DFO Science
Kil Hltaanuwaay	Taylor Brown	Council of the Haida Nation
Kosziwka	Kerri	DFO Science
Lee	Lynn	Gwaii Haanas Parks Canada
Lessard	Joanne	DFO Science
Leus	Dan	DFO Fisheries Management
Liu	Amy	DFO Science
Lothead	Janet	DFO Science
Lok	Erika	Environment and Climate Change Canada - Canadian Wildlife Service
McDougall	Chris	Marine Protected Areas Technical Team
Gwiisihlgaa	Dan McNeill	Council of the Haida Nation
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O	Miriam	DFO Science
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Richardson-Deranger	Lindsay	DFO Oceans
Robb	Carrie	DFO Science
Rubidge	Emily	DFO Science
Sastri	Akash	DFO Science
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Gartner	Heidi	DFO Science
Ross	Tetjana	DFO Science