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**Pacific Region**

**Proceedings of the Pacific regional peer review on the proposed monitoring framework for S<sub>G</sub>aan K<sub>I</sub>ngh<sub>L</sub>as-Bowie Seamount Marine Protected Area, British Columbia, Canada**

**May 3-5, 2022  
Virtual Meeting**

**Chairperson: Sarah Dudas  
Editor: Jill Campbell**

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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 May 3-5, 2022 via the online meeting platform Zoom. The working paper presented for peer review focused on providing science advice related to indicators, protocols, and strategies for monitoring the SGaan Kinghlas-Bowie Seamount Marine Protected Area (SK-B MPA).

Due to the COVID-19 pandemic, in-person gatherings have been restricted and a virtual format for this meeting was adopted. Participation included DFO Science, Oceans, and Fisheries Management staff and Council of the Haida Nation (CHN) staff as well as representatives with relevant expertise from Gwaii Haanas Parks Canada, National Oceanic and Atmospheric Administration (NOAA), and academia.

Meeting participants agreed the working paper satisfied all Terms of Reference objectives. The working paper was accepted with minor revisions. The conclusions and advice resulting from this review will be provided in the form of a Science Advisory Report providing advice to the SK-B MPA Management Board (representing the Haida Nation and the Government of Canada) to develop recommendations for a SK-B ecological monitoring plan in support of the SK-B MPA conservation objectives.

The Science Advisory Report and supporting Research Document will be made publicly available on the [Canadian Science Advisory Secretariat](#) website.

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## INTRODUCTION

A Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat (CSAS) Regional Peer Review (RPR) was held on May 3-5, 2022 via the online meeting platform Zoom to review the working paper on science advice related to indicators, protocols, and strategies for monitoring the SGaan Kinghlas-Bowie Seamount Marine Protected Area (SK-B MPA).

The Terms of Reference (TOR) for the science review (Appendix A) were developed in response to a request for advice from DFO Oceans (on behalf of the SK-B MPA Management Board). Invitations to the science review and conditions for participation were sent to DFO Science, Oceans, and Fisheries Management staff and Council of the Haida Nation staff as well as representatives with relevant expertise from Gwaii Haanas Parks Canada, New South Wales Government, National Oceanic and Atmospheric Administration, environmental non-governmental organizations, and academia.

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

*Du Preez, Cherisse, Skil Jáada (Zahner, Vanessa), Gartner, Heidi, Chaves, Lais, Hannah, Charles, Swan, Kelly, and Norgard, Tammy. 2022. A Monitoring Framework for SGaan Kinghlas-Bowie Seamount Marine Protected Area, British Columbia, Canada. CSAP Working Paper 2016OCN03.*

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

The Chair reviewed the Agenda (Appendix C) and the Terms of Reference for the meeting, highlighting the objectives and identifying Jill Campbell as the Rapporteur for the review. The Chair then reviewed the ground rules and process for exchange, reminding participants that the meeting was a science review and not a consultation. 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, 39 people participated in the RPR (Appendix D).

Participants were informed that Andrew Cooper (DFO Science), Niisii Guujaaw (Council of the Haida Nation), and Kate Thornborough (New South Wales Department of Primary Industries - Fisheries) had been asked before the meeting to provide detailed written reviews of the working paper to facilitate the peer-review process.

The conclusions and advice resulting from this review will be provided in the form of a Science Advisory Report to the SK-B MPA Management Board to develop recommendations for an ecological monitoring plan in support of the SK-B MPA conservation objectives. The Science Advisory Report and supporting Research Document will be made publicly available on the [Canadian Science Advisory Secretariat](#) website.

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## GENERAL DISCUSSION

Following a presentation by the authors, the reviewers, Andrew Cooper (DFO Science) and Niisii Guujaaw (Council of the Haida Nation) shared their comments and questions on the working paper. Since Kate Thornborough (New South Wales Department of Primary Industries - Fisheries) was unable to attend the meeting, Sarah Dudas read her written review to the meeting participants. The authors were given time to respond to the reviewers before the discussion was opened to all participants. This proceedings document summarizes the discussions that took place by topic, where points of clarification presented by the authors in their presentations and questions and comments raised by the reviewers and participants are captured under the appropriate Working Paper section headings.

Participants commended the authors on the breadth of the monitoring framework, highlighting the complexities of pulling together the information into one cohesive and detailed document. It was discussed that the framework provides a strong foundation on which to develop a monitoring plan for the SK-B MPA and with theoretical application to other MPA processes. Participants were also supportive of the collaborative, co-authored nature of the document highlighting the strength of co-management of the MPA. It was noted that the document was improved by integrating informative figures and Indigenous art.

### SECTION 1: INTRODUCTION

**Framework terminology:** A participant struggled with how the term ‘monitoring framework’ was defined in this working paper. They provided some historical context to how the term has been applied within DFO outside of Pacific Region, stating that some previous monitoring frameworks laid out specific indicators and outlined how the data could be collected. The participant contrasted ‘monitoring framework’ to ‘monitoring plan’ which they understood to be funded programs with specific details on where and when the monitoring would occur and how it would be carried out. The participant thought the framework presented by the authors was distinct from these two terms. Another participant mentioned that the next step in the broader process is to develop a monitoring plan and that this plan will recommend the specific indicators to monitor and the strategies that will be used. Those recommendations will be backed up by statistical power analyses and budgetary considerations. The authors indicated they reviewed previous research and existing DFO publications and policies when outlining their work to ensure consistency as this type of monitoring framework is new for the Pacific region. The authors indicated they aligned their framework to the recently published national framework for monitoring cold-water coral and sponge protected areas (DFO 2021) and included the definition used in the glossary. The authors also indicated that they did limit the options presented to those that were most suitable to seamount monitoring in the Pacific region. The authors will add more information to the term ‘monitoring framework’ in the glossary to present the historic context around this term. The terminology in the proceedings document reflects use by participants at the meeting, however, there was confusion surrounding some definitions, which the Research Document will address in the glossary. Additionally, during the Science Advisory Report (SAR) development specific monitoring recommendations to managers were developed and the authors will include these in the Research Document.

### SECTION 4: ECOLOGICAL MONITORING INDICATORS AND METRICS

**Ecosystem function terminology:** It was unclear to a participant if this term was defined at the seamount level (function, singular) or at the individual species level (functions, plural). The participant asked the authors to clarify if they propose monitoring how the seamount contributes to the broader ocean function, how the seamount ecosystem is functioning, or how specific species or groups of species contribute to the overall ecosystem. The authors acknowledged

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the nuance of the term is important to clarify and will provide clear definitions of ecosystem, ecosystem function, and trophic structure in the glossary and ensure their use of the terms are consistent throughout the Research Document. The term ecosystem function will be removed from Tables 3-6 under the ‘Strength’ column since all biological components contribute to the ecosystem function for the seamount.

**Indicator and metric terminology:** A participant mentioned that all metrics were presented as equal, yet some metrics are measured and some are derived from the measurements. A participant also highlighted that metrics should be measurable. Metrics such as the abundance of corals is measurable, however, ecosystem health is not directly measurable. The authors were encouraged to think about which data are considered ‘core data’ and which indicators or metrics require those core data to be generated. It was discussed that the use of the term indicator may not be consistently applied in this field and in some instances referred to metrics. A participant indicated ongoing work they are doing to provide consistent, agreed-upon definitions for some of these terms (e.g., indicator, attribute, metric). This participant will share their working definitions with the authors to aid in their reflection on their work. The authors will consider reorganizing Tables 3-6 to note the relative importance/measurability of each metric, provide supporting text in the Research Document to indicate if metrics are measured or derived, and ensure consistent use of their terminology.

**Patch dynamics for fish:** A participant requested more clarity on how patch dynamics were interpreted in the context of fish in Table 5. They indicated that many fishes are depth distributed and there are ontogenetic changes in distributions with depth. They were not sure patch dynamics were suitable metrics for fish. The authors indicated they intended to apply consistent wording for metrics across all indicator groupings. They noted that “patch dynamics” are usually termed “population” metrics when it comes to fish. In the case of fish, patchiness is a derived, scale-dependent metric, it is determined by models which are influenced by the scale of the data. As models are updated over time, it will be challenging to determine if changes are due to the models or the fishes.

**Environment and stressor metrics:** A participant was uncertain how substrate/grain size and sedimentation rate were able to inform coral and sponge fitness and mortality. There was also some confusion by the manner in which the table was formatted across the two pages. The authors indicated that if a coral settles on a rock in an otherwise sandy area, it may influence the life history traits that would be observed for that individual. Sediment resuspension was contextualized in terms of adjacent resource extraction/mining increasing the deposition of sediment and other particles. The authors will ensure appropriate clarity in the text and ensure the tables in question accurately reflects the text.

## **SECTION 5.1: TOOLS**

**Limitations of non-extractive survey tools:** Participants noted that the use of broad-scale extractive surveys is against the conservation objectives within the SK-B MPA. Not having data generated from broad-scale extractive surveys will limit the ability to understand certain metrics such as: Sablefish abundance, fish condition and age composition, genetic samples for taxonomic resolution or developing an eDNA database, and gut contents/isotopic data to understand the trophic structure. Historic data from surveys or fisheries may exist, but future analyses would need to be conducted to see how these data compare to data collected using different technologies. The authors will be more explicit in the text about the limitations of sampling tools and the data that can be obtained.

**Technological advances:** A few participants spoke on how quickly the technology and tools to monitor deep seamount habitats are rapidly evolving. They expressed concern that this

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framework will quickly become out of date. Aspects of the ecosystem that are challenging to monitor currently may become more accessible in the future. The authors noted that by indicating which core data are needed, future readers can determine which of the tools available to them are most appropriate to use.

### **SECTION 5.3: MONITORING METHODOLOGIES**

**Lack of reference/control site:** It was discussed many times that SK-B is unique and cannot be directly compared to other seamount or coastal shelf ecosystems. The lack of comparable reference or control sites makes it challenging to determine how conservation and protection measures have affected seamount ecosystems. SK-B is the most studied seamount off the west coast of Canada, and therefore, the historic data can be useful in determining the effectiveness of conservation efforts, however, this might not be the case for other seamounts. An author noted that even on Cobb seamount, which shares many of the same characteristics as SK-B, the rockfish communities were dissimilar. A few participants suggested looking to the coastal shelf ecosystem as a comparison since fishing is still ongoing in many areas along the coast, however other participants indicated that the ecosystems and the historic fishing pressures are too dissimilar to use the coastal shelf as a reference/baseline for SK-B. For example, the extensive brittle star mats on offshore seamounts are not observed on the continental slope and shelf. As well, since many protected areas are becoming so large, control sites simply do not exist. This lack of reference sites means monitoring the SK-B MPA will need to be continuous. The authors will add text to capture these comments.

**Before-After Control-Impact survey design:** The effectiveness of before-after control-impact (BACI) survey design was discussed at length. It was widely agreed that BACI survey designs are flawed (Hurlbert 1984; Wilding et al. 2015; Perkins et al. 2018; Perkins et al. 2020). Some participants wanted to see this survey design mentioned as being ineffective, especially for seamounts where control sites are unachievable. They thought that by mentioning BACI in this context it will prevent future researchers or stakeholders from going down this survey 'dead end'. Other participants cautioned the authors from including it at all since statistical considerations are out of scope and the paper is already complex enough. Another participant indicated work they have done to review BACI-like survey designs and instances in which they can yield valuable information. The authors will briefly mention that BACI survey designs are not suitable for seamount monitoring.

**Marine Traditional Knowledge:** Haida Marine Traditional Knowledge was discussed as having the potential to provide baseline context for SK-B MPA. There are extensive protocols in place to access this sensitive information, and the interviews with Haida Elders and knowledge keepers (and the corresponding spatial data) were not explored in the context of this working paper. The authors will ensure the Haida Marine Traditional Knowledge study database is mentioned in the text as a valuable source of information, but will not provide any specific details on how these interviews could be included in the SK-B MPA monitoring efforts, since future work should be undertaken with CHN to explore this avenue.

**Determining protection efficacy:** A participant questioned the ability to determine the efficacy of the MPA conservation in terms of recovery given the long time frame and lack of reference sites. As well, since there has been recently limited fishing pressure in the SK-B MPA and there is an abundance of marine life on the seamount, it is unlikely that any indicators would trend upwards in a statistically significant manner, which may make justifying the protections to stakeholders a challenge. It was pointed out that although climate change may exert an overall downward trend, the protections may exert undetectable upward trends, and the direction or presence of changes may have different meanings for different indicators and metrics. This is subtle and the factors contributing to it are difficult to untangle. To address this, the authors will



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add detail in Table 2 to indicate the current state and expected responses of each indicator group to the already listed stressors.

## **SECTION 5.4: DATA MANAGEMENT**

**Data management plan:** The importance of a robust data management plan and the amount of work it takes to develop this plan was reiterated by many participants. Given the long-term nature of monitoring seamounts it is critical to document methodologies well to support repeatability over time. The data need to be shared freely with CHN as well as being made available to the public, in line with DFO Open Data policies. Participants mentioned the FAIR principles of data management: findable, accessible, interoperable, and reusable (Wilkinson et al. 2016) and the CARE principles for Indigenous Data Governance: collective benefit, authority to control, responsibility, and ethics (Carroll et al. 2020) which may provide helpful frameworks for the development of a future data management plan. The authors already included a data management section in the working paper but will ensure the magnitude and importance of a data managed plan is indicated throughout the Research Document.

**Report card:** Participants suggested the authors recommend that a report card be used to communicate the findings of MPA monitoring. It was not recommended that a report card be developed here, however a list of elements that could be reported on may be useful for future work. Other participants pointed to other report cards currently in use or proposed that could be used as examples in DFO (Dunham et al. 2018) or externally (e.g., Parks Canada, NOAA). The authors will indicate a report card should align with existing and developing regional and national efforts.

## **SECTION 6: MONITORING FOR OTHER CONSERVATION OBJECTIVES**

**Additional rationale for monitoring:** A participant challenged the group to consider why monitoring this MPA is important. They indicated that the main threat to the seamount, fishing, has been removed, monitoring this remote seamount is very costly, and the seamount appears quite healthy from the observations we have. They posed that areas along the coastal shelf that are experiencing heavy fishing pressure may benefit more from increased monitoring efforts. Any potential changes observed within the MPA may likely be from climate change which management measures have no ability to mitigate. An author said other activities could be mitigated if climate change impacts are detected. Furthermore, an author said that if conservation means to protect and maintain the ecosystem, then without monitoring the ecosystem could still be susceptible to illegal fishing or increased vessel traffic. A participant indicated that the effects of climate change are uncertain and monitoring is the best means available to determine the impacts of climate change within the SK-B MPA. Monitoring for negative trends is important work, as is monitoring the long-term impacts of lost/ghost fishing gear which could continue fishing or destroy sessile life as it moves with the current or slides down the seamount slope. Other authors noted the importance of monitoring for invasive species, pollution, and new fishing opportunities as fish ranges shift over time, increasing public awareness and buy-in, and meeting the commitments CHN and DFO have to report back to Haida citizens and Canadians on the MPA. This conversation will be captured in the Research Document.

## **SECTION 7: MONITORING TROPHIC STRUCTURE**

**Monitoring trophic structure:** The limited ability to collect physical samples will impact the ability to understand the trophic structure within SK-B MPA. Again the discussion on the uniqueness of SK-B was brought up which also highlighted the difficulty in obtaining the necessary data from reference sites, which may not exist. While there are no known endemic

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species within the SK-B MPA, the subset of animals is unique (e.g., differing rockfish communities, brittle star mats, depth distribution differences for many species, relative abundance differences). However, if trophic structure is explored in a very broad sense (i.e., functional groups, trophic linkages, food webs), data from the coastal shelf may be useful to consider. In contrast, a participant said that on coastal shelf ecosystems the horizontal transfer of nutrients and plankton can often be ignored due to the homogenous community up and downstream. On seamounts however, most of the energy comes from allochthonous sources and the up and downstream communities are very different. They cautioned against basing MPA monitoring of trophic structure on another ecosystem. The authors will indicate that future work is needed to better understand SK-B MPA seamount trophic structures.

## **SECTION 9: SUMMARY AND CONCLUDING REMARKS**

**Achievability of the monitoring objectives:** A participant pointed out that in Table 14 not all of the six operational objectives are likely to be met, based on the metrics used to evaluate them (specific, measurable, achievable, realistic, and time-sensitive). The authors said that given the limited spatial management measures for the SK-B MPA and the current interpretation of the term “within a natural state”, the operational objectives are challenging to meet. The pelagic and sea surface conditions related to climate change are outside the control of spatial management measures and the impacts of activities within the scope of the management measures would be near impossible to detect (e.g., any potential pollution would wash away). Furthermore, transient pelagic species are difficult to monitor. A participant stated that monitoring the pelagic and sea surface habitat is still important. The authors agreed, noting the importance of monitoring climate change impacts that will affect all components of the ecosystem and clarified that the table is intended to evaluate the likelihood of the MPA achieving its objectives and does not evaluate what should or should not be monitored. The authors will add text to clarify.

**Next steps:** The authors clarified that their understanding is monitoring has two phases: baseline monitoring (which in addition to obtaining baseline data could also determine indicators, metrics, thresholds, additional research questions, etc.) and long-term monitoring to detect changes. A participant noted that while having an iterative monitoring plan sounds like a good idea, since observed changes will be very subtle and very slow and monitoring is so costly, any long-term monitoring plan needs to have well-defined methods to ensure repeatability over decades or centuries. Additionally, set methods will allow researchers to determine if any changes are real or artifacts of technological/statistical updates. While these monitoring and management plans are meant to be iterative, there needs to be some recognition of the long-term scale of the monitoring efforts. An author noted the importance of iterations for many aspects of monitoring, not just methodologies. For example, analyses may point out the need for a change in survey frequency and new stressors may necessitate MPA objectives being revisited.

**New summary table:** In response to a reviewer’s request for recommendations to be explicitly stated together (rather than throughout the text), the authors developed a new summary table of the in-text recommendations related to the objectives, indicators, metrics, methodologies, protocols, and strategies. A participant cautioned against being too prescriptive in which methodologies, protocols, and strategies should be used to monitor each objective as this detail would be included in a monitoring plan, however the authors indicated the TOR asked for this level of detail. The participant asked the authors to consider only listing one example methodology, protocol, or strategy, however an author said that conservation protection, maintenance, or rehabilitation monitoring are very different. For example, monitoring for protection may best be accomplished by indirect monitoring of compliance whereas recovery would take direct monitoring. They noted that a given metric will have specific strategies that are

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best suited to address it. The author also suggested potentially including separate rows for each biological, environmental, and stressor indicator for each strategic objective. The authors will explore various options for displaying the information in the table. The authors will also include text stating that these current/best options will need to be revisited following baseline and long-term monitoring. Since this table will also be included in the SAR, participant feedback on the table will be incorporated into the final version of the table for inclusion in the Research Document.

**Recommendations:** During SAR development the group developed clear recommendations and conclusions from the meeting that will also be included in the Research Document. This will address a reviewer's request for clearer communication for decision makers.

## **SAR DEVELOPMENT**

A participant withdrew themselves during the SAR development citing concerns over the CSAP process. Participants were disappointed this participant did not feel comfortable continuing, and acknowledged the important contributions they made right up until their departure. After a thorough conversation with the group, consensus was reached to continue developing the SAR. The group unanimously agreed that they did not feel that the participant's departure compromised the scientific validity or integrity of the research document under review and all felt comfortable continuing with the process.

## **CONCLUSIONS**

Meeting participants agreed the working paper satisfied all Terms of Reference objectives. The working paper was accepted with minor revisions (see Appendix E for a list of agreed upon revisions).

## **ACKNOWLEDGEMENTS**

We appreciate the time contributed to the RPR process by all participants. In particular, we thank the reviewers, Andrew Cooper (DFO Science), Niisii Guujaaw (Council of the Haida Nation), and Kate Thornborough (New South Wales Department of Primary Industries - Fisheries) for their time and expertise. We also thank Sarah Dudas as Chair of the meeting, Jill Campbell as the Meeting Rapporteur, and Jessica Nephin as the Revision Table Rapporteur.

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## APPENDIX A: TERMS OF REFERENCE

### PROPOSED MONITORING FRAMEWORK FOR SGAAN KINGHLAS-BOWIE SEAMOUNT MARINE PROTECTED AREA, BRITISH COLUMBIA, CANADA

Regional Peer Review – Pacific Region

May 3-5, 2022

Virtual meeting

Chairperson: Sarah Dudas

#### Context

The [SGaan Kinghlas–Bowie \(SK-B\) Seamount Marine Protected Area \(MPA\)](#) is located 180 km west of the Haida Gwaii archipelago in northern British Columbia (BC). This seamount is the shallowest seamount in the [Offshore Pacific Bioregion](#), and includes a number of habitat types, from deep-sea coral and sponge gardens to shallow sub-tidal seaweed beds, and related biological communities. The Haida Nation has a historical, spiritual and cultural connection with the SK-B Seamount area. In recognition of its ecological and cultural significance, the area surrounding SK-B — and its two sister seamounts Hodgkin and Davidson/Pierce — was designated by the Haida Nation as a Haida MPA in 1997 and by Canada as an *Oceans Act* MPA in 2008. The cooperative management and planning of SK-B MPA is facilitated by the Management Board composed of representatives of the Council of the Haida Nation (CHN) and Fisheries and Oceans Canada (DFO), and in July 2019 the partners completed the cooperatively developed [SK-B MPA Management Plan](#). The management plan identifies goals, strategic objectives, and operational objectives for the MPA and describes how they will be achieved. A priority for implementation is the development of a monitoring plan as part of an adaptive co-management approach.

To support the SK-B Management Plan, Fisheries and Oceans Canada (DFO) Oceans (on behalf of the SK-B Management Board) is requesting that Science Branch provide science advice related to indicators, protocols, and strategies for monitoring the SK-B MPA. Monitoring of biological and ecological indicators (and related threats) is essential for: 1) incorporating an ecological component into broader MPA monitoring ‘frameworks’, ‘plans’, or ‘programs’; 2) tracking status, condition, and trends to determine if MPAs are effective in achieving their conservation objectives; 3) aiding managers in the adjustment of MPA management plans to achieve conservation objectives; and 4) supporting the development of a reporting strategy to the Haida Nation, the Government of Canada, and Canadians.

This work will build on and integrate the results of recent Canadian Science Advisory Secretariat (CSAS) processes that explored future monitoring work in the SK-B MPA. In 2015, scientists estimated the cumulative and relative risk posed by human activities to significant ecosystem components (SECs; e.g. corals, sponges, rockfish) by applying a regionally-developed Ecological Risk Assessment Framework (ERAF) to the SK-B context (DFO 2015; O et al. 2015). For SECs, stressors, and stressor-SEC interactions associated with higher risk in the ERAF outputs, DFO Science then proposed monitoring indicators, measurable indicator components, and data collection methods (Thornborough et al. 2016). This work follows the development of monitoring frameworks for the Gully MPA (Kenchington 2010) and Musquatch Estuary MPA (Cooper et al. 2011) on Canada’s east coast, as well as the national monitoring framework for coral and sponge areas identified as Other Effective Area-Based Conservation Measures (DFO 2021).

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The advice arising from this CSAS Regional Peer Review (RPR) Process will be used by the SK-B MPA Management Board to develop recommendations for a proposed SK-B monitoring framework in support of the SK-B MPA conservation objectives. A monitoring framework is the first step towards a monitoring plan in which a scientifically defensible selection of indicators, protocols, and strategies are developed for the collection and analysis of baseline and monitoring data.

## **Objectives**

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

Du Preez, Cherrisse, Skil Jáada (Zahner, Vanessa), Gartner, Heidi, Chaves, Lais, Hannah, Charles, Swan, Kelly, and Norgard, Tammy. 2022. Proposed Monitoring Framework For SGaan Kinghlas-Bowie Seamount Marine Protected Area, British Columbia, Canada. CSAP Working Paper 2016OCN03.

The objectives of the science advice are as follows:

1. Review baseline knowledge of the SK-B MPA ecosystem.
2. Identify the ecological conservation goals, strategic objectives, and operational objectives outlined in the SK-B MPA Management Plan (CHN and DFO 2019).
3. Propose monitoring indicators, protocols, and strategies for the collection and analysis of data to determine if the MPA is effective in achieving the ecological conservation objectives.
4. Where possible, incorporate (i) anticipated changes in the SK-B MPA ecosystem (e.g. climate change, recovery from fishery impacts) (ii) pre-existing sources of data and/or information for the proposed monitoring indices, and (iii) feasibility of strategies.
5. Evaluate the monitoring framework against the ecological conservation objectives described in the SK-B MPA management plan.
6. Examine and identify uncertainties and limitations.

## **Expected Publications**

- Science Advisory Report
- Proceedings
- Research Document

## **Expected Participation**

- Fisheries and Oceans Canada (DFO) (Ecosystems Science, Oceans)
- Council of the Haida Nation
- Academia (University of Victoria, Simon Fraser University, Memorial University)
- Government Agencies (Parks Canada, Environment and Climate Change Canada, National Oceanic and Atmospheric Administration, New South Wales Government)
- Non-Government Organizations (World Wildlife Fund)

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## References

- CHN and DFO. 2019. [SGaan-Kinghlas-Bowie Seamount Marine Protected Area management plan](#).
- Cooper, J.A., K.J. Curran, R. Singh, B. Chang, and F.H. Page. 2011. [Musquash Estuary: A proposed monitoring framework for the Marine Protected Area \(MPA\) and Intertidal Area Administered \(AIA\) by Fisheries and Oceans Canada](#). DFO. Can. Sci. Advis. Sec. Res. Doc. 2011/055. vi + 38pp.
- DFO. 2015. [Application of an ecological risk assessment framework to inform ecosystem-based management for SGaan Kinghlas-Bowie Seamount and Endeavour Hydrothermal Vents Marine Protected Areas](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2015/037.
- DFO. 2021. [A National monitoring framework for coral and sponge areas identified as other effective area-based conservation measures](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2021/048.
- Kenchington, T.J. 2010. [Environmental monitoring of the Gully Marine Protected Area: A recommendation](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2010/075. vi + 59 p.
- O, M., Martone, R., Hannah, L., Greig, L., Boutillier, J. and Patton, S. 2015. [An ecological risk assessment framework \(ERAF\) for ecosystem-based oceans management in the Pacific Region](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2014/072. vii + 59 p.
- Thornborough, K., Dunham, J., and O, M. 2016. [Development of risk-based indicators for the SGaan Kinghlas-Bowie Seamount Marine Protected Area](#). DFO Can. Sci. Advis. Sec. Res. Doc 2016/027. vii + 120 p.

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## APPENDIX B: WORKING PAPER ABSTRACT

The SGaan K̓inghlas-Bowie (SK-B) Seamount Marine Protected Area (MPA) is co-managed by the Haida Nation and the Government of Canada to conserve and protect the unique biodiversity and biological productivity of the area. In 2019, the SK-B MPA management board published the management plan detailing the ecological conservation goals of the MPA. In this research document, we propose a monitoring framework summarizing the full spectrum of available options for monitoring the effectiveness of the MPA management measures against the ecological conservation objectives. The intended use of the monitoring framework is as a comprehensive list of indicators, protocols, and strategies from which to select a subset for the monitoring plan. When applicable, aspects of the future monitoring program are discussed within the context of climate change, anthropogenic activities (e.g., fisheries, vessel traffic), and anticipated changes (e.g., recovery, adverse impacts). We base the framework on biological, environmental, and stressor groupings that are related to its conservation objectives (similar to a national framework on coral and sponge protected areas). We describe metrics and the appropriateness of using each metric for monitoring each indicator grouping. We then link indicators and metrics to the standard tools and techniques (protocols) used in the respective scientific fields (e.g., benthic and pelagic ecology, geological, biological, chemical, and physical oceanography). We provide region-specific information to amend the national framework's considerations and best practices for designing a monitoring program, such as baseline data, statistics, and sampling design. Previous research within the MPA affords us the ability to identify specific species of interest within each grouping as potential priority indicators (e.g., the species and habitats Significant Ecosystem Components from the SK-B MPA Ecological Risk Assessment Framework). We also examine ecosystem functions and trophic structure as part of the conservation objectives. The framework concludes with summary tables and schematics to support the development of the future monitoring plan, and an evaluation of the framework against the ecological conservation objectives. The information in this paper is presented in support of a Canadian Science Advisory process (peer-reviewed May 3-5, 2022) and will be used by practitioners and managers to develop an appropriate and effective monitoring plan for the SK-B MPA, as well as other seamount and deep-sea MPAs within the region.



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## APPENDIX C: AGENDA

Canadian Science Advisory Secretariat

Centre for Science Advice Pacific

Regional Peer Review Meeting (RPR)

### AGENDA

Monitoring Framework for SGaan KInghlas-Bowie Seamount Marine Protected Area, British Columbia, Canada

May 3-5, 2022

Virtual Meeting

Chair: Sarah Dudas

#### DAY 1 - Tuesday, May 3 (*All times listed below are in PST*)

Time	Subject	Presenter
0900	Introductions Review Agenda & Housekeeping CSAS Overview and Procedures	Chair
0915	Review Terms of Reference	Chair
0930	Presentation of Working Paper	Authors
1030	<b>Break</b>	
1045	Overview Written Reviews	Chair + Reviewers & Authors
12:00	<b>Lunch Break</b>	
1230	Identification of Key Issues for Group Discussion	Group
1330	Discussion & Resolution of sections Introduction to end of Indicators and Metrics (first half of doc)	RPR Participants
1430	<b>Adjourn for the Day</b>	

#### DAY 2 - Wednesday, May 4

Time	Subject	Presenter
0900	Introductions Review Agenda & Housekeeping Review Status of Day 1 ( <i>As Necessary</i> )	Chair
0915	Carry forward outstanding issues from Day 1	RPR Participants

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<b>Time</b>	<b>Subject</b>	<b>Presenter</b>
1030	<b>Break</b>	
1045	Brief high-level presentation: Protocols to Glossary	Authors
1100	Discussion & Resolution of sections: Protocols to Glossary (remainder of document)	RPR Participants
1200	<b>Lunch Break</b>	
1230	Develop Consensus on Paper Acceptability (TOR objectives) & Agreed-upon Revisions (Revisions Table)	RPR Participants
1430	<b>Adjourn meeting</b>	

### DAY 3 - Thursday, May 5

<b>Time</b>	<b>Subject</b>	<b>Presenter</b>
0900	Introductions Review Agenda & Housekeeping Review Status of Day 2 ( <i>As Necessary</i> )	Chair
0915	Carry forward outstanding issues from Day 2	RPR Participants
1030	<b>Break</b>	
1045	<i>Science Advisory Report (SAR)</i> Develop consensus on the following for inclusion: <ul style="list-style-type: none"> <li>● Summary bullets</li> <li>● Sources of Uncertainty</li> <li>● Results &amp; Conclusions</li> <li>● Figures/Tables</li> <li>● Additional advice to Management (as warranted)</li> </ul>	RPR Participants
1200	<b>Lunch Break</b>	
1230	<i>Science Advisory Report (SAR) cont'd</i>	RPR Participants
1330	Next Steps – Chair to review <ul style="list-style-type: none"> <li>● SAR review/approval process and timelines</li> <li>● Research Document &amp; Proceedings timelines</li> <li>● Other follow-up or commitments (<i>as necessary</i>)</li> </ul>	Chair
1400	Other Business arising from the review	Chair & Participants
1430	<b>Adjourn meeting</b>	

## APPENDIX D: MEETING PARTICIPANTS

Last Name	First Name	Affiliation
Anderson	Erika	DFO Centre for Science Advice Pacific
Bates	Amanda	University of Victoria
Boyko	Rayne	Council of the Haida Nation
Campbell	Jill	DFO Centre for Science Advice Pacific
Chaves	Lais	Council of the Haida Nation
Clark	Lindsay	DFO Science
Cooper	Andrew	DFO Science
Davies	Megan	University of Victoria
Davies	Sarah	DFO Science
Dower	John	University of Victoria
Du Preez	Cherisse	DFO Science
Dudas	Sarah	DFO Science
Eisner	Noah	Council of the Haida Nation
Gartner	Heidi	DFO Science
Gauthier	Stephane	DFO Science
Guujaaw	Niisii	Council of the Haida Nation
Haggarty	Dana	DFO Science
Hannah	Charles	DFO Science
Harris	Laura	DFO Oceans (National Headquarters)
Jeffery	Sharon	DFO Science
Labbe	Daniel	University of Victoria
Lee	Lynn	Gwaii Haanas Parks Canada
Leus	Dan	DFO Fisheries Management (Marine Conservation Targets)
Lipski	Danielle	NOAA - Greater Farallones and Cordell Bank National Marine Sanctuaries
Macnab	Paul	DFO Oceans (Maritimes)
Manning	Clayton	DFO Oceans
Murdock	Sheryl	University of Victoria
Nephin	Jessica	DFO Science
Neves	Bárbara	DFO Sciences (Newfoundland and Labrador)
Norgard	Tammy	DFO Science
O	Miriam	DFO Science
Robb	Carrie	DFO Science
Roizman	Raquel	DFO Fisheries Management (Marine Conservation Targets)
Rooper	Chris	DFO Science
Ross	Tetjana	DFO Science
Rubidge	Emily	DFO Science
Samuels	Tasha	Council of the Haida Nation
Skil Jáada	-	Council of the Haida Nation
Stanley	Ryan	DFO Science

## APPENDIX E: AGREED UPON MAJOR REVISIONS TO THE WORKING PAPER

Section	Revision	Addressed
1. Introduction	Linkages with the TOR and with Goal 1 of the management plan could be explicitly introduced in section 1 to assist less informed readers.	- Text addition to Intro section
1. Introduction	Who are the decision makers? Make clear in the document who this is.	- Text clarification (Management composed of CHN and DFO) - Add that while it's Management Board for SK-B MPA, the framework may inform other MPAs (different decision makers) - Broader context emphasizing co-management through the whole process [mention the technical team]
1. Introduction/ Overall	Participant suggested that the use of the term framework here isn't in line with other DFO monitoring frameworks (historic, e.g. Gully MPA). Discuss: What is a monitoring framework versus a monitoring plan? How do we get from this framework to the next step of providing the recommendations in the SAR?	- Authors highlighted DFO documents from which the developed the framework - Include in glossary with clear definition and the context of the historic use of terminology (how the term has evolved) - New table (added to summary - compiling all key recommendations) will satisfy meeting the working term definition - Will also add a 'next steps' section
1.1.4 Introduction (What is a monitoring framework)	Participant indicated as Ecological Risk Assessment Framework (ERAF) is referenced so much in the research document an expansion/explanation would help reader be more informed.	- Text addition to provide elements of ERAF - Add text about why we need the ERAF in the first place (some figures that might help)
1.4 Introduction (Ecological timeline)	Participant suggested adding vessel traffic.	- Text addition to include vessel traffic within disturbed - Authors note numbering off in this section (should be 1.3.1) - Enhanced Maritime Situational Awareness (EMSA) and Burke publication

Section	Revision	Addressed
		added here (also other monitoring section 6).
2. MPA Objectives & Indicator Groupings	This section would benefit from introducing the issues with the operational conservation objectives discussed in section 9 and how this has impacted the framework development. Some of the information from table 14 could be suitable.	<ul style="list-style-type: none"> <li>- We have clarification from author (in email)</li> <li>- Will foreshadow evaluation below table 1</li> </ul>
4. Ecological Indicators and Metrics	Participant wanted clarity between ecosystem functions (what ind. species do) versus ecosystem function (how is the ecosystem functioning) throughout doc. Ecosystem function was mentioned in the purposes/strength in the indicator metric summary tables. What do you mean by 'ecosystem function' in those tables?	<ul style="list-style-type: none"> <li>- Add detail to the glossary about ecosystem function</li> <li>- Ensure consistency throughout document</li> </ul> <p>[Authors addressed in presentation]</p>
4. Ecological Indicators and Metrics	Condition often referred to in terms of health. For fish things like growth rates are more commonly used.	<ul style="list-style-type: none"> <li>- Text addition</li> </ul>
5.1 Tools	It might be outside the scope of this paper and instead be part of the monitoring plan, but are there recommendations for how decision-makers should use this information or how they could weigh the "key points to consider" in their decision making?	<ul style="list-style-type: none"> <li>- Outside the scope of science advice.</li> <li>- New table will help address some of this.</li> </ul>
5.1 Tools	Be more explicit about the limitations of sampling tools, especially the visual survey tools for fish data. (i.e. clarity in what kinds of data will not be collected if we don't do broad-scale extractive fishery surveys).	<ul style="list-style-type: none"> <li>- Add text to strengthen existing acknowledgement (transparent language).</li> </ul>

Section	Revision	Addressed
5.1 Tools	Focus on data streams of each tool given changing technology.	- Text additions (tread through the text that the key point is data in hand for assessments).
5.3 Monitoring Methodologies (and other sections)	Participant suggested that more detail is needed on the potential benefits of current protections. And the differences between the 'natural state' versus a 'disturbed state' or the 'current state'. Choosing a baseline will be important when monitoring the efficacy of those protections.	- Clarify in text: Table 2, stressors—add current state and expected response.
5.3 Monitoring methodologies	Participant pointed out that when monitoring we are looking for upward trends and that may be difficult at SK-B given how productive it already is. Suggestion to discuss the trends we are looking for (increase or at least no decrease) when measuring efficacy. Another participant suggested you could be more specific about change - which types of change represent low resilience. The direction of change, or the presence of it, might mean different things for different indicators and metrics.	<ul style="list-style-type: none"> <li>- Refer to comments from previous suggestion (we can add what you would expect the responses to be and what you would monitor for).</li> <li>- Tease apart the difference between threads and pressures (e.g., maybe downward but “slowed” because of upward pressure) (cumulative)</li> </ul>
5.3 Monitoring methodologies	More detail on frequency of sampling should be included while considering limited resources.	- Have some existing text on frequency, have referred to Neves et al. but can't add more detail unless you have more info on indicators (e.g. life history etc.)
5.3.1 Baseline data	Suggested research to replace historical data [i.e., bottom-contact fishing] with compatible non-destructive methods. Assessment of feasibility and comparability with historical information.	<ul style="list-style-type: none"> <li>- Add as bullet point within baseline data</li> <li>- Propose as analysis for 'next steps/future research' of historic fishing data sets with new data collections</li> <li>- If using extractive methods (fishing) include collection of isotopic and stomach samples as baseline as well</li> </ul>

Section	Revision	Addressed
		- Again acknowledge limitations of monitoring fish species with imagery techn vs fishing methods (see comment in tools)
5.3.4 Sampling Design	Participant wants more detail on potential sampling design (e.g., index sites versus seamount wide spatial coverage; can pull knowledge from monitoring of shelf ecosystems).	-In text clarification. Possibly in table, to identify if a method lends itself to population or index. (wording re: pilot study index site, vs. studying relationship; grad students examples) BACI design discussion? [Participant: include the responsible uses] [potentially appropriate re: Marine Protected Area Network (MPAN) and small protected areas with comparable sites.]
5.3.4 sampling design	SK-B is very unique, therefore finding a reference site for it might be impossible. Be honest about this. A stronger position is to look at baseline data and compare to that and we have quite a lot for SK-B already rather than relying on a BACI plan. Recommendation that the seamount itself will need to be monitored continuously due to its uniqueness, can't rely on coastal areas as proxies.	<ul style="list-style-type: none"> <li>- Text addition [representation of the other 65 and there's the future large MPA] keeping in mind the unique community on each.</li> <li>- Text addition to explain why is a dead-end (stat. inappropriateness, temporal vs. BACI) and unrealistic sample size.</li> </ul>
5.4 Data management	Add to <b>recommendations section:</b> in going forward with a data and information management plan that the methodologies related to 'the effort to assemble and review information from various programs and data streams' are well documented and archived to support repeatability over time.	- Text addition with language about the magnitude of this task, make language consistent to demonstrate importance of data management throughout.
5.4 Data management	Participant suggested that more detail could be included on the government open data tools and directives.	- Text addition and link (e.g., seamount data).

Section	Revision	Addressed
	Government agencies are required to make data open access.	
5.4 Data management	Participants suggested a report card as a reporting tool. Communication - report card with red, green, yellow. etc. (for management plan). Super easy for status for reporting. Participant recommended indicating elements to be included in this report card within this framework.	<ul style="list-style-type: none"> <li>- Text addition (keep it simple) as recommendation within reporting discussion (indicate some discussion happening at National level and provide examples of where used before e.g. Dunham et al. 2018, Parks Canada report card, NOAA)</li> <li>- Outside scope to provide report card elements at this point but reporting tool important part of management and plan</li> </ul>
6. Other conservation objectives	This section could highlight how monitoring the other conservation objectives is helpful in supporting future program evaluations or assessments of management effectiveness.	<ul style="list-style-type: none"> <li>- Strengthen text</li> </ul>
7. Monitoring trophic structure	Participant thought this could be expanded. Would like to see linkages to coastal monitoring tools that are used to understand trophic linkages and food web connections. (Lean into existing models, etc. what's new, what's missing. Linkages and connections may be similar)	<ul style="list-style-type: none"> <li>- Acknowledge interactions that exist b/w shelf and seamounts but have caveat b/c communities are different (similarities but so unique!) and linkages may not be applicable on SK-B</li> <li>- Future research/next steps</li> </ul>
9. Summary	Recommendations are stated throughout the concluding remarks (Section 9) but are not explicitly identified as "recommendations". It would be clearer to decision-makers if proposed <b>recommendations</b> were more clearly identified. This would facilitate discussion on what the authors consider are the most critical points (e.g. Tool without a strategy?).	<p>[presentation: the recommendations that are developed for the SAR will go into the Res Doc (helping pull together the last section)]</p> <ul style="list-style-type: none"> <li>- New recommendations section (includes new table)</li> </ul>



Section	Revision	Addressed
9. Summary	The findings on pages 126-127 related to the monitoring recommendations will be incredibly valuable when developing the monitoring plans. Highlighting the “count” column totals from tables 11 and 12 would strengthen these recommendations.	<ul style="list-style-type: none"> <li>- Can strengthen text to highlight</li> <li>- New table addresses as well</li> </ul>
9. Summary	<b>Add to Recommendation Section:</b> the need for operational baselines is not unique to SK-B MPA, MPA community should seek to develop a common lexicon of what constitutes baseline information and appropriate interpretations for management (e.g., working definitions/categories of “natural conditions”)	<p>[make this recommendation (conclusion), add to SAR and Res Doc]</p> <ul style="list-style-type: none"> <li>- Add to limitations section: acknowledgement that national work is ongoing/required</li> </ul>
9. Summary	<b>Add to Recommendation Section:</b> Research to explore and adapt other monitoring strategies that are conducted outside of the SK-B MPA (section 5.2.2). Agree with the suggestion that compatible programs should be investigated to determine comparability within the MPA.	<p>[make this recommendation (conclusion), add to SAR and Res Doc]</p> <ul style="list-style-type: none"> <li>- Seek confirmation that our interpretation is correct.</li> </ul>
9.2.6. Summary, Data	<b>Add to Recommendation Section:</b> Develop guidance and tools for MPA-specific data and information management (i.e., develop a comprehensive data management plan). The program should not underestimate the challenge and investment required to manage multiple data streams and to implement a system that supports timely and repeatable and data assessments.	<p>[make this recommendation (conclusion), add to SAR and Res Doc]</p>
9. Summary Table 14	Discussed the achievability of the objectives (e.g. not all achievable). Make	<ul style="list-style-type: none"> <li>- Clarify how assigned terms unlikely to likely.</li> </ul>

Section	Revision	Addressed
	recommendations on which objectives we should monitor for (the achievable ones), given the cost and other limitations.	<ul style="list-style-type: none"> <li>- Add more text to say which of the 6 operational objectives are specific, measurable, achievable, realistic, and time-sensitive.</li> <li>- Add text about non-achievable objectives worth monitoring (despite not being able to achieve objective) e.g. water column and climate change effects on animals.</li> </ul>
9. Summary	Suggestion to add 'Next Steps' section. Question to discuss - are we ready for a plan yet, or does more baseline work needed? If the next step is the monitoring plan then should the framework have recommendations for how to build the plan? Maybe baseline monitoring needs to be defined in glossary and distinguished from 'monitoring' - looking for temporal change.	<ul style="list-style-type: none"> <li>- Section addition</li> <li>- Discuss monitoring plan (reference papers on current pre-defined steps- there are existing definitions monitoring for baseline and monitoring for temporal change) and 'other research' next steps</li> </ul>
12. References	Follow up/ensure Neves et al. <sup>1</sup> is available for the intended use of the framework (i.e. publicly available or somehow incorporated into a data/information management plan).	<ul style="list-style-type: none"> <li>- Should be published shortly [co-authors acknowledge this information wasn't provided for the review; future sharing options known]</li> </ul>
Next steps?	Define the monitoring plan next step, separated into 2 phases 1. baseline and 2. long-term monitoring. Be clear about what 'iterative' means in this context and be realistic about how iterative it can actually be. Recommendation to start with the most robust plan as possible.	<ul style="list-style-type: none"> <li>- Addressed above (In Res Doc and SAR - participant suggested next steps and recommendations for the frequency of the review go in the SAR).</li> <li>- Add iterative language (with realistic lens)</li> </ul>

<sup>1</sup> Neves, B.M., Faille, G., Murillo, F.J., Dinn, C., Pućko, M., Dudas, S., Devanney, A., and Allen, P. In prep. A national monitoring framework for coral and sponge areas identified as Other Effective Area-Based Conservation Measures. DFO Can. Sci. Advis. Sec. Res. Doc.

Section	Revision	Addressed
4.3.1 Indicator groupings and metrics	Participant pointed out that indicators are a mix between directly measured and derived variables.	- Potentially reorganize tables to improve clarity? Or maybe just add a column to indicate the type of metric (measured v derived). Add some text to differentiate between the two. Authors will figure out the best way to do this.
4.3.1 Indicator groupings and metrics	Participant asked the authors to clarify the wording around indicators and metrics - especially for the environmental and stressors. Be explicit about what the indicator is versus metric.	- Text consistency clean-up
5.2. Strategies	<ul style="list-style-type: none"> <li>- Consider removing Principal Investigators</li> <li>- Offshore - highlight how made publicly available</li> <li>- In each box add what indicator/stressors/metrics could be addressed by strategy</li> </ul>	<ul style="list-style-type: none"> <li>- Will consider listing affiliations</li> <li>- Text addition/edits</li> <li>- Possible addition that may be simplified as covered in other areas</li> </ul>
5.3 Sampling design	Participant recommended strengthening this section to tie back to more SK-B specific context	- Authors will adjust text where possible (some aspects not possible yet)
5.3 Sampling design (and/or other sections)	Suggestion of ways to include traditional knowledge (potentially within context of 'before' and 'after')	<ul style="list-style-type: none"> <li>- Authors will suggest within 'next steps' (resource/process intensive and wasn't possible within timeline of this framework)</li> <li>-Text about that it exists (with careful assessment) - which section TBD by authors</li> </ul>
New summary table	Lots of support for the new summary table that provides examples of indicators methods, protocols and strategies to the objectives. Participant recommended just selecting one top suggestion/proposal for method, protocol and strategies. Need to link the methods/protocol/strategies directly to the metrics.	<ul style="list-style-type: none"> <li>- Add new table with text emphasizing that these are current/best options that need to be revisit with baseline and time-series monitoring</li> <li>- May not be limited to 'one' e.g. one indicator species</li> </ul>

Section	Revision	Addressed
		- Will link biological vs stressor/env metrics directly with protocols/strategies, etc.
4.3 Indicator groupings and metrics	Participant pointed out that all metrics need to be measurable, keep that in mind. Are there any revisions needed here? Some metrics are more measurable than others.	- Will review to ensure measurable components - How to address aspects like ecosystem function that is not measurable (again derived or interpreted?)
-	Participant flagged that the patch dynamic metric for fish might need more consideration	- In text clarification, adjusting terms as needed based on authors research. Connect with participant (fisheries scientist) for appropriate use.
-	Sablefish - more recent research and data missing here and should be included. More recent data shows more positive trends. Fishing section - language could be improved	- In text update of information re: recent trends and management measures to traps (degrade). - Clarify: ghost fishing AND habitat alteration - Clarify the intent of including: pelagic long-line information, rejjig jig survey
-	Include Recommendations in SAR in Res Doc	-