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Proceedings of the Regional Peer Review on the Identification of Reference Sites and a Scientific Monitoring Approach for the Laurentian Channel Marine Protected Area

Meeting dates: June 22–24, 2022
Location: St. John's, NL

Chairpersons: Nadine Wells & Neil Ollerhead
Editor: Christina Pretty

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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

A Regional Peer Review process to identify reference sites and a scientific monitoring approach for the Laurentian Channel Marine Protected Area (MPA) was held from June 22–24, 2022, in St. John's, Newfoundland and Labrador (NL) with a virtual option on Microsoft Teams. The purpose of the meeting was to identify direct or indirect indicators and reference sites, where possible, that could be used to monitor the status and trends of key species listed as part of the six conservation objectives, as well as overall biodiversity for the Laurentian Channel MPA; develop a scientific monitoring approach; and investigate the ability to assess MPA conservation priority species metrics using existing Research Vessel (RV) trawl survey data and seafloor imagery data. The meeting was reconvened on July 25, 2022, to finalize a summary bullet.

Participants included representatives from Fisheries and Oceans Canada (DFO) Science, Aquatic Ecosystems, and Fisheries Management Branches; Government of Newfoundland and Labrador; academia; industry; and environmental non-governmental organizations.

This Proceedings Report includes abstracts of presentations and summaries of meeting discussions, including the reconvening, as well as a list of research recommendations. The meeting's agenda, Terms of Reference, and list of participants are appended.

PRESENTATIONS

DAY 1 – JUNE 22, 2022

CHONe I/II

Presenter: P. Snelgrove & N. Templeman

Abstract

Canadian Healthy Oceans Network (CHONe) is a Natural Sciences and Engineering Research Council of Canada (NSERC) strategic network to provide science advice on biodiversity conservation strategies for Canada's oceans. CHONe I ran from 2008–14 and focused on biodiversity assessment and developing tools. Its success led to renewal via CHONe II, which focused on the application of CHONe I tools while focusing on various aspects of marine conservation strategies, including studying human impacts and support for spatial management. DFO was a major funding partner for both CHONe I and II through its wrap up in 2021. Additional support for CHONe came from Memorial University, Dalhousie University, World Wildlife Fund, Ocean Networks Canada, and Ecology Action Center. The many outputs of CHONe I and II included publications, conference presentations, collaborative networks, and a series of policy briefs. Additionally, there were lessons learned on managing large and complex data. Several CHONe projects were relevant to the Laurentian Channel MPA specifically, including topics on sea pens; meaningful monitoring; indicators; and non-destructive survey methods. These projects and their findings were briefly described. Recommendations on foundation species, meaningful monitoring, research data, and training future generations of scientists were also presented.

Discussion

A discussion was held around lessons learned from CHONe on the topic of open data and data stewardship. The presenters noted that creating an integrated dataset is a substantial undertaking, especially when collaborating with other organizations that may have different data management strategies and/or policies and when dealing with many diverse types of data. It was suggested that the Marine Conservation Targets (MCT) program and DFO as a whole look to previous programs like CHONe and other researchers for applicable data models and examples. An overall emphasis was placed on ensuring metadata are available for all datasets.

A participant asked about CHONe's foundation species and the criteria used to define them. The presenters answered that foundation species emerged as research was undertaken and the different pieces were unified. The participant noted that some foundation species are vulnerable and had special areas designated because of them, and was curious as to the link between foundation species and the Laurentian Channel's conservation objectives, some of which were not foundation species. The presenter noted that vulnerability is one aspect of identifying foundation species, but there are other considerations as well.

A discussion was held on the conservation objectives for the MPA. A presenter noted that there is often an emphasis on benthic species and marine mammals as conservation objectives for a lot of MPAs. They believed that sea pens had the greatest potential to produce measurable benefits as a result of the MPA, something that was confirmed by the power analysis, and mentioned that it may be more difficult to measure the effect of the MPA on the other conservation objectives because they are not as abundant or are more difficult to quantify because of their transient nature. It was noted that some of the tracking work proposed in the working paper for the other conservation objectives has potential. The other presenter noted

that, from a research perspective, previous CHONe work aligned with departmental objectives as a whole (e.g., National Conservation Targets) with no specific focus on species or the conservation objectives, which resulted in building relationships between and achieving objectives of students, academic researchers, and DFO scientists. The first presenter clarified that their comment did not diminish the need for the other (i.e., non-sea pens) conservation objective species in terms of conservation efforts, but rather it is challenging to demonstrate the benefits of the MPA on them.

Overview of Regional MPA and Other Effective Area-Based Conservation Measures (OECM) Monitoring

Presenter: J. Janes & M. Warren

Abstract

Under the Government of Canada's 2020 Marine Conservation Targets approximately 120,000 km^2 of marine waters around NL have been protected through the *Oceans Act* Marine Protected Areas and Other Effective Area-based Conservation Measures (OECMs) such as *Fisheries Act* Marine Refuges. Recognizing the importance of monitoring and reporting on these Marine Conservation Areas (MCAs), a Regional Monitoring Working Group (WG) was formed in September 2021. The WG includes members from multiple DFO Science sections, Marine Planning and Conservation, and Resource Management and Indigenous Fisheries. The WG meets monthly with the primary objective to oversee the development of reference sites and monitoring requirements for all MCAs. Other objectives include identifying data gaps, tracking the status and trends of conservation priorities, and identifying linkages and opportunities with other complementary monitoring programs.

Under the Regional Monitoring Working Group, three sub-working groups utilize different areas of scientific expertise and support the long-term objective to develop a scientific monitoring approach for the region. They are convened according to their conservation focus and include the Laurentian Channel MPA, Corals & Sponges Marine Refuges (Hopedale Saddle, Northeast Newfoundland Slope and 30 Coral closure) and Atlantic cod Marine Refuges (Hawke Channel and Funk Island Deep).

In preparation for this science process, the initial focus has been on monitoring requirements for the Laurentian Channel MPA while considering implications for monitoring the Marine Refuges. Primary monitoring focus will be given to the identified conservation objectives, or priorities, for each MCA (e.g., Black Dogfish, Smooth Skate, corals and sponges, Atlantic cod). However, other species that are likely to benefit from protections in place (known as indirect biodiversity conservation benefits) will also be considered and monitored opportunistically.

Discussion

A participant asked if the regional monitoring working group was considering whether or not the boundaries of MPAs and other effective area-based conservation measures (OECMs, e.g., marine refuges) captured, or could be moved to capture, a significant portion of the conservation taxa adjacent to those areas. The presenter noted that those types of adaptive management measures have not been a focus of the working group, as changes to boundaries, conservation objectives, etc., would require many steps (e.g., revisiting the Canada Gazette, extensive consultations). It was noted by the co-chair that this item could be discussed in the future depending on the outcome of this meeting, but that it was not in the terms of reference for that working group.

A participant asked if monitoring for broader ecosystem change would be included, for example, using data from the Atlantic Zone Monitoring Program (AZMP) or research vessel (RV) trawl

surveys to develop metrics to track changes. The presenter stated that the focus was currently more regional and site-specific as reporting requirements for MCT initiatives nationally were still being discussed. The presenter noted that broader ecosystem level changes (e.g., climate change) would factor into the monitoring. The co-chair and presenter mentioned that there are proposals for indicators related to this in the Warren et al. working paper. Participants contributed that this would be part of the conversation on 'network monitoring' and that useful guidance documents related to this already exist.

A participant asked if the working group had any lessons learned to date with the Laurentian Channel MPA that could be applied to the other MPAs or OECMs. The presenter replied that a lot of the work to date with the Laurentian Channel MPA has been done keeping other MPAs and OECMs in mind; however, some of that work would not translate well to smaller coastal MPAs. The co-chair added that the working group had been formed for less than a year and that there were more lessons to be learned moving forward.

Laurentian Channel MPA Establishment / Regulations / Conservation Objectives (COs)

Presenter: M. Lynch

Abstract

The Laurentian Channel Marine Protected Area (MPA) establishment process began in 2008. The Laurentian Channel Area of Interest (AOI) was selected from a candidate list of 11 Ecologically and Biologically Significant Areas (EBSAs) considering advice from a DFO inter-sectoral working group and feedback from key stakeholders. The Laurentian Channel AOI was announced on Oceans Day, June 8, 2010. Following the announcement, work began on the biophysical overview and socio-economic assessment (2010 to 2011) to gather information on key physical and biological features of the Laurentian Channel AOI as well as the economic activities and other human activities that occurred within and adjacent to the AOI. A risk assessment was undertaken from 2011 to 2012 to identify the impacts from those human activities on the potential conservation priorities within the AOI. At that time, a Steering Committee was also established to provide a forum for advice with respect to the development, implementation, and monitoring of the proposed MPA. The Steering Committee provided feedback on the regulatory processes during establishment, including input and feedback into the development of conservation priorities, management strategies, and geographic boundaries of the MPA. This feedback, along with extensive consultation and engagement, also supported the development of the regulatory intent framework, which captured the intent and design of the proposed MPA, and informed the development of the MPA regulations.

The Laurentian Channel MPA was announced by the Minister of Fisheries & Oceans Canada and the Canadian Coast Guard on Oceans Day, June 8, 2019 as Canada's newest and, at the time, largest MPA. It was also the first Oceans Act MPA to include Canada's new protection standards that prohibit four key industrial activities: oil and gas activities, mining, dumping, and bottom trawling. The Laurentian Channel MPA Regulations (SOR 2019/105) came into force as an Annex to the Oceans Act, which outlines the designation of the MPA by defining its geographic coordinates, including the management zones, and describes the prohibitions and exceptions for activities that may occur in the MPA, as well as detailing the Activity Plan process for research or educational activities. The development of a scientific monitoring plan for the Laurentian Channel MPA is a key step in the MPA management process, and will consider the goal of the MPA, the conservation and research objectives of the MPA. At the end of the initial management cycle, MPA managers will report back to Canadians and those involved in the management of the MPA on the results of the scientific and other monitoring programs.

Information collected in the scientific monitoring program will also support other aspects of the management program, including developing communications and promotional materials for the MPA, and educating the public on the biodiversity aspects of the Laurentian Channel MPA.

Discussion

The linkages between the monitoring program and the management program were discussed. How will one affect the other and what changes could be made to the management of the MPA based on results from monitoring? The presenter mentioned that over the next management cycle (i.e., the next five years) for the Laurentian Channel MPA, the work done by the monitoring working group would be considered, and if there were any issues, they would be taken into consideration based on overviews or reporting from the group. A participant gave an example of corals being discovered in a new area in the Gully and management zones were changed to reflect that. In regards to the Laurentian Channel MPA, it has pretty all-inclusive protection standards, what are some things that can be done or changed based on monitoring data? Another participant asked about the regulations and whether or not indirect impacts (e.g., disturbances from outside the MPA boundaries that may drift in and affect conservation objectives) are considered? The presenter responded that they likely were not. The risk assessments would have been done on activities occurring within the MPA boundaries, although they acknowledged that fishing occurs right up to the boundary line and it would be something to think about. Another participant brought up an example of the glass sponge reefs on the Pacific coast where trawling is not allowed in a certain area outside the protected area because it may cause disturbed sediment to affect the glass sponges. More research was recommended on the impacts of sedimentation on sea pens relevant to this area. It was noted that the edge effects of sediment disturbance could be relatively minimal given the large scale of this MPA; however, these indirect impacts could be added to the list of considerations for sea pens when doing risk assessments for activity plans in the future.

It was noted that the monitoring program will be challenged by the diversity of conservation objectives, vastness of the region, large size of the areas, and finding cost-effective ways to monitor and report on each of the areas. Sharing of best practices and leveraging funds from other sources and/or collaborators would be a key component to the success of this program. One participant brought up the fact that even a single PhD or Masters student can take several years to collect, process and analyze data related to a single conservation objective in one conservation area. Some prioritization and focus on key conservation objectives for each area was recommended to make this task manageable. Some of the key conservation objectives may also be used as models to inform on others. The co-chair stated that DFO will be taking a holistic approach to monitoring the entire bioregion. DFO will also be utilizing collaborations with other groups (e.g., MUN's Marine Institute) to carry out some of the monitoring and help get the program established.

Laurentian Channel Site Characterization

Presenter: D. Bélanger

Abstract

The Atlantic Zone Monitoring Program (AZMP) collects physical and biogeochemical oceanographic data in the NL Region along cross-shelf oceanographic sections. Two of these sections are located to the northeast of the Laurentian Channel MPA – southeast (SESPB) and southwest St. Pierre Bank (SWSPB) – and are sampled during the spring (April-May) and fall (November-December). This presentation described the physical and biogeochemical oceanographic conditions of the Laurentian Channel based on these data, including ocean climate; ocean circulation; surface and bottom temperature; drivers of variability (e.g., North

Atlantic Oscillation, subpolar gyre); phenology of the primary production cycle; and distribution of main macronutrients.

Discussion

There was a general discussion on how environmental variables can be indicators of change and may be able to help us discern whether observed changes are an effect of the MPA or some broader ecosystem change.

A participant brought up the idea that we should be discussing the components of each conservation objective that would be influenced by a period of the North Atlantic Oscillation (NAO), positive or negative, so that the signals captured by monitoring could be better interpreted.

A participant asked if the AZMP line that goes across the Laurentian Channel MPA is more variable than other areas that are less influenced by NAO. The presenter replied that this is something that could be looked at since the data is available. Seasonal variability is also captured by AZMP and any indices could be tailored to any question regarding the effect of the MPA or variability of oceanographic conditions.

Another participant raised the possibility of including zooplankton data collection protocols to the proposed core stations. The workload of the Oceanography section would need to be considered or the work could potentially be outsourced. This is something that could be further discussed by the working group.

Laurentian Channel Stressors

Presenter: C. Morris

Abstract

The long-term conservation and protection of ecologically important areas against threats is a global priority to reduce impacts on biodiversity (e.g., towards Aichi Target 11). While the effects of human activities on marine life are not always well understood, tracking activities can indicate potential stressors and better inform potential cumulative impacts. Marine Protected Areas can provide protection against identified threats on valued ecosystem components, and also offer protection from potential future impacts. This presentation considers a range of activities and their relevance to the Laurentian Channel MPA. DFO's vessel monitoring system tracks large commercial fishing vessels, and shows a very low impact of fishing inside the MPA from 2005 to 2018. While commercial shipping consists of several categories (cargo, container ships, bulk carriers and more), most primary shipping lanes do not transit through the MPA. Seismic surveying for oil and gas exploration purposes has been primarily been located outside the MPA. These activities may result in negative impacts inside the MPA, for example and oil spill could cross MPA boundaries and noise could have effects over a large area, however the activities themselves are relatively low inside the MPA boundaries. Recognizing that change is likely to occur within ecosystems, in management values, and technology, monitoring a range of potential stressors is an important part of adaptive management.

Discussion

A participant noted that although there has been little seismic activity within the Laurentian Channel MPA itself, seismic shots are still heard at recorders in the MPA, even from great distances.

Another participant suggested it might be interesting to do some comparisons with the St. Anns Bank MPA, as it is adjacent to the Laurentian Channel MPA in the Maritimes Region. It would

also be interesting to compare the conservation objectives, looking at the degree to which there are similarities, as it may help inform on the types of monitoring or create areas for collaboration. A participant agreed, given the stated desire to use similar frameworks for different monitoring initiatives across regions.

Conservation Objective Species Background

Presenter: B. Neves

Abstract

This presentation focused on providing a background on the six conservation objective species (sea pens, Porbeagle Sarks, Black Dogfish, Smooth Skate, Northern Wolfish, and Leatherback Turtle) and on biodiversity of the Laurentian Channel MPA. Analysis of DFO trawl survey data (1995–2021) for fish and invertebrates indicate that the MPA has elevated taxa richness and diversity (Shannon-Wiener index) relative to many other areas of the region (NAFO [Northwest Atlantic Fisheries Organization] Divisions 3LNOP). The importance of considering infauna/macrofauna diversity was also mentioned, as these make a considerable component of the benthic fauna in this MPA. At least 10 sea pen species are known for the MPA, where they are widely distributed, although not uniformly. They live on soft sediments and have been shown to influence macrofauna diversity. Porbeagle Sharks (*Lamna nasus*) are widely distributed throughout the North Atlantic, and appear off the south coast of Newfoundland and in the Gulf of St. Lawrence in the summer and fall. One of only two known Porbeagle mating grounds occurs at the entrance to the Gulf of St. Lawrence, but not in the MPA. COSEWIC has assessed the Atlantic designatable unit of Porbeagle Shark as Endangered, and their Northwest Atlantic stock remains below abundance levels observed in the 1960s. Black Dogfish (*Centroscyllium fabricii*) is a deep-water shark (200–1,100 m) distributed across most of the North Atlantic, and shallow portions of the MPA are potentially unique nursery areas. In NAFO Subdivision 3Ps, their biomass has been generally stable since 2004, following a decline from levels observed in 1996–97. Smooth Skate (*Malacoraja senta*) is distributed from waters off New Jersey, to the banks and shelf waters of Newfoundland and Labrador, and found at depths ranging 50–500 m. Both adult and immature Smooth Skates are distributed within the MPA. In NAFO Subdivision 3Ps, their biomass generally increased from 1996–2005, and has since remained stable; except for recent years. Northern Wolffish (*Anarhichas denticulatus*) is widely distributed in Atlantic and Arctic waters, including the MPA. The Arctic Ocean/Atlantic Ocean designatable unit of Northern Wolffish is listed as Threatened (under SARA). In NAFO Subdivision 3Ps, their biomass has been stable at very low densities along the deep edges of the banks. Leatherback Turtle (*Dermochelys coriacea*) is the largest sea turtle, and its Atlantic subpopulation is considered endangered. They migrate from the tropics to Canada in summer and early fall to feed on gelatinous zooplankton. In this region they are threatened by underwater noise, vessel strikes, and oil spills from bilges. There are no directed fisheries for any of these species, but they are vulnerable as bycatch. These taxa have different habits, niches, ecology, distribution, vulnerability, etc., and bring challenges to develop a monitoring program that can cover all of them.

Discussion

A participant asked whether the sea pens conservation objective was for sea pens generically (i.e., at the functional group level) or if there was a desire to differentiate among the different species? The presenter recognized that there are a few species that are more common than others in the MPA, but that they had not had any discussions on this point and were considering all sea pens as one group, including in the power analysis done for the meeting. A participant from Marine Planning and Conservation added that the conservation objective is for “coral and

sponges, but particularly sea pens," which refers to the functional group. There were 10 species identified in the MPA, two of which were more predominant than others. They suggested that sea pens would likely be a focus for the monitoring program in the short, medium and long term. If it was found that there are major differences between the species (e.g., if one species is particularly sensitive to certain activities), then risk assessments could be done differently, but for now, it is easier to do it at the functional group level. A participant suggested that the power analysis may help in determining if there is utility in separating species out later. The presenter added that sea pens are similar at the functional group-level, but there are species-level differences. These differences are nuances that will need to be considered when getting into the details of the plans; e.g., metrics from imagery, including counting polyps, will not be possible for every species.

With respect to Leatherback Sea Turtles, a participant asked if there was any chance of being able to detect an effect of the MPA? It was stated that an aerial survey across the MPA might show 10s of turtles, most of them likely to be found north of the MPA feeding on jellyfish aggregations along the shelf areas. As a result, it may be difficult to see a conservation effect because their density and distribution varies from year to year based on the prey they are chasing. There is interest in looking at bycaught animals or vessel strikes and comparing areas inside and outside the MPA, but it will be difficult to attribute a change in density of turtles to the effects of this MPA.

Ideas on how to assess biodiversity were discussed including comparing inside to outside the MPA. Theories were discussed on how fishing may affect biodiversity from a regional perspective. A participant made some points around biodiversity from the species diversity in the DFO multispecies trawl catches looking at the whole NL Region. Obviously there will be influences from oceanographic features and depth etc. But fishing intensity could also have an impact. It will be important to consider whether those spatial patterns presented truly reflect the natural differences in diversity or are a product of fishing removals. The presenter stated that the plots were meant to show that the Laurentian Channel MPA is not completely different from what is outside but that there is a high species richness and diversity in general within the MPA compared to outside. We just don't have an answer to the impact of fishing pressure on this area. A question was asked to see if there were any statistical analyses done on the data or if they were just general plots of distribution. A participant replied that they were done simply as descriptive plots with no statistical analysis but that would be an interesting direction to take things. In the meeting chat a couple of participants suggested it would be interesting to compare with outside areas of similar depth, and bottom type so that the difference could be better linked to other factors such as fishing intensity. A comparison of community structure (composition of species and diversity) would also be interesting, including looking at what species are driving those similarities/differences.

There was a comment in the meeting chat about what we are 'required' to monitor (i.e., the six conservation objectives) versus looking at general biodiversity. The regulations were developed to support the six conservation objective species but then through those conservation objectives we would, by default, contribute to its biodiversity goal. From a regulatory, and perhaps a MPA audit perspective, the nuance for clarity is the focus on conservation objectives that might limit the application, or recognition, of "general biodiversity" (not linked directly to conservation objectives) from targeted MPA efforts or recognition of the value of the MPA for things other than its conservation objective species. Unsure if monitoring other things will be valuable if there are no connections to the conservation objectives (from an adaptive management perspective).

A participant noted that the presentation mentioned how 10 kg of one sea pen species will differ in abundance from 10 kg of another species. They commented that a published paper compared remotely operated vehicle (ROV) drop camera to trawls and found that epifauna

patterns differ depending on the tool being used, but also partly based on sea pen species. They questioned whether numerical abundance and diversity of species is important for habitat, or biomass more important? The participant posed another question related to maps showing biodiversity inside versus outside the MPA. Was this looked at in the context of the habitat classification or landscape maps that already exist, e.g., does biodiversity change between known habitats within the MPA? The presenter responded that this was a preliminary look into the question of the number of taxa in relation to what is outside of the channel and did not consider environmental data, habitat type, depth, etc., but it could be something worth exploring. The purpose of these maps was to show that the Laurentian Channel MPA has high biodiversity compared to what is outside, and was not necessarily an in-depth characterization or why/where it is higher. The participant responded that it would also be interesting for determining monitoring locations.

In the meeting chat, there was a question about considering looking into traits of sea pens and whether that would be useful for distinguishing them later on while also providing additional information in terms of their ecological role (e.g., size and body shape) and vulnerability (e.g., reproduction strategies). The presenter agreed that was a good idea to explore this further.

Monitoring Approach for Laurentian Channel MPA

Presenter: M. Warren

Abstract

The overall scientific monitoring approach for the Laurentian Channel MPA is based on a three-pronged approach that will be applied to the whole region including both MPAs and marine refuges. Part one is the core sampling (now referred to as core monitoring), part 2 is referred to as targeted sampling (now referred to as targeted research), and part 3 is complementary surveys (now referred to as complementary monitoring). Core monitoring focuses on being efficient, using co-located sampling for multiple indicators. The aim is to generate a long-term dataset, standardized across the region. Techniques used will be cost-effective and minimally invasive. The targeted research will be more short-term and research oriented, aiming to gather more detailed information on the Conservation Objectives. Targeted research can be used to test equipment or methods as well as to collect more information to understand trends observed as part of the core or complementary monitoring programs. Complementary monitoring uses data from other ongoing surveys that are not specifically designed for the monitoring program. For example, DFO's multispecies trawl survey and the Atlantic Zonal Monitoring Program (AZMP). Applying this approach to both MPAs and marine refuges throughout the NL Region will allow for more comparable data across the region, help us invest in capacity building, and will be an efficient way to test the survey methods and strategies for the purposes of monitoring. In order to apply these three-prongs of the approach to the Laurentian Channel MPA, four key elements must first be evaluated:

1. reference sites,
2. survey methods and strategies,
3. indicators, and
4. study design.

These elements will be described in more detail in subsequent presentations.

Discussion

A participant stated that it would be important to have a cross-region approach, in particular for the offshore-type missions where there is some prior experience in other regions/gear access options, etc. In this way, other regions would also be able to benefit from NL Region's approaches. Another participant suggested that maps showing all MPAs and marine refuges should be used when planning surveys so other regions can be considered when planning missions.

There was a question about a change in terminology, "targeted" versus "strategic", on the presentation slides. It was clarified that the term "strategic" was from an earlier iteration and has since been changed to "targeted". Any directed research will fall under that "targeted" sampling program, including short-term studies that are not going to be accomplished in every area every year, that require more sampling time, etc.

There was a comment in the meeting chat about considering the "opportunity cost" of different monitoring approaches. By doing a particular one (and if expensive) you then cannot do others. It may lead to considering some things would be periodic, or just one-off to establish spatial context for monitoring rather than temporal-based sampling. Another participant mentioned that the listed "annual aerial surveys" are being conducted as a subset of the right whale Atlantic monitoring programme (national funding source) and that there are transects that cross the Laurentian Channel MPA. Thus no cost to the Laurentian Channel MPA monitoring programme per se. This is a good example of value for money, especially when it comes to larger offshore monitoring programs.

A participant asked if there was an advisory committee for the Laurentian Channel MPA similar to the one in the Maritimes Region? The co-chair responded that there is no such committee here that would be involved in seeking proposals for funding, etc., but there is an agreement in place with MPC and the Marine Institute (Memorial University) to carry out some of the monitoring. So far, the working group has been developing the monitoring program and DFO is trying to determine its own capacity to carry it out in addition to what Marine Institute can offer. Looking to the future there may be an opportunity to seek funds, etc., but for now it is internal DFO monies. The participant clarified that proposals could also just be looking for input and not for money as well.

There was a comment about bottom trawling in MPAs and OECMs. Is there a plan for mitigating the impacts of those? Is more non-impactful sampling being done? Have they looked at the minimum number of sets in the multispecies trawl survey needed to not interrupt the time series? The co-chair responded that there was a previous CSAS meeting looking at scientific surveys in protected areas. While the SAR is not yet published, the advice provided in the meeting has already been implemented and is taken into account when reviewing activity plans. DFO Science is involved in reviewing activity plans to ensure they are minimizing impacts. It was noted that the RV trawl would continue as part of DFO Science's stock assessment work, that the current rate of RV trawls in the MPA have low areal impact and recurrence rates, and that the monitoring program would not be seeking to increase the amount of trawling.

A participant asked if there were potential synergies with the industry redfish surveys and if cumulative impacts were being considered? The participant mentioned a new winter redfish survey by industry in Gulf Region that overlapped the Laurentian Channel MPA in January 2022. It was noted that only four sets were completed within the MPA. The presenter noted that the processes for governing those activities are still evolving, but Marine Planning and Conservation has been working with those carrying out the surveys to minimize impacts where possible. A participant from Marine Planning and Conservation highlighted that the department has other objectives besides conservation that it has to honour.

A participant asked if a reporting framework was available to assess whether conservation objectives have been achieved. The presenter responded that nothing had been set up yet, but that it was something they were considering based on work done by Parks Canada.

A participant noted that the wording of the conservation objectives was very specific and asked how that would drive decisions about what is monitored and how it is reported on. The presenter mentioned that national headquarters (NHQ) had been approached about changing the conservation objectives to make them more measurable, but that those efforts had not led anywhere and so the intention was to monitor the conservation objectives as they currently exist as best as possible. To do so, they would focus on the status and trends of the conservation objective species and the overarching goal of biodiversity rather than the specific wording of the conservation objectives, and mentioned that this would be further discussed tomorrow.

A participant asked if the proposed schedule of monitoring activities also accounted for the time required to analyze and report on the information? They cautioned that the reporting could take years, in some cases. The presenter responded that the schedule was designed around the actual sampling (i.e., occurrence of the survey in a given year) and that the time needed for analyzing and reporting on the data was to be determined. They noted that the first year of the monitoring program would be used to test the feasibility and practicality of the proposed sampling with the opportunity for adjustments.

A participant suggested adding additional context on the sampling, including the time frames, capacity, and experience levels of analysts required for each sampling type, to help with identifying what sampling would be sustainable over the long term. The presenter noted the experience of several of the co-authors with this type of research and analyses, as well as the importance of field trials for testing this approach. Prioritization was also mentioned as a potential consideration going forward.

DAY 2 – JUNE 23, 2022

Summary of Day 1

Presenter: N. Wells

Discussion

A question was asked about what frequency of sampling would be necessary. A co-chair noted that this question would be discussed in detail throughout the day.

The co-chair rephrased a question from yesterday that was not addressed regarding a reporting framework, how the conservation objectives are worded, and how they can be reported on. There are concerns around defending the monitoring approach if there is ever a regulatory review or audit of the Laurentian Channel MPA, particularly because the regulations of the MPA have already achieved the conservation objectives given their current wording (i.e., “protect species from human harm”). A participant confirmed that the MPA goals have already been achieved because the area is closed to human stressors and noted that the meeting request to know about status and trends to inform ecological monitoring was clear, and that further regulatory and management-based discussions are outside the scope of this meeting. They continued that they were not certain as to what type of regulatory review may happen in the future, but that lessons could be learned from the recent Eastport MPA audit. A different participant shared their experience with the Eastport and Gilbert Bay MPAs, noting that even though this discussion is outside of the Terms of Reference for this meeting right now, these discussions will come up in future reviews and the decisions made at this meeting will have to be justified. Another participant noted the difference between Science advising on whether the conservation objectives can be evaluated versus discussing what research can be done to understand ecosystem structure and function.

Overview of Approach to Reference Sites

Presenter: M. Warren

Abstract

Using a Before-After-Control-Impact (BACI) experimental design to isolate the effects of MPA protection from broader trends or natural variability is a common recommendation for the management of MPAs. Reference sites outside of the MPA with similar habitats, species representation and environmental conditions are often used to accomplish this. In the case of the Laurentian Channel MPA, several issues were identified that make it difficult to choose appropriate reference sites. First and foremost, the establishment process for the MPA resulted in an area that was not easily comparable to adjacent habitats. The area is generally characterized by large swaths of habitat with historically low levels of exposure to fishing stressors (e.g., bottom trawling). Furthermore, two of the six species of conservation interest, Leatherback Sea Turtles and Porbeagle Shark, are highly migratory and using reference sites to detect noticeable changes for these species is not likely as they only spend a short period of time in the area. Any detected changes in abundance, for example, would not be attributable to the protections afforded by the MPA. The approach taken here is to focus on identifying monitoring sites within the boundaries of the MPA to track the status and trends of the key species. Collection of data from outside the MPA may still be used to provide baseline information for future studies and will provide context for understanding broad-scale changes in the ecosystem. Three methods are proposed for choosing monitoring sites within the MPA boundaries and for identifying areas outside the MPA with similar characteristics. Method 1 identifies the Core Monitoring Areas, aiming to be cost effective with co-location of sampling.

They will also be representative of several different habitat characteristics found throughout the MPA. Method 2 uses unsupervised habitat mapping of abiotic environmental variables to identify areas around the MPA with comparable environmental conditions, while Method 3 uses the DFO multispecies trawl survey data to identify comparable fish community structure, both of which will provide baseline information and context for ecosystem level trends. These will be further described in the next three presentations.

Discussion

A discussion was held around the possibility of experimental manipulations and/or research studies within the MPA to better understand potential impacts on sea pens, including status and trends. It was noted that this could fall under a targeted monitoring program, but the authors have not gotten into deep discussions on the topic. It was also noted that these experiments would have to have an activity plan and be approved, and general optics may prevent this type of manipulation happening within an MPA. It was acknowledged that it is an important question, perhaps something that could be looked at in a collaboration with Marine Institute, but outside of the MPA. Other potential research questions included investigating the catchability of sea pens, habitat use by fish species (e.g., how much of a feature is needed to qualify as “good” habitat), and recovery after minimal impact versus complete removal.

A participant asked if the RV survey site locations varied from year to year. Another participant answered yes, but noted the impact could still be significant.

A participant asked if the reference areas search was constrained to NL Region or if it extended into the adjacent Maritimes Region. Because survey methods are different between regions and therefore the data are not easily comparable, it was decided to stay within NL Region, but authors noted that this conversation warrants further discussions with Maritimes Region. It was also noted that potential reference sites could also exist in the Gulf of St. Lawrence.

A participant questioned whether a reference site could be established within a similar MPA (e.g., St. Anns Bank MPA), to which another participant mentioned it could be useful to gauge if changes over time were due to natural forcing.

A participant asked how reference sites would support monitoring of status and trends of the conservation objective species. It was explained that “reference sites” in this context was not being used in the traditional sense, but that would be further explained over the following presentations. Core monitoring sites within the MPA would be chosen and data would be repeatedly collected at these locations. Targeted monitoring may also occur at these locations. This information would be supplemented by other strategic monitoring initiatives (e.g., inside/outside comparisons). It was noted that it may take some time to determine what data would be useful in the context of monitoring.

Core Monitoring Sites

Presenter: B. Neves

Abstract

This presentation focused on the selection of core monitoring and paired reference sites for the Laurentian Channel MPA. Discussions on site selection for core monitoring started with the objective of surveying sea pen indicators using seafloor imagery gear, but were ultimately considered for monitoring general biodiversity as well. A few criteria were used to select sites, which aimed at including:

1. different areas of the MPA representing different bottom types and benthoscapes,

2. representative depths,
3. sites within the sea pen Significant Benthic Areas (SiBA) polygons, and
4. considerations regarding survey efficiency/feasibility and cost.

The proposed plan has a set of stations along four lines 60 km from one another crossing the MPA from west to east, covering different depths and benthoscapes. The final number of stations per line, number of seafloor imagery transects per station, their length, and the method (e.g., photos/videos) have not yet been determined. Eight equally spaced stations per line (~5 km apart) were proposed in order to achieve ~30 transect per trip, based on power analysis detailed in the Morris et al. accompanying working paper. A scenario was described where a minimum of ~100 hours (roughly 4.5 days, assuming 24-hour operations) of ship-time would be required in order to accomplish the proposed plan, which does not include time need to conduct other core monitoring program activities, contingency time, or travel to and from MPA. The next item described was the selection of paired reference sites. Although identifying reference sites as part of the core monitoring of this MPA was avoided, the existence of pockets of historical fishing activity represent an opportunity to assess recovery of sessile conservation objective taxa like sea pens (previously fished inside vs. outside the MPA). The creation of paired reference sites was proposed as part of targeted sampling, but not core monitoring. The final item described was the need for the creation of buffered exclusion zones around stations to avoid impacts from bottom-contact scientific surveys, which could influence metrics. It was also emphasized that the final number of required stations along the lines will be variable across metrics (e.g., sea pen abundance vs. infauna) and that no one scale is appropriate for all taxa/metrics. Pilot studies (targeted sampling) are required to define scale and appropriate sample size, and a high sampling frequency was suggested in the first years of the monitoring program, which will yield a large volume of data that needs to be considered in terms of available resources (i.e., financial and human).

Discussion

Some brief comments were made around the benefits and possibilities of using emerging technologies (e.g., AI) to shorten time needed for analyses.

A reference was provided where a BACI design was used successfully at a small scale in the nearshore environment for eelgrass; it was suggested that sea pens could be substituted for eelgrass. Another participant mentioned that BACI designs assume a big change was made, but argued that no big changes were made in establishing the Laurentian Channel MPA.

A participant liked the stratified approach and asked how the transect locations were determined. The presenter said the transect lines were the length of the MPA divided by the number of lines they wanted. The participant suggested considering the species data that is available (e.g., Black Dogfish) and optimize the design accordingly. Another participant commented that Line 1 could be further to the northwest to capture another sea pen area and the northwest bottom type.

A suggestion was made to consider when an area was fished and focus on inside/outside areas that were fished around the same time to align recovery times.

A participant suggested considering spatially balanced survey designs.

A participant liked the idea of putting buffer zones around core sampling sites.

A participant asked what the primary goal of the monitoring would be; for example, to understand detailed changes in size structure over time (e.g., to estimate recruitment and growth) or broader trends in sea pen aggregations (e.g., stable, increasing decreasing). The presenter mentioned they would be interested in seeing if size is changing, but would likely

focus on a metric that has statistical power and is more easily measurable (e.g., abundance, status and trends) and retrieve size data from that. The participant suggested early consideration of what metrics/attributes may want to be extracted from the imagery in the future.

A participant noted that an image along a single transect line can only be 1 m wide and questioned whether that would be representative of an area when the species is patchy on a local scale. They also cautioned that east-west transects would not find significant patches of sea pens that run north-south, and that the distance between images may make it challenging to give estimates of mean abundance. The presenter responded that the patchiness and variability of different species was still unknown, but that part of the first year of sampling would be to experiment with replication. Transects could be altered to be north-south if required. Regarding distance between images, they were happy with the results of a power analysis that was used to determine the number per transect and the distance between them.

The presenter mentioned that drop camera may be more useful than ROV, although they were still trying to decide on the system they would use going forward. A participant clarified that drop camera may be better at capturing diversity at certain stations versus abundance, although they would look at ROPOS for local analyses. Another participant expanded by noting different tools (e.g., ROPOS, CAMPOD) have been optimized for different purposes, and the right equipment depends on the goals of the monitoring program. The participant suggested doing surveys that give the highest capacity for acquiring imagery, collect as much as possible, but only analyze what is necessary.

A participant suggested having an indicator or metric related to our general state of knowledge and how it will improve as this monitoring work moves forward.

A participant asked if there was any intention to do additional multibeam surveys. A co-author noted that a full coverage data layer for the Laurentian Channel had been completed several years prior, but additional multibeam could be considered in the future as part of targeted research. The participant suggested that the current multibeam could be updated, particularly along the eastern slopes, as turbidity currents and other factors can cause local scale seabed changes. The presenter noted that there is room for improvement, as the current resolution is 50x50 m, and newer technology allows for much higher resolution. They had previously discussed using new technology to identify fauna on the sea floor, similar to work being done by the Geological Survey of Canada with Maritimes Region. Several participants mentioned existing multibeam systems that could be used, as well as limitations of different multibeam systems (e.g., surface vessel-based versus AUV/ROV-mounted subsurface systems).

A participant asked about the goal for better understanding size structure of sea pens. The presenter clarified that they were interested in whether size structure of populations is changing as a way to better understand what is happening in an area (e.g., recruitment).

A participant suggested restricting the sampling frame (e.g., clustering the spatial distribution of the transects) to reduce variability and increase power. The presenter said that they had been trying to increase the range of sites sampled in the MPA. The participant explained that some areas, depths, or benthoscapes may be too variable, and this approach may lose too much power. Instead, they suggested looking at areas that represent the dominant type of area and sampling those well to increase the power, which would also provide a better return on effort versus the planned equal distance sites.

A participant asked how targeted sampling questions would be linked to core monitoring and the conservation objectives. A co-author explained that targeted monitoring would be triggered by core monitoring, for example, if a change was detected but the cause was unknown. The

intention of targeted monitoring is to provide flexibility and an opportunity to further explore information found during core monitoring. They mentioned this would be clarified in the paper.

A participant asked if this monitoring approach considered seasonality. A co-author mentioned that a lot of the complementary data (e.g., RV survey, AZMP) was outside of their control, but that they would try to keep the core monitoring consistent, ideally in mid- to late-summer, to establish a time series. The presenter noted that seasonality would be less of a concern for some conservation objectives/indicators (e.g., sea pens) than others (e.g., zooplankton).

A discussion was held around the viability of sampling several large offshore MPAs in a short time window. It was mentioned that a collaborative approach with partners (e.g., Marine Institute) was being explored. Currently there is support and commitment through a 5-year contribution agreement, although a participant wondered if that interest for the partnership would be sustained beyond the initial five years.

Unsupervised Habitat Mapping

Presenter: C. Konecny

Abstract

A habitat mapping analysis was carried out to identify areas within NAFO Divisions 3P and 3O with similar abiotic conditions. Habitats within the study area were characterized using a dimensionality reduction approach (Principal Component Analysis) followed by an unsupervised cluster analysis (k-means clustering). Eleven abiotic variables were selected as input variables into the analysis. The results of this analysis grouped the study area into five clusters. The majority of the Laurentian Channel MPA was assigned to cluster two, which was characterized by a mean depth of 280 m, slope of 0.4 degrees, salinity of 34.4 psu, surface temperature of 2.2 degrees Celsius, and bottom temperature of 5.4 degrees Celsius (relatively high bottom temperature compared to other clusters). Cluster two was classified as having few pits or peaks in the topography and is generally south-west facing. This analysis also assigned areas around Burgeo Bank, Hermitage Channel, and the south-west edge of the Grand Banks to cluster two, indicating that these areas could have similar abiotic conditions to the Laurentian Channel. The clusters identified in this analysis could be used to make comparisons between the biological communities inside and outside the MPA as well as provide additional context for climate and ecosystem-level changes in the future.

Discussion

A participant mentioned that it would be interesting to see this process repeated including acoustic backscatter.

The presenter clarified that the bathymetric data layer used in this analysis was from GEBCO, but that data collected inside the MPA would be useful for ground truthing.

A participant noted that higher resolution data (e.g., the benthoscape analysis) would be required in order for this analysis to be particularly useful for MPA monitoring. However, it could be useful for informing sampling design and general planning. The presenter agreed that this analysis does not capture the heterogeneity of the environment but suggested pairing it with biotic data from the RV survey and other data collection. Another participant suggested re-running the analysis but constraining it to within the Laurentian Channel using higher resolution data to see if there are clusters within the MPA.

Strata-based Community Analysis

Presenter: M. Warren

Abstract

A strata-based community analysis was done to help identify potential reference sites using the DFO multispecies trawl survey data. This analysis will provide comparable baseline information and will help to understand larger ecosystem level changes. The approach focuses on fish functional groups, which are groupings of species based on their general size characteristics and known feeding habits. The groups included in the analysis were small, medium, and large benthivores, piscivores, plankpiscivores, planktivores and another grouping that included all species. The strata from the stratified random survey design were used as a way to group similar depth profiles for the analysis and only NAFO Divisions 3O and 3P were included to limit the study area. A Bray-Curtis similarity index was calculated using standardized biomass among trawl sets (kg/tow) and a centroid for each stratum was calculated to reduce the overall volume of data. Non-metric multidimensional scaling plots and a cluster analysis were done to group strata into clusters of similar fish functional group community structure. Across the majority of the groups, the Laurentian Channel MPA appears to have a similar community structure to areas in the Hermitage Channel and northwest of the Burgeo Bank as well as to the southeast of the MPA along the slope of the Grand Bank. This analysis will provide useful context for understanding whether potential community shifts in the MPA are driven by larger-scale ecosystem changes.

Discussion

A participant mentioned a publication by O'Brien et al. (2022) that looked at fish and invertebrate assemblages across four regions (NL, Maritimes, northern Gulf of St. Lawrence, southern Gulf of St. Lawrence), all of which found the Laurentian Channel to be a unique cluster with its own distinct assemblage. It was noted that dissimilarity of the Laurentian Channel to its surrounding areas (with the Hermitage Channel being a possible exception) will make it challenging to find comparable reference sites outside of the MPA.

A participant commented that the current proposed transects cross through different community assemblages, giving added benefits to the design of the core monitoring survey.

A participant asked if there was more resolution in the data. The presenter mentioned that there could be enough data to perform this analysis within the MPA itself. The participant suggested comparing that output with the benthoscapes. Other participants noted that this reanalysis could impact the outcome of the original cluster analysis.

The presenter clarified that this analysis was performed using the last five years of available data.

A participant asked whether information on fish and fish communities would feed into new and specific monitoring or would it be more of a contextual piece. The presenter said it was intended to be more contextual, although it could be reevaluated in the future if changes are detected at core monitoring sites. Based on the accompanying power analysis, it was determined that using the RV survey data to track conservation objectives was not realistic, so this analysis was exploring another way of utilizing the long-term RV survey data in monitoring.

Another participant noted that a similar finer scale analysis could inform areas of higher or lower functional richness within the MPA, which could lead to the prioritization of specific areas to monitor. As part of this, large scale processes (i.e., climate change) and their effects on community assemblages in the MPA and surrounding areas could also be examined.

A participant asked if non-functional group species were considered in the analysis. The presenter acknowledged that the analysis focused only on species included in functional groups, as this is also the focus of the RV survey (i.e., fish assemblages). Although some

invertebrate data are collected during the survey, the dataset requires cleaning to fix inconsistencies in taxonomic identification; this work is ongoing and the invertebrate dataset was not ready for use in this process, but would be worth analyzing when ready.

A participant asked why the RV survey data was not considered a core sampling input given the role it played in the delineation of the MPA and the ongoing time series. The presenter mentioned that the power analysis to be presented on later would address this question, in addition to the desire to move towards more non-invasive methods.

Survey Methods and Strategies

Presenter: V. Hayes

Abstract

There were four elements considered in the development of a practical and feasible monitoring approach. This presentation focused on one of these elements, Survey Methods and Strategies, that will be considered for long-term monitoring of MPAs and marine refuges within DFO NL Region. Monitoring methodologies presented focused on benthic habitats (e.g., sea pens) and showed an array of possibilities highlighting advantages, limitations, and quality of data for each method. Other factors considered were degree of impact, non-invasive techniques and costs for long-term monitoring within realistic resources. Sampling activities were summarized into categories based on a three-prong approach: Core, Strategic, and Complementary. Core or primary methods would be conducted annually and may include water sampling (e.g., CTD casts, eDNA sampling), standardized sediment collections, baited cameras, and Underwater Vision Profilers. Strategic or targeted methods would be planned in advance and would be conducted less frequently than core sampling. Targeted methods may include sea floor imagery (e.g., ROV surveys, drop cameras), multibeam or Sidescan Sonar Surveys, satellite imagery, acoustic and satellite tagging, and passive acoustic receivers. The third approach would be complementary data collection methods and may include existing surveys that are on-going such as oceanographic surveys (e.g., Atlantic Zone Monitoring Program), annual trawl surveys (e.g., multispecies survey, redfish survey), and fixed gear surveys (e.g., halibut long-line survey). Other fisheries related programs could be incorporated including dockside monitoring, logbooks, and fisheries observer program. Testing of methods will be essential for the selection process along with cost-benefit comparisons between methods. External collaborations are necessary and in place with academia (e.g., Memorial University, Marine Institute). Collaborations provide valuable sources of data for long-term monitoring programs; however, it will be critical to ensure data collection protocols are standardized at the beginning for data quality assurance.

Discussion

A participant offered a correction to change the noted 420 micron sieve size to 300 micron, a mesh size often used in deep-sea macrofauna studies.

A participant mentioned that these imaging tools can also be effective for monitoring mobile species over time, including some fish and mobile benthic invertebrates, if they include video and forward-looking imagery.

A brief discussion was held on the potential of eDNA. eDNA methods and reference databases have advanced significantly over the past several years, and results are not limited to higher taxonomic levels. However, there are still improvements to be made in these methods, especially for coral and sponge taxa. As well, while eDNA can be used to inform on presence and absence, it is limited in providing information on abundance. DFO has established a national working group on eDNA.

A participant suggested a table to summarize the different approaches and grouping them by readiness level and/or their applicability to each of the monitoring programs (i.e., core, targeted, complementary). Another participant agreed and noted that this approach would bring more transparency to how ready (or not) each of these methods are. A third participant suggested adding the scale at which each tool operates to allow for comparison and context (e.g., multibeam on the order of tens to hundreds of metres, drop camera is centimetres, eDNA is millimetres).

A participant noted that the positioning systems for tools are significant, and gave the example of upgrading their Campod's ultra-short baseline (USBL) system using capital funds.

A participant suggested identifying synergies between this monitoring program and other groups (e.g., stock assessments) to get buy-in from those groups. These collaborations and value-added research questions could leverage the program and build opportunities to better understand biological and/or ecosystem processes, and would be beneficial to client groups as well as other scientists.

Indicators

Presenter: M. Warren

Abstract

The selection of appropriate indicators is crucial to the effectiveness of the overall monitoring program. These metrics will be used to help identify change and impacts on the ecosystem. Several potential indicators have been identified through other CSAS processes (e.g., Lewis et al. 2016, DFO 2021) and here a subset of those were selected using guidelines provided in DFO (2013). Meetings were held with members of the NL monitoring working group, and other subject matter experts, to evaluate the list of potential indicators using selection criteria, such as theoretical basis, measurement, historical data, sensitivity etc. as described in DFO (2013). A final list of 29 indicators were agreed upon by the working group along with corresponding survey methods and strategies. Indicators were identified for the overall goal of biodiversity as well as infauna and non-sea pen epifauna such as taxa diversity and richness. Indicators for quantifying the underwater sound or soundscape were identified which can help characterize both the fauna in the area as well as anthropogenic noise stressors. Several indicators were then identified for each of the key species of the Conservation Objectives (sea pens, Black Dogfish, Smooth Skate, Northern Wolffish, Porbeagle Shark and Leatherback Sea Turtle). Finally, several physical and biogeochemical indicators were included to monitor changes and status of the ecosystem and also any changes associated with climate change.

Discussion

A discussion was held around the exclusion of distribution as a sea pen indicator. A participant mentioned that distribution analysis could include looking at abundances across a transect to determine areas of higher abundances. The presenter explained that they had been thinking about distribution based on RV survey data, where distributions based on the data may not be useful because absences are not always true absences. The participant elaborated that they had meant "fine-scale distribution" or patchiness. The presenter noted that these indicators were selected based on a previous CSAS, and that "patch" was also excluded due to a lack of a definition at this time. It was also mentioned that some methods will inform multiple indicators (e.g., imagery surveys can provide information on both fine-scale abundance and distribution).

A participant noted that important breeding grounds for porbeagle sharks are northeast of the MPA but do not overlap with it, and suggested determining if there is a link between these two areas if it is part of the narrative of the MPA. Another participant answered that this may be a

challenge given the general knowledge gap around why the sharks are mating in this area, but could involve the Maritimes Region shark survey looking for females with fresh bite marks within the MPA.

A participant asked if any thought had been given to how these indicators will be operationalized into action, for example, developing thresholds or trigger points that would feed into adaptive management. The presenter mentioned that the focus of this process in particular was on the approach. However, determining thresholds and trigger points is included in the later phases of the indicator selection criteria, and that a statement could be included in the document noting that these discussions would need to happen in the future. The presenter mentioned looking at an indicator framework developed by Parks Canada as part of the next steps.

Several participants recommended various approaches for using imagery abundance data to determine how to define a sea pen “patch” (e.g., coarse-graining).

A question was asked regarding the process for refining the list of indicators. The presenter said that they started with a large list of indicators, but narrowed them down based on practicality and feasibility, as well as being reasonable about what can be done over the next five years. The sea pen indicators were given as an example of being easier to narrow down because of the absence of some species. A co-author outlined that the first year would involve looking at the data and what can be done with it, followed by evaluating what is realistic and informative the following year. After five years, the indicators will be reviewed, which allows for flexibility to adjust the indicators as needed based on power analyses and the results of field trials and other new research.

Morris et al. Working Paper / Overview of Power Analysis

Presenter: C. Morris & K. Nguyen

Abstract

The Laurentian Channel MPA is anticipated to promote the replenishment of depleted stocks within its boundaries and generate potential spillover to surrounding areas. Predicting and measuring changes resulting from marine protected areas (MPAs) has posed a challenge for practitioners, partly because ecosystems are complex and can change in unanticipated ways, but also due to MPA characteristics such as design factors, conservation objectives (COs), and monitoring programs, that can leave little chance of meeting stated goals. We consider these design factors for the Laurentian Channel MPA, a large offshore Canadian protected area established to protect against fishing impacts. We evaluated

1. whether it is realistic to expect improvements in the MPA for four previously established taxa-specific COs, and
2. whether existing scientific surveys are capable of detecting changes in these CO taxa even if they occurred.

Three CO species were sampled in scientific multispecies research vessel trawl surveys (Black Dogfish, Smooth Skate, and Northern Wolffish) and a fourth CO, sea pen taxa, were enumerated using seafloor imagery. Statistical power analysis was used to help evaluate the potential effectiveness of the Laurentian Channel MPA towards reaching its stated objectives, based on existing monitoring methods and available data. Simulations indicate that research vessel trawl surveys have very little chance of detecting change in the abundance of the three fish species examined, while seafloor imagery data had higher statistical power for sea pen taxa. Moreover, we show that expecting change related to the removal of fishing is unrealistic due to the fact that the MPA was established in an area of minimal fishing pressure. While

positive change is unlikely to be induced by the MPA, or be detected if they occurred, this MPA could provide conservation benefits if COs and monitoring approaches were realigned to match the unique features of this area that represents largely unimpacted sensitive benthic habitats.

Discussion

A participant asked if fixed stations were considered to improve upon the spatial variation of the power analysis. Another participant agreed that fixed stations could increase the power particularly for the stationary conservation objectives (i.e., sea pens). The presenter said that the analysis of trawling data is based on DFO's random stratified survey design and that they did not consider fixed stations. Another participant noted that changing the RV trawl survey design had been discussed before and was determined not to be feasible given the impacts on other programs and/or indices that rely on the survey. The first participant noted that the fixed stations could be in addition to the regular stratified random survey design. Several participants agreed that the existing DFO ship time does not allow for additional sampling on a routine basis, noting that it may be hard to find even half a day given the regular RV survey schedule.

A participant asked how many Northern Wolffish are encountered annually in the RV survey. Several participants said low to none, and another participant noted that its life history characteristics make the bottom trawl survey a less than ideal method for tracking trends in abundance.

A discussion was had around the alpha value (0.05). A participant noted that one way to increase power is to increase the alpha value to 0.1 or 0.2. The presenter noted they had considered changing the alpha too late in the process, but was not against re-running the analysis where alpha = 0.1. The first participant also questioned the effects sizes and whether success of the monitoring program would be detecting 60–80% decline. They noted that Parks Canada uses a 20% decline. The presenter acknowledged these points and mentioned that they had been tied up with the conservation objective values, and they were not sure how valuable they actually are.

External reviewers and participants agreed that this paper would be valuable to publish as a primary publication. Subsequently, a manuscript was submitted and published in scientific literature (Morris et al. 2024).

DAY 3 – JUNE 24, 2022

Summary of Day 2

Presenter: N. Wells

Discussion

No questions were raised.

Study Design

Presenter: J. Desforges

Abstract

Long-term monitoring programs have the potential to evaluate the status of biodiversity, identify trends in relation to various stressors, and prioritize management efforts accordingly. However, the effectiveness of these monitoring programs hinges on establishing a robust and comprehensive study design. Flaws in study design can results in erroneous conclusions, loss of confidence in the program, costly corrections, disruption of times series, and/or misalignment with program objectives. When designing a study to monitor marine protected areas, it is essential to

1. establish clear study goals;
2. minimize sampling bias;
3. understand the assumptions associated with statistical tests that will be used to interpret the data.

Research questions should focus on interpreting measurable indices while specifying the species, timespan, and spatial coverage of interest. Sampling bias can be minimized by implementing a sampling frame that uses either random, systematic, stratified, or core sampling approaches. These approaches should be further refined to ensure sufficiently high statistical power and independence of data. While it is important to establish a robust and comprehensive study design, logistics and resources may present limitations. Trade-offs between statistical power or sampling coverage are often required to establish cost-effective solutions.

Discussion

The presenter and a participant both clarified that the proposed survey designs were examples of different approaches that could be taken, and not all designs were being suggested for the Laurentian Channel MPA. In particular, these survey designs could be used to answer questions arising outside of the conservation objectives.

A brief discussion was held around power analysis. It was clarified that there are an average of 23 trawls per year within the MPA, and the analysis compared a “before” (2010–14) and “after” (2015–19) with approximately 115 sets each. Making the sampling effort comparable between different survey design approaches was also noted by participants and co-authors.

A discussion was held around autocorrelation of baited camera work. A participant said the degree of spatial autocorrelation would have to be tested in the field and would depend on the photo spacing. This autocorrelation can be accounted for in the model, but it is more challenging if the data is highly autocorrelated. Another participant noted that there can be benefits to oversampling; sophisticated analyses can be used to assess spatial correlation and/or other highly resolved spatial statistics. A co-author supported collecting data at multiple scales and using it to identify problems and explain the final approach taken.

A participant asked if the variability would increase if transects were spaced further apart. A co-author acknowledged that they worked with available data, which included variable distances between transects, without looking into the details of how the transects were designed. They noted that distance between transects would be considered in new survey designs, especially given the outcomes of discussions at this meeting.

Considerations / Recommendations

Presenter: M. Warren

Abstract

There are several important considerations and recommendation to make when developing a monitoring approach for the Laurentian Channel MPA. The relatively large size and the offshore location of the MPA can be prohibitive due to longer transit times and the scale of sampling required to be representative of such an area. Considerations for prioritizing sampling sites and methods used may be necessary. A recommendation to allocate resources to monitoring within the boundaries of the MPA as opposed to investigating the effectiveness of the MPA relative to outside areas was made. Further recommendations were made regarding reporting requirements with a reproducible, standardized annual report and a more in-depth report, or workshop, after several years (e.g., five years) to evaluate the overall approach and provide a venue to provide advice and feedback for adaptive management purposes. Considerations for the maintenance of a long-term monitoring program include keeping a consistent effort on the core monitoring program as well as planning ahead for limited resources and utilizing collaborative opportunities where available. Other considerations regarding long-term impacts of climate change were included. Improving statistical power and experimental design are important when trying to ensure the monitoring approach will provide robust scientific advice into the future. Further use of power analyses was recommended as we gather preliminary data during field trials in the coming years. Information collected as part of the monitoring approach will provide useful information to assess the status of the MPA and the conservation species which will ultimately feed into adaptive management procedures. It is recommended that reports, workshops and general feedback from the NL monitoring working group be included as part of any ongoing adaptive management process. Finally, seasonality of the data collected through the various survey methods and strategies will need to be considered when interpreting and reporting on findings in the MPA, however it is recommended that the core monitoring activities and targeted research be restricted to late summer when most of the conservation objective species occupy the MPA. Many unknowns still remain with the approach to scientific monitoring in the Laurentian Channel MPA. These first few years of implementation will require re-evaluation and refinement, particularly after field trials, to ensure MPA objectives are being achieved over the long term.

Discussion

A participant cautioned that the monitoring plan should not be overly complicated or rely too heavily on new techniques (e.g., eDNA) or other methods that could fall out of favour (e.g., citizen science, external monitoring). They summarized that the monitoring plan should be repeatable and also defensible 10–15 years from now. Other participants mentioned that funding cycles and available resources should also be considered. A co-author acknowledged these concerns and noted that the intention is to design a self-sufficient monitoring plan that is feasible, reproducible, cost-effective, and long-term based on the evaluation of field-testing the various methods discussed during this meeting over the next five years.

A brief discussion was held around at-sea survey management and metadata capture. A participant recommended ANDES (developed by Gulf Region) as a data entry system because

it has sophisticated components (e.g., survey re-planning, estimate time to next station), can run on a single computer station or on a network, and can be used on both small coastal fishing vessels and larger offshore vessels. This system is being explored for use by other programs (e.g., Maritimes Region assessments, AZMP) and could feed into reproducible reporting systems by allowing for standardized metadata at sea. There was general support for a similar system to be used and/or customized for this monitoring program.

A participant suggested that the recommendations as presented be revised to be more explicit and give direct advice regarding a monitoring plan for the Laurentian Channel MPA. The participant noted that these recommendations may need to be revised in the future, but could be revised as part of adaptive management. Co-authors acknowledged that they could be revised for the Science Advisory Report (SAR) based on discussions had at this meeting.

A participant commented on adaptive management and encouraged the management client to consider the decisions and/or actions that this monitoring program would inform. Particularly in the case of the Laurentian Channel MPA as a large no-take MPA with historically no fishing, the potential management changes that could be triggered based on this monitoring program to affect change within the MPA should be a core consideration. Other participants agreed.

Reviewer Comments

D. Kehler

The first reviewer remarked that the conservation objectives as written are problematic and pose challenges to the monitoring program. They recommended having clear monitoring objectives tied to the conservation objectives. They also cautioned about moving to status and trends without revising the conservation objective wording to match so these monitoring and reporting efforts can be justified.

The reviewer noted that the logic or conceptual model that would be used to guide monitoring decisions was unclear. The reviewer gave the example of the Pressure-Stressor-Response model used by Parks Canada that is tied to management levers that can be acted upon. Having such a model would also increase transparency.

The reviewer suggested keeping reporting simple, understandable, and actionable to ensure longevity of the program, and suggested reporting on 2 to 3 indicators per conservation objective. The reviewer generally mentioned design issues and considerations, and that the design should be influenced by the conservation objectives. They also spoke on the difference in status and trends (i.e., requiring a lot of data from one point in time versus data over multiple time periods) and encouraged the authors to think about whether both are of equal importance.

R. Stanley

The second reviewer encouraged the authors to make recommendations and advice more direct where possible.

The reviewer suggested that the background information provided throughout the document (e.g., species biology) should be expanded upon to explain how it relates to monitoring. The reviewer also questioned the need to find outside reference sites for the Laurentian Channel MPA given historically no fishing and suggested focusing internally on the site and monitoring its status.

The reviewer noted the importance of knowing what management levers are available to inform the monitoring plan (i.e., what needs to be monitored to inform adaptive management).

The reviewer encouraged the authors to include some reflection on network monitoring and how the Laurentian Channel MPA fits into the regional context.

P. Snelgrove

The third reviewer commented that this working paper provided an objective story of how difficult monitoring will be for some species given the conservation objectives as they are written. They added that the Laurentian Channel MPA is a striking case for the need to thoroughly think about conservation objectives at the beginning of a process so that they do not end up asking managers and planners to do something that will be impossible.

M. Koen-Alonso

The fourth reviewer noted that the power analysis produced a robust, core result that is defensible. The results were informative for discussing monitoring of the conservation objectives. The reviewer was direct about their conclusion, that the only meaningful conservation objective of the Laurentian Channel MPA is for sea pens.

Discussion

There was a brief discussion around the importance of data management and reproducible reporting being at the forefront of monitoring.

A participant agreed that they would like to see network monitoring mentioned in the resulting documents.

There was a discussion around power analysis and its role in larger MPAs. A participant commented on the potential to shift from specific fisheries-based outcomes to broader biodiversity outcomes. Another participant emphasized the utility of the Laurentian Channel MPA for broader biodiversity conservation, even if this aim is not reflected in the formal conservation objectives, and also its link to conservation networks. A third participant asked how species-focused power analysis can be used to reflect community level change. A co-author acknowledged that some thought had already been given to this question. Given the existing data, they believe that a biodiversity approach would be better than single species, but more work is required. A reviewer suggested including simple biodiversity metrics in this paper.

There was a discussion amongst several participants on the wording of the conservation objectives. One participant echoed the fourth reviewer, i.e., that the conservation objectives were not the right ones for this particular MPA. A co-author said that the power analysis presented at this meeting stemmed from wanting to explore these concerns objectively through science. A participant mentioned that these issues with the conservation objectives were flagged during the spatial analysis for the 2017 Placentia Bay-Grand Banks EBSAs process. There is a want to work with client partners to solve the problem rather than placing blame; this may include discussions with management around whether to continue monitoring or if there will be changes made based on the outcomes of the meeting. Another participant asked about re-wording the conservation objectives and was told it was outside the scope of the meeting, but that it had been suggested before and were unable to proceed with the proposed changes at this time. A reviewer discussed a similar issue in Maritimes Region with their marine conservation network plan. They suggested e.g., including the number of Northern Wolffish documented in the Laurentian Channel MPA over time to show the low probability of capture, how the MPA is not the tool to recover this species, and also how some information can still be provided on status and trends but not for actual monitoring. Another participant mentioned how MPAs can be a tool for recovery if they are designed for that purpose (i.e., in areas that can recover) and with appropriate life history context and locations in mind for specific at-risk species.

Drafting of SAR Summary Bullets

Presenter: N. Wells & N. Ollerhead

All meeting attendees participated in drafting and refining the wording of the summary bullets.

There was disagreement around whether adaptive management had been presented on and/or discussed sufficiently to be included as a summary bullet. The co-chairs and several participants argued that including this bullet would be crucial to better understanding what management actions are available before finalizing the monitoring program approach and solidify the link between monitoring and management. Meeting coordinators stated that, although the meeting had gone over time, these discussions were happening in plenary and were valid. Given the lateness of the day, it was suggested that a bullet on adaptive management could be drafted after the meeting based on discussions in plenary and shared with participants in the coming days. All participants were in agreement to this suggestion.

The meeting concluded by stating that the summary bullets, as well as the completed Science Advisory Report and Proceedings, would go out to all participants for review and approval.

DAY 4 – RECONVENING THE LAURENTIAN CHANNEL MPA REGIONAL PEER REVIEW, JULY 25, 2022

Summary of Situation

Presenter: N. Wells

Abstract

The regional peer review meeting was reconvened to finalize a bullet on adaptive management that was drafted and shared with meeting participants after the conclusion of Day 3. It was first stated that this reconvening was considered a full plenary session of the CSAS meeting. A summary of presentations and discussions on adaptive management that occurred throughout the first three days of the meeting was outlined. Relevant reviewer comments around adaptive management and the utility of the conservation objectives were also highlighted. The development of the bullet was explained, including original text from the co-chair and proposed text from participants during the initial meeting. Finally, three versions of the bullet developed post-meeting were shared for discussion. The three versions of the bullet read:

1. Bullet sent to meeting participants by CSA Office on June 30:
    - The establishment of a relevant and effective monitoring program requires feedback from management detailing the information required to support adaptive management decisions.
2. Updated bullet based on comments/questions from client:
    - The establishment of a relevant and effective monitoring program would benefit from feedback from management on the information that would be required to support adaptive management decisions, as this information becomes available.
3. Bullet proposed by client in response to updated bullet:
    - A relevant and effective monitoring program for the Laurentian Channel MPA would benefit from ongoing/annual consideration of available conservation objective taxa and other ecosystem information, and the power of that information/analysis to provide meaningful conclusions on status and trends. This is key to informing potential adaptive management actions, including adjustment of monitoring approaches, or modification of regulatory intent to effectively conserve and report.

Discussion

A meeting coordinator began the discussion by saying that there is no CSAS policy or perspective that would prevent a bullet on adaptive management from being added. While it may not be directly referenced in the Terms of Reference, it would not be the first time that additional bullets have been included based on presentations and/or discussions that occurred in plenary.

Several participants spoke on the differences in meaning between the three bullets and noted the increasing specificity and implications of the third proposed bullet. One participant framed the original intent of a bullet on adaptive management as wanting to understand what management actions the monitoring and science would inform. Another participant explained that the third bullet was intended to draw attention to the cyclical relationship between monitoring and management, although agreed that wordsmithing was required.

There was a discussion on the conservation objectives. A participant referred to the conservation objectives as metrics. Another participant argued that referring to the conservation

objectives as metrics infers ecological effectiveness, and this term had been purposely removed from the Terms of Reference for the meeting. This participant continued that the Terms of Reference specifically sought advice on status and trends of priority species (i.e., those named in the conservation objectives) and did not seek advice on the wording of the objectives nor the ecological effectiveness of the MPA. This point was acknowledged. However, it was also acknowledged that the co-authors thought it was important to include to show that change in conservation objective taxa cannot be attributed to the establishment of the MPA alone. Another participant spoke on their experience with the expectations of MPAs in NL Region, including the Laurentian Channel MPA, and how those expectations cannot be achieved without management changes (e.g., changing conservation objectives).

A co-chair suggested modifying the second bullet to achieve consensus. A participant wanted to still capture the second sentence of the third bullet (i.e., there are several adaptive management actions). The co-chair agreed.

It was clarified that the intention of this bullet was to encourage open dialogue and feedback between Science and Management on what is required of the monitoring program and was not intended to be required before any other steps can be taken. For example, if changing the boundaries is not an option, then science monitoring around the expansion of the MPA to include nursery areas, etc., would not be required.

A participant was concerned that feedback from management could be “do nothing.” It was stated that this would be management’s prerogative. The participant asked about frequency of this feedback. Several participants agreed that it would be implied as part of the 5-year management cycle in the Regulatory Impact Analysis Statement (RIAS).

There was a discussion around “monitoring priorities” vs. “monitoring approach.” It was decided to keep “monitoring priorities,” as it was already stated in other bullets that changes to the monitoring approach was captured in other bullets (e.g., as a result of field trials).

A participant requested to add “adaptive management is required” to the beginning of the bullet. Another participant disagreed, stating that, while adaptive management is built into the existing management cycle, the wording was too strong and that the main takeaway should be the need for iterative discussions. Other participants spoke to the importance of emphasizing the need for adaptive management and its implementation, not just assuming that it will be considered going forward. Another participant agreed with the sentiment, but suggested that it strayed too far from the scope of the meeting. It was not added to the bullet.

Consensus was achieved on the final bullet as follows:

- The establishment of a relevant and effective monitoring program would benefit from ongoing dialogue with management on the information that would be required to inform potential adaptive management actions, including adjustment of monitoring priorities, or modification of regulatory intent to effectively conserve and report.

The meeting was concluded.

RESEARCH RECOMMENDATIONS

1. Compare the Atlantic Zone Monitoring Program (AZMP) line that crosses the Laurentian Channel MPA with other AZMP lines to determine if the Laurentian Channel is more variable than areas less influenced by the North Atlantic Oscillation (NAO).
2. Develop a research study to perform experimental manipulations inside of the MPA to assess the impacts of trawling on sea pens. This study may involve sampling areas trawled by the RV survey to provide insights on habitat use by fish species (minimal impact vs complete removal), monitoring frequency, and/or rates of change in the habitats, as well as looking at recovery.
3. Re-run selected analyses at the scale of the Laurentian Channel MPA:
    - Biodiversity analyses (e.g., Shannon-Wiener index, species richness) – to provide additional information for the selection of monitoring locations within the MPA.
    - Unsupervised habitat classification using higher resolution data – to determine if there are (abiotic) habitat clusters within the boundaries of the MPA.
    - Unsupervised habitat classification including seasonality (e.g., temperatures from all seasons, not just spring) – to see what difference seasonality makes.
    - Strata-based community analysis with different dissimilarity values to create more groups – to see if there is more differentiation in the MPA itself and to see if it matches the benthoscapes.
4. Develop thresholds or trigger points for indicators to make them operational (i.e., determine a point at which to take management action).
5. Further explore power analysis applications:
    - Experiment with changing the alpha value to 0.1 or 0.2 or reducing the effects size.
    - Expand the power analysis from its species-focus to broader biodiversity metrics to reflect community-level change.
6. Explore ways of integrating CHONe projects (i.e., 2017–18 missions) that can help inform monitoring design.
7. Explore whether future RV survey set locations can be projected into the future.
8. Refine the benthoscape analysis as monitoring evolves and new data become available.
9. Investigate the potential impacts of sediment plumes from trawling outside the Laurentian Channel MPA on sea pens inside the MPA.

REFERENCES CITED

DFO. 2013. Guidance on the Formulation of Conservation Objectives and Identification of Indicators, Monitoring Protocols and Strategies for Bioregional Marine Protected Area Networks. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/081.

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Lewis, S., Ramirez-Luna, V., Templeman, N., Simpson, M.R., Gilkinson, K., Lawson, J.W., C. Miri and Collins, R. 2016. A Framework for the Identification of Monitoring Indicators Protocols and Strategies for the Proposed Laurentian Channel Marine Protected Area (MPA). DFO Can. Sci. Advis. Sec. Res. Doc. 2014/093. v + 55 p.

Morris, C. J., Nguyen, K. Q., Neves, B. M., and Cote, D. 2024. Monitoring data for a new large offshore marine protected area reveals infeasible management objectives. Conservation Science and Practice. 6(2): e13076.

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APPENDIX A – TERMS OF REFERENCE

Terms of Reference

Identification of Reference Sites and a Scientific Monitoring Approach for the Laurentian Channel Marine Protected Area

Regional Advisory Meeting
Newfoundland and Labrador Region

Date: June 22-24, 2022
Virtual Meeting

Chairpersons: Nadine Wells and Neil Ollerhead

Context

National Marine Protected Area (MPA) guidance states that monitoring plans must address the MPA conservation objectives (COs) contained within Section 35 of the *Oceans Act*, including associated specific measurable objectives (i.e., particular species, habitats, or features to be protected by the MPA). For the Laurentian Channel MPA, the overarching goal is to "conserve biodiversity in the Laurentian Channel MPA through protection of key species and their habitats, ecosystem structure and function, and through scientific research". There are six COs for the Laurentian Channel MPA:

1. Protect corals, particularly significant concentrations of sea pens, from harm due to human activities (e.g., fishing, oil and gas exploratory drilling, submarine cable installation and anchoring) in the Laurentian Channel MPA.
2. Protect Black Dogfish from human induced mortality (e.g., bycatch in the commercial fishery) in the Laurentian Channel MPA.
3. Protect Smooth Skate from human induced mortality (e.g., bycatch in the commercial fishery) in the Laurentian Channel MPA.
4. Protect Porbeagle sharks from human induced mortality (e.g., bycatch in the commercial fishery, seismic activities) in the Laurentian Channel MPA.
5. Promote the survival and recovery of Northern Wolffish by minimizing risk of harm from human activities (e.g., bycatch in the commercial fishery) in the Laurentian Channel MPA.
6. Promote the survival and recovery of Leatherback Sea Turtles by minimizing risk of harm from human activities (e.g., entanglement in commercial fishing gear, seismic activities) in the Laurentian Channel MPA.

MPA monitoring assesses the status of conservation priorities on which the COs are based, providing trends where available; and considers other ecosystem information as appropriate in order to incorporate greater context to any changes in components of interest over time. MPA monitoring can include the provision of reference areas to demonstrate if change has occurred resulting from a change at the treatment site. In 2014, DFO Science developed the framework for the identification of monitoring indicators, protocols and strategies for the Laurentian Channel MPA (DFO 2014).

This peer review process was requested by DFO Marine Planning and Conservation to inform the identification of reference sites and the development of a scientific monitoring approach for the Laurentian Channel MPA.

Objectives

The objectives of the peer review process are to:

1. Identify direct or indirect indicators and reference sites, where possible, that could be used to monitor the status and trends of the key species listed as part of the six COs, as well as overall biodiversity for the Laurentian Channel MPA. Those key species are as follows:
    i. Corals (sea pens);
    ii. Black Dogfish;
    iii. Smooth Skate;
    iv. Porbeagle shark;
    v. Northern Wolffish; and
    vi. Leatherback Sea Turtle.

    Other necessary monitoring data that can inform on the overall health of the ecosystem and aid in the interpretation of indicators for the key species could also be proposed.
2. Develop a scientific monitoring approach for the Laurentian Channel MPA based on proposed indicators, survey methods, and strategies identified by Lewis et al. (2014). Each of the key species listed above will be considered when developing indicators, survey types, and study design considerations.
3. Investigate the ability to assess MPA conservation priority species metrics using existing Research Vessel (RV) trawl survey data and seafloor imagery data. A case study for four CO species (Black Dogfish, Northern Wolffish, Smooth Skate, and sea pens) will be considered, however, the approach, simulation modelling, and evaluation of statistical power to detect temporal changes in species metrics could also be useful for other MPA applications.

Expected Publications

- Science Advisory Report
- Proceedings
- 2 Research Documents

Expected Participation

- Fisheries and Oceans Canada (DFO) (Science, Ecosystems Management and Resource Management Branches)
- Provincial/Territorial jurisdictions
- Academia
- Indigenous groups
- NGO’s
- Industry

References

DFO. 2015. Monitoring Indicators, Protocols and Strategies for the Proposed Laurentian Channel Marine Protected Area (MPA). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2014/049.

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APPENDIX B – LIST OF PARTICIPANTS

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APPENDIX C – MEETING AGENDA

CSAS Regional Peer Review Process
Identification of Reference sites and a Scientific Monitoring Approach for the Laurentian Channel Marine Protected Area

Virtual Meeting – MS Teams Platform
June 22-24, 2022

Co-Chairs: Nadine Wells and Neil Ollerhead

DAY 1 – Wednesday, June 22

Time	Activity	Presenter
10:00 am	Welcoming remarks *(10 min)*	Atef
10:10 am	Overview/ToR/CSAS request *(20 min)*	N. Wells / N. Ollerhead
10:30 am	CHONe I/II *(30 min)*	P. Snelgrove / N. Templeman
11:20 am	Overview of Regional MPA and OECM Monitoring *(40 min)*	J. Janes / M. Warren
12:00 pm	Lunch *(60 min)*	All
1:00 pm	Laurentian Channel (LC) MPA Establishment/Regulations/COs *(30 min)*	J. Janes / M. Lynch
1:30 pm	LC Site Characterization *(30 min)*	D. Bélanger
2:00 pm	LC Stressors *(30 min)*	C. Morris
2:30 pm	Break *(15 min)*	All
2:45 pm	CO Species Background *(30 min)*	B. Neves
3:15 pm	Monitoring Approach for LC MPA *(45 min)*	M. Warren
4:00 pm	Adjourn	All

DAY 2 – Thursday, June 23

Time	Activity	Presenter
10:00 am	Overview of approach to Reference Sites *(30 min)*	M. Warren
10:30 am	Core Monitoring Sites *(60 min)*	B. Neves
11:30 pm	Unsupervised Habitat Mapping *(30 min)*	C. Konecny

Time	Activity	Presenter
12:00 pm	Lunch *(60 min)*	All
1:00 pm	Strata-based Community Analysis *(30 min)*	M. Warren
1:30 pm	Survey Methods and Strategies *(30 min)*	V. Hayes
2:00 pm	Indicators *(30 min)*	M. Warren
2:30 pm	Break *(15 min)*	All
2:45 pm	Study Design *(30 min)*	J. Desforges
3:15 pm	Morris et al. working paper Overview of power analysis *(45 min)*	C. Morris / K. Nguyen
4:00 pm	Adjourn	All

DAY 3 – Friday, June 24

Time	Activity	Presenter
10:00 am	Considerations/Recommendations *(30 min)*	M. Warren
10:30 am	Reviewer Comments *(60 mins)*	Reviewers
11:30 am	Drafting SAR summary bullets and conclusions *(30 min)*	All
12:00 pm	Lunch *(60 min)*	All
1:00 pm	Drafting of SAR summary bullets (continued if required)	All
TBD	Research Recommendations (Captured in Proceedings Report)	All
TBD	Meeting Deliverables and ToR Objectives Review	All
2:30 pm	Break *(15 mins)*	All
2:45 pm	Continuation of above items	All
4:00 pm	Adjourn	All