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Proceedings of the National Peer Review on the Significance of Canadian Healthy Oceans Network (CHONe) Research to Marine Conservation within Fisheries and Oceans Canada

February 2–3, 2016
Ottawa, Ontario

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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 Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat (CSAS) National peer review process was held February 2nd - 3rd, 2016 at the Indigo Hotel, Ottawa, Ontario. The purpose of this meeting was to explore contributions that the Natural Sciences and Engineering Research Council of Canada (NSERC) Canadian Healthy Oceans Network (CHONe II; 2015-2020), given its partnership with the Department, could make to marine conservation activities within DFO. Participants included those occupying various positions in the Science and Ecosystems Management Sectors of DFO, as well as researchers from various academic institutions across the country with leadership roles in CHONe II.

Initially, the meeting specifically focused on the role and process of science in decision-making at DFO. Researchers presented and discussed outputs of CHONe I (2008-14), which were potentially applicable to marine conservation and currently available for mobilization within the DFO Science and Oceans Management programs. Challenges and lessons learned from CHONe I were also put forward and set the basis for the identification of methods by which to improve communication and the dissemination of information between the partners, including research outputs, through the course of the five-year CHONe II research program and partnership. All meeting participants validated the importance of ensuring the optimization of integrating CHONe II findings into marine conservation activities at DFO.

SOMMAIRE

Le Secrétariat canadien de consultation scientifique (SCCS) de Pêches et Océans Canada (MPO) a tenu une réunion nationale d'examen par les pairs les 2 et 3 février 2016, à l'hôtel Indigo d'Ottawa (Ontario). Cette réunion avait pour but d'étudier les contributions que le Réseau stratégique du CRSNG pour des océans canadiens en santé (CHONe II; 2015-2020) pourrait apporter aux activités de conservation marine au MPO, étant donné son partenariat avec le Ministère. Parmi les (21) participants à l'atelier, on comptait les occupants de divers postes dans les secteurs de la gestion des sciences et des écosystèmes du MPO et les chercheurs de divers établissements d'enseignement partout au pays assumant un rôle de leader du CHONe II.

Le début de l'atelier mettait tout particulièrement l'accent sur le rôle du Secteur des sciences dans la prise de décisions à Pêches et Océans Canada et le processus qu'il doit suivre à cet égard. Les chercheurs ont présenté et discuté des résultats du CHONe I qui pourraient s'appliquer à la conservation marine et être adoptés, prochainement, par les programmes de gestion des océans et des sciences au MPO. Les défis et leçons retenues du CHONe I ont également été mis de l'avant. Ceux-ci établissent le fondement permettant de déterminer les méthodes à suivre pour améliorer la communication et la diffusion de l'information, comme les résultats de recherche, entre les partenaires pendant toute la durée (cinq ans) du partenariat et programme de recherche CHONe II. Tous les participants à la réunion ont convenu qu'il est très important d'optimiser et d'intégrer les résultats du CHONe II aux activités de conservation marine au MPO.

INTRODUCTION

The chair (Patrice Simon) welcomed participants to the meeting and conducted a roundtable of introductions, including the name, affiliation, and area of expertise of each participant (Appendix 1) from Fisheries and Oceans Canada (DFO) and/or the Canadian Healthy Oceans Network (CHONe II). CHONe II is a strategic network jointly funded by the Natural Sciences and Engineering Research Council of Canada, DFO, and others (other government agencies; L'Institut nordique de recherche en environnement et en santé au travail (INREST) representing the Port of Sept-Îles and City of Sept-Îles; and environmental non-governmental organizations (ENGOs)). Some of the context for convening the meeting was provided, including identifying the previous and current research partnerships that DFO entered with CHONe I and CHONe II respectively, and its perceived value to marine research and conservation activities in Canada. The meeting Terms of Reference (Appendix 2) was reviewed, highlighting the objectives of the meeting, and identifying the expected publications. The chair then provided an overview of the two-day meeting agenda (Appendix 3), consisting of a series of presentations and discussions.

The main goal of the meeting was identified as generating a list of potential CHONe II outcomes applicable to marine conservation activities (science and management) within DFO and to agree upon recommendations for ensuring optimal integration of CHONe II findings, as appropriate, into marine conservation activities at DFO.

PRESENTATIONS AND DISCUSSION

CANADIAN HEALTHY OCEANS NETWORK (CHONE) RESEARCH AND MARINE CONSERVATION WITHIN FISHERIES AND OCEANS CANADA: CONTEXT

Presenter: Patrice Simon

Summary

DFO and CHONe researchers face distinct challenges when seeking to collaborate on informing policy from scientific findings. These challenges include the effective dissemination of scientific findings to relevant officials within DFO (or government in general). Communication channels are often lacking, or are insufficiently utilized between parties involved at all levels.

Lessons were learned from CHONe I that will inform CHONe II as it continues to develop. All partners involved in marine conservation efforts, including the development of Marine Protected Areas (MPAs) and other activities to achieve Canada's newly mandated marine conservation goals, must foster open and transparent relationships utilizing effective communication strategies. Only through effective communication will policy formulation and application optimally incorporate CHONe II findings.

The role of science in governmental procedures must be considered more broadly. Policy makers face the challenge of ensuring that all interests, including stakeholders, receive equal consideration. However, should industry interest receive greater weighting than ecological value for any reason (including absence of knowledge) formulated policy can contain inherent bias. The importance of peer-reviewed science to inform policy and management is most evident here where the stronger the science the clearer the basis for decisions should be.

Discussion

An exploration of the partnership fostered between DFO and CHONe ensued. Reflection on some of the challenges faced over time (mainly during CHONe I) resulted in important lessons learned. These lessons inspired proposed approaches for overcoming hurdles for a productive partnership and, ultimately, the effective mobilization of CHONe scientific findings as appropriate.

Participants discussed specific challenges faced when incorporating scientific findings (internal and external to DFO) into policy development and management in general. The science advisory process plays a key role (to be discussed in further detail in a subsequent presentation) – and the inclusion of CHONe expertise and outputs within the science advisory process was deemed to require further and specific attention as the partnership between CHONe II and DFO continues.

One of the newest challenges facing the ongoing partnership between CHONe II and DFO relates to timelines for marine conservation actions influenced by the Government of Canada's newly mandated marine conservation targets (i.e., biodiversity targets). These targets call for the protection of 10% of Canada's marine area by 2020 (equivalent to approximately 525,000 km^2) with 5% protection by 2017. The discussion highlighted that these ambitious goals will require that DFO further examine the interaction between science findings and policy implementation and the ways in which scientific advice may be most efficaciously communicated to policymakers.

The discussion emphasized the necessity for streamlining and optimizing effective communication, specifically between CHONe II research scientists and managers/policy-makers. Enhanced presence by non-science groups 'at the table' was seen as essential to communicating needs for science advice to inform management work plans. Discussions also highlighted inclusion of the Province of Quebec (as another CHONe II partner) in discussions on research priorities. The group therefore concluded that the creation of various accessible and effective communication channels were absolutely essential for the proper application of CHONe scientific findings into MPA development and other marine conservation activities.

SCIENCE IN GOVERNMENT: DFO AND SCIENCE ADVICE

Presenter: Nadine Templeman

Summary

A brief overview of the DFO science advisory process, emphasizing the requirement for active engagement by all participants, the principle of consensus in peer review meetings, and expectations for the overall process, was put forward. Science priorities flow/come from Parliament, Ministerial Mandate(s), and Strategic Priorities in the Reports on Plans and Priorities (RPPs). Particular DFO Science priorities at the program level (e.g., International Governance Strategy (IGS), Strategic Program for Ecosystem-Based Research and Advice (SPERA), Aquatic Climate Change Adaptation Services Program (ACCASP), Program for Aquaculture Regulatory Research (PARR), Aquaculture Collaborative Research and Development Program (ACRDP), Canadian Hydrographic Services (CHS), etc.) are set in consultation with client sectors and, in some cases, stakeholders (e.g., Fisheries Science Collaborative Program (FSCP)).

DFO provision of science advice has been long standing, starting with providing fisheries advice on Canada's east coast in the 1970's. The Science advisory process is well established, and provides the basis for policy and management options and decisions at DFO. Science advisory priorities are generally set via the annual Canadian Science Advisory Secretariat (CSAS) advice planning process which responds to requests for advice from client sectors and takes into consideration Departmental priorities and achievability by science based on specific timeframes or available resources. The CSAS work plan, outlining the regional and National schedule for provision of science advice, is approved at the Departmental Management Board level. Currently the CSAS schedule results in ~100 advisory processes and ~300 documents per year.

Science advisory demands have been changing over time and increasing in frequency, scope and scale. Requests from “newer” clients (e.g., the *Species at Risk Act* (SARA) group, Oceans, and Fisheries Protection) are in addition to historic demands (i.e., Fisheries and Aquaculture Management). Required research/monitoring to provide advice may be ongoing or may require new activity to be funded from various sources (e.g., B-base funding allotments, collaborative agreements, partnerships, etc.). The overall CSAS planning process is important in that it informs work planning for the short/medium/long-term, including relative to collaborative research, and the inclusion of external expertise at peer-review meetings.

Discussion

Meeting participants discussed some of the challenges faced by the CSAS process. The greatest challenges stem from timing and aligning of scientific research to suit pressing management deadlines. This need highlights further the crucial importance of effective coordination and/or interactions between government and academia in order to maximize efficiency of delivering science advice.

With respect to new or changing priorities, participants noted that the process for the provision of science advice allows for the consideration of addressing ad hoc or urgent requests as needed. In particular, researchers reiterated the potential role of CHONe in the provision of this advice. Further, in cases where timelines allow (i.e., where non-urgent but changing requirements for science advice are identified), slight changes in or additions to the CHONe II research plan could be considered in order to contribute to science advisory needs.

The discussion highlighted that the conception and design of CHONe (I and II) stemmed from the need to address a myriad of gaps that remained in the ability to inform “newer” non-traditional marine management needs (i.e., outside of the realm of fisheries management considerations) within the Department. Although “ecosystem science” and the ability to respond to “newer” client needs within DFO have become more mainstream in recent years, “oceans management” also continues to broaden with increasing need for scientific collaboration and partnerships.

CHONE I: ECOLOGICAL FINDINGS RELEVANT TO DFO MARINE CONSERVATION

Presenters: CHONe I Researchers

Summary

The scientific findings of ten CHONe I research projects relevant to further advancing science and/or for consideration in marine conservation activities were presented and discussed concurrently. Participants explored the research relevance of CHONe I to current and future marine conservation theories and practice. The project overviews and their outcomes provided novel understandings of the nature of current and future marine conservation activities (especially spatial management), not only in Canada, but also globally.

Discussion

Theme 1: Biodiversity in Space and Time

1. **Canadian Arctic Megabenthic Biodiversity - Identification of regions of high productivity and diversity can be undertaken to prioritize areas for protection.**

   The analysis of Arctic megabenthic marine biodiversity was undertaken using the concept of Ecologically and Biologically Significant Areas (EBSAs). Analysis of various aspects of the distribution of biodiversity in the Arctic Ocean demonstrated that polynyas (i.e., stretches of open water found within large expanses of sea ice) and other significant areas contained some of the greatest levels of biodiversity.

   However, the project also determined that the boundaries of the EBSAs used in the study were not necessarily reflective of the importance of the surrounding areas. For example, influx of nutrients and sediments from areas outside of an EBSA or polynya, carried by ocean currents, was frequent and significant. The coarseness of the EBSA boundaries was thus questioned as current Arctic EBSA boundaries do not account for such external contributions.

   Therefore, the development of MPAs must consider ecological contributions of relatively species-poor areas to species-rich areas through nutrient supply, and perhaps in other as-yet unknown ways. Simply representing significant biodiversity within EBSA boundaries does not encompass the entire realm of importance within the local/regional ecosystem, further speaking to the need for MPA network development.

   Notably, Ocean Biogeographic Information System (OBIS) data is now available for use in conducting studies similar to that described above and can circumvent some of the challenges faced around the costly nature of Arctic field sampling. This database opens the possibility for new analytical work in the area without sending personnel to the Arctic region (or other areas) for data collection. This opportunity punctuates the major value in keeping track of remotely obtained data in the Arctic (and elsewhere) for additional analysis to be undertaken as appropriate. While field work in isolated sites may sometimes be necessary, remote-sensing methods can provide substantial data for these and other analyses.

2. **Habitat Mapping to Increase Coral and Sponge Species Protection - Recent developments in multi-beam mapping and predictive mapping technology have great potential in the provision of guidance for features of specific protection plans (e.g. for coral and sponge taxa).**

   When implementing predictive benthic analyses, different scientific modelling approaches may be considered for specific cases.

   One of the goals of CHONe II is to continue to foster the use and further development of such predictive mapping capabilities. For example, multi-beam mapping is capable of extrapolation of broader spatial areas in spite of limited sampling points (potentially employing this method in analysis of the data-poor Arctic regions.

   Prior to the development of these predictive mapping technologies, there were no mechanisms available for the prediction of Sensitive Benthic Areas containing fragile species or communities such as corals and sponges. Now, automated image processing can be used to extrapolate sea floor variability data and features with much greater efficiency (e.g., see the Northeast Fan, an extension of the Northeast Channel).

3. **Substrate Type Affects Marine Biodiversity in Deep Waters - Semi-automated computer video processing for image extraction supports instant recognition of anomalous benthic areas that may merit conservation measures.**

   This newly developed software can instantly determine image characteristics and therefore greatly reduce image processing time compared to human-based image analysis.

   Such new analysis methods and resulting data can provide both general and specific conservation guidance for the ongoing development of the features of the 10% protection plan. It is especially useful in areas characterized by mosaic benthic communities.

   MPA development critically requires the analysis of how measures of biodiversity vary in space and time. Spatial variation at many levels affects biodiversity and these new remote sensing tools will enable the quantification and qualification of such spatial influences. These new visual techniques can capture temporal variation in geographic regions of Canada's marine regions to help in planning temporally influenced MPA boundaries.

   Data collected via the method above may be stored in specific software templates used by CHONe researchers and/or in the public domain. Furthermore, such new measurement tools developed during CHONe I can also be applied to work outside of oceans management (e.g., fisheries management and fisheries protection). This new mapping data also enables description of the use of these types of geographic surrogates with increasing confidence.

Theme 2: Ecosystem Function

1. **Identification of Source populations of *Ridgeia piscesae* - Gene flow data can form a basis for identification of vulnerable habitat locations and sources of genetic variation in ecologically valuable species within an MPA.**

   CHONe I utilized gene flow analysis to examine the spatial pattern of two *R. piscesae* morphotypes in the Endeavour MPA. The study showed less robust geographic structure in genetic variation patterns than expected, and that ocean circulation heavily influences such patterns.

2. **Arctic Seafloor Areas Important for Healthy Oceans - Areas of high diversity and function may not spatially coincide. Therefore, function must be considered in tandem with diversity in conservation planning.**

   Analysis of ecological parameters in an Arctic environment determined that important details can be missed when considering only species diversity as a measure of protection value for a given area. Therefore, process must be considered in parallel with function. For example, algae settling onto the seafloor depends on ocean currents which can transport the algae from one area to another, thus contributing nutrients and biomass to destination areas.

   This specific process is highly relevant in Arctic benthic environments, because algae from species-poor areas, outside EBSA boundaries, travel in ocean currents into species-rich areas within EBSAs. Analyses that only focus on species diversity cannot capture this contribution of external nutrients into the EBSAs from adjacent regions.

   Current EBSA boundaries do not account for such allochthonous nutrient contributions from areas previously considered unimportant. Therefore, when examining the Arctic region from an ecosystem function approach, the true ecological value of areas otherwise considered relatively unimportant may require re-evaluation in the context of EBSA boundaries. This example illustrates the importance of evaluating productivity in addition to other considerations.

Structural variations through time in a marine ecosystem must also be considered. In the Arctic regions of Canada, for example, reduced sea ice coverage will affect ecosystem function, demonstrating the need for process-based analyses in addition to species abundance analyses, and for holistic water-mass analyses rather than benthic or planktonic communities alone.

Evaluating integrated processes and functions will increase the feasibility of the prediction of time-dependent changes within EBSA boundaries.

The above study not only has implications for EBSAs, but also for MPA networks, specifically connectivity, where these nutrient-contributing areas may connect EBSAs.

Theme 3: Population Connectivity

1. **Juvenile Greenland Cod Movement and Habitat Use - Path-based (vs. point-based) estimate of spatial use from high-frequency tracking data better identifies species movement corridors.**

Analysis of juvenile Greenland cod (*Gadus ogac*) migration patterns showed that individuals of this species travel greater distances for access to eelgrass beds than was previously thought. Indeed Greenland cod sometimes travelled several kilometers to access required eelgrass areas. These cod also move through less desired habitats (e.g., kelp beds) to access these eelgrass areas.

These analyses demonstrate the utility of the Dynamic Brownian Bridge approach that recognizes that data points and measurements are not necessarily independent of one another. The fact that fish move through non-ideal areas to access optimal areas may mislead observers. For example, the presence of the Greenland cod in kelp beds in no way indicates whether or not this locale is the final destination of the individuals.

The above study illustrates the importance of examining species behavioural/migration patterns where possible when deciding on MPA boundaries. This inherent connectivity of habitats and water masses must also be considered in MPA network planning.

2. **Conservation of Golden Cod - Temporal variation in population location is vital to informing MPA formation and placement. This knowledge, acquired through acoustic tracking or other means, can support MPA efficacy during establishment and/or adaptive management phases to best protect species of interest.**

In Gilbert Bay, Newfoundland and Labrador (NL), a nineteen-year golden cod (*Gadus morhua*) monitoring program assessed attributes of this species' behavioural patterns and migration routes. Acoustic tools were utilized for data collection relating to population size and movement patterns.

The increased knowledge regarding patterns of movement of golden cod outside of the Gilbert Bay MPA motivated coordinated alterations in fishing season dates in areas in which the population seasonally migrated (such that the opening date was permanently delayed until September). This combination of actions allows golden cod to migrate back into the MPA before the fishing season begins, thus protecting much of their population.

Notably, declines of golden cod coincide with the movement of other fish species into the Gilbert Bay MPA that may possibly compete with this species in the future. Ongoing monitoring and analysis of this population is therefore required.

Temporal variation was frequently overlooked in MPA management strategies in the past, but this case clearly demonstrates its potential importance to conservation success.

3. **Genetic Diversity and Connectivity of Glass Sponge Reef - Genetic information can provide insight into reef management requirements and lead to predictive models of genetic diversity in other glass sponge species.**

   Genetic analysis of sponge populations from the extremely rare "prehistoric" glass sponge reef on the Pacific Coast was undertaken to inform understanding of dispersal patterns. This study provided information on population structure, reproductive season, and larval distribution boundaries, and helped to determine source-sink populations.

   This work formed the basis for further research on this delicate ecosystem type in CHONe II.

4. **Source-Sink Dynamics of Capelin in the Saguenay-St. Lawrence Marine Park – MPA implementation in an area may provide unforeseen benefits.**

   Capelin (*Mallotus villosus*) within the Saguenay-St. Lawrence Marine Park (SSLMP) have gained some protection within the boundaries of this conservation area even though the species was not targeted there for conservation measures. This study found that approximately 50% of individuals recruiting into the capelin population within the SSLMP's boundaries were also spawned inside the conservation area.

   Noting that the original intent of the implementation of SSLMP was not to protect capelin, this finding may create a grey area in which the question of whether capelin may be fished within the SSLMP's boundaries arises. The need for *a posteriori* alterations or additions in MPA management and regulation thus becomes apparent in such situations.

   Regulatory and political challenges may exist where such unforeseen benefits as those shown here become apparent after MPA implementation. It is important, therefore, to develop a method to facilitate changes in MPA regulations to increase protection measures where the necessity becomes clear (i.e., to ensure that all ecological vulnerabilities, foreseen or not, are addressed).

5. **Rockfish Conservation Areas and Their Effectiveness - Ensuring the implementation of the most effective tools to recover depleted marine species requires evaluating how effectively management actions achieve their objectives.**

   CHONe researchers assessed the effectiveness of rockfish conservation areas (RCAs) by comparing rockfish population size in RCAs versus in unprotected rockfish habitats. The study demonstrated a 60% increase in rockfish population sizes within protected areas compared to unprotected areas. Importantly, the absence of baseline data prior to the implementation of the RCAs presented a challenge in drawing definitive conclusions regarding the efficacy of this management action.

   Interestingly, a recent mass death of Pacific starfish initiated a resurveying of populations, contributing new data to the time series, and increasing the robustness of the initial comparative measurements.

CHONE I: RESEARCH TOOL FINDINGS RELEVANT TO DFO MARINE CONSERVATION

Presenters: CHONe I Researchers

Summary

Various scientific data collection and analysis methods and tools were developed over the course of CHONe I. These newly developed approaches can provide a vast repertoire of options for the reinforcement of scientific work in CHONe II. Additionally, they hold potential for

application in other scientific endeavors beyond CHONe as well. Novel methods and tools can broaden the scientific basis for marine conservation considerations in Canada.

Theme 1: Biodiversity in Space and Time

1. **Seafloor Roughness, Effects on Biodiversity - Seafloor rugosity measurements can inform on the biodiversity characteristics of an area.**

   Benthic substrate physically affects biodiversity levels. Past studies show a positive relationship between elevated rugosity (i.e., greater seafloor roughness and variability) and increased biodiversity levels.

   Seafloor roughness provides a surrogate for marine biodiversity, due in part to greater habitat heterogeneity on complex seafloor environments that supports greater ecosystem niche diversity.

   CHONe I researchers developed new optical measurement tool, combining laser beams and predictive algorithms to extrapolate and calculate characteristics of the surrounding seafloor. Rugosity, the variation in roughness and texture of the seafloor, was measured using physical and optical measurement methods.

   Such methods are highly useful for fine-scale seafloor mapping which, in turn, may be applied to the interpretation of acoustic measurements, thus bridging the gap between optical and acoustic methods.

   This tool can therefore provide a proxy for the biodiversity characteristics of a given area simply by typifying the seabed roughness.

2. **Environmental Drivers of Taxonomic Shifts in Picoeukaryotes - Taxonomic shifts in picoeukaryotes can predict pelagic diversity patterns and how they may respond to environmental change.**

   Recent developments in the utilization of physical and geographic environmental data improve the characterization and inference of biodiversity levels.

   In terms of microbial eukaryotes, water mass is the strongest determining factor of species diversity. Water mass reflects temperature and nutrient concentrations, two of the greatest drivers of microbial diversity. The positive relationship between nutrient concentration/temperature and picoeukaryote diversity improves our understanding of the relationship between water mass and the level of microscopic biodiversity present.

3. **Remote Sensing of Arctic Intertidal Landscapes - Remote sensing techniques enable the characterization of benthic biodiversity patterns via the determination of physical landscape variables.**

   CHONe I examined interactions between the physical landscape, biodiversity, and productivity. Iqaluit, Nunavut (NU), situated on Frobisher Bay, and Pangnirtung, NU located on the Pangnirtung Fjord, have both recently increased sewage output into their respective nearby marine areas. The effect of increased sewage output from these two communities on the surrounding benthos was examined using the DalBlimp tool.

   Recent developments in remote-operation drone technology go hand-in-hand with ecological and geographical data sampling of extremely remote regions. However assessing the robustness of these newly-derived technologies requires ground-truthing. If shown to be sufficiently accurate and feasible, the use of such remotely controlled data collection tools would usher in an entirely new era for Canadian Arctic biogeographical research.

4. **Scaling-Up of Seafloor Observations from Remote Sensing - It is possible to utilize a statistically representative number of geographic point samples of seafloor characteristics to scale-up to larger areas?**

   Exploring remote-sensing technologies have led to the development of methodologies where the collection of seafloor point samples allow for extrapolative examination of larger surrounding seafloor areas. These findings have great implications for improving project feasibility because this method requires less data, thus saving on sampling costs, which in some cases, may significantly limit a particular research project or monitoring study.

   The outcomes of this work have led to the development of a predictive model and "R" analysis package available to any user via the principal investigators.

5. **Mollusk Diversity In Canada's Oceans: DNA Barcoding Catalogues - DNA sequencing techniques can increase the resolution of diversity information.**

   Examination of the genetic diversity of groups of organisms can lead to the discovery of new species or new genotypes. Genetic variation is not always visibly expressed in an organism's physical appearance. This hidden diversity is often only visible at the genetic level because phenotypic analysis does not necessarily capture such molecular differences.

   Through recent advances in DNA sequencing technologies, the diversity of Canadian mollusks can now be analyzed at the genetic level. Two new cryptic species of mollusks were discovered through genetic differences defined using DNA barcoding. The creation of a new DNA barcoding library for Canada's mollusks holds exciting new potential for the discovery of such cryptic diversity. Presently, approximately 256 entries are available in this library of Canadian mollusk genetic barcodes.

6. **A Method to make Conservation Planning Trade-offs more explicit - A new method can help report on the relative benefit and cost, of specific spatial management actions, to different stakeholders involved in a marine conservation planning process.**

   When planning for conservation areas, stakeholders must be informed of the potential impacts closed areas will have on their activities. The final outcome of a protection plan should attempt to be equitable to different stakeholder groups, not only in terms of lost revenues but also for other measures (e.g., impacts on employment, geographic location of the impacts). However, existing methods and software used in marine conservation planning (e.g., Marxan) are sometimes ineffective at combining diverse socio-economic data and at showing explicitly and spatially trade-offs between different criteria in the decision-making process.

   Case-specific trade-offs may be required when implementing new conservation measures, making it vital to consider, during planning stages, all of the ways in which stakeholders could be affected.

   A new method was developed, combining Geographic Information Systems (GIS) and multi-criteria decision analyses, and tested using a software application. The tool was used in a conservation planning scenario for NL waters, helping a group of stakeholders discuss various options and visualize the resulting proposed closures. The analyses indicated that less than 5% of NL waters offer easy decisions (i.e., sites with valuable ecosystems but low socio-economic activities), suggesting that going beyond 5% of closed areas requires either selecting areas of low ecological value or others resulting in higher socio-economic impact.

   Challenges exist, however, with regard to the implementation of this new tool in an operational context. First, it requires biological and socio-economic data input from the beginning of the analysis. Second, data must be geo-referenced to reflect specific areas. Third, this tool is still in an exploratory phase of development and will require further optimization. However, completion of this software could provide an invaluable tool for application in MPA planning strategies.

Theme 2: Ecosystem Function

1. **The Role of Seafloor Diversity in Carbon and Nutrient Recycling - Environment and functional group diversity both influence nutrient efflux where higher functional richness may result in more efficient nutrient recycling.**

   Studies to date suggest that functional groups (i.e., feeding related) are better predictors of nutrient cycling than diversity or single species.

   Methods were developed to examine functional groups (i.e., aggregates of species that perform specific ecosystem functions in a similar way that differs from other such aggregates) that may be of particular relevance to the community as a whole in the delivery of a particular function. Such functional groups may represent indicators of function that require protection measures in a given marine area. The functional group approach to conservation broadens the focus beyond single species that sometimes add commercial interest, for example; such an approach provides a more holistic analysis upon which to base conservation measures. Functional group analysis may provide a more profound understanding of the ecosystem in question, as a whole.

2. **Bivalves as Indicators of Arctic Environmental Variation - Sclerochronological proxies can be used as long-term analytical tools to evaluate environmental change.**

   The relatively slow growth rate and elongated life cycle of Arctic bivalves, results in mineral deposition in bivalve shells that can yield environmental data from as far back as one hundred years. Most bivalves, however, provide data from within the last thirty-five years.

   CHONe scientists applied the emerging realization, that environmental data concerning past years can be gleaned from bivalve shells, toward examining the effects that melting glaciers (i.e., including the resultant spikes of freshwater input into marine areas) have on benthic organisms. The fact that bivalves do not relocate substantial distances allows for geographically accurate interpretation of the data.

   This method is highly accurate and not limited to areas with strong temporal patterns of growth and may thus be applied to organisms located in regions without strong seasonal variation in growth indicators.

Theme 3: Population Connectivity

1. **Stock Structure in Arctic Marine Fish - Genetics can be used to quantify connectivity and stock structure in Arctic fish prior to development of commercial harvesting.**

   Given that marine fish respond to changes in oceanic temperature gradients, climate change will play a central role in ongoing changes expected within populations of such species.

   A dataset informing on fish distribution patterns in current times can act as baseline data for the examination of the future effects that ocean warming and climate change will have on the distribution patterns of these species and populations.

   The presence of genetic clusters within species also occurs because warm-water and cold-water ecotypes populate areas with disparate temperature characteristics. Genetic analysis can resolve this type of cryptic diversity to examine patterns of hidden diversity.

From a marine conservation perspective, this information can assist in resolving stock structure in fisheries, developing sustainable management options, identifying conservation units, and informing on aspects of marine fish diversity.

2. **The Influence of Larval Behaviour on Dispersal Patterns - Increasing our scientific understanding of the mechanisms that regulate larval dispersal patterns can improve MPA design, protection of endangered species, and invasive species management practices.**

   Laboratory experiments examined larval swimming patterns as a function of thermocline orientation, allowing CHONe researchers to develop a predictive simulation model based on these observations of larval behaviour.

   The study also considered larval distributions in the environment and factors that influence dispersal patterns. A biophysical model based on these observations determined that the most important predictor of larval dispersal was the geographic origin of the larvae, which outweighed larval behaviour.

3. **Dispersal of American Lobster Larvae - New understanding of factors influencing lobster dispersal & population dynamics (e.g., connectivity) can inform managers on appropriate lobster conservation considerations.**

   CHONe researchers evaluated the behaviour (e.g. swimming speed and vertical position) of American lobster larvae as a function of various biological and physical parameters. Researchers documented variation in larval behaviour as a product of larval development, phenotype (e.g., colour), and environment (e.g., temperature and light). Variation in behaviour associated with these parameters was nested within the geographic origin of larvae, indicating for the first time biogeographic variation in larval behavior of American lobster. Importantly, this study also demonstrated that larval lobster swimming does not progressively improve with ontogeny, as had been previously assumed.

   As part of the behavioural analysis, a new analytical protocol was developed using open source software (i.e., ImageJ and R) to measure behaviour. This approach was designed to be flexible and open, with the ability to be scaled to a variety of larval taxa.

   Building on observations made in the lab, a biophysical modelling approach was developed to incorporate the observed behavioural information. Models were used as a platform to test how variation in the prescribed behaviour can influence realized dispersal. Comparisons of biophysical simulations clearly demonstrated that small variations in behaviour (e.g., swim speed and depth) can have profound influence on dispersal, and therefore predicted connectivity. These results highlight potential limitations to conventional dispersal modelling approaches (e.g. null behaviour) to resolve important biological detail.

   The fact that population origin, among other biophysical factors, significantly influences larval behaviour, and by extension dispersal, is of vital importance to lobster conservation managers particularly by informing on connectivity considerations for spatial management.

4. **Towards the Development of a Canadian Ocean Health Index - The Ocean Health Index is an international measurement tool employed with the intent of aiding in the quantification of the health of Earth's oceans.**

   Ten established indices contribute to the computation of the Ocean Health Index. CHONe scientists adapted this approach for specific use within Canada, and performed surveys across the country to determine what mattered most to citizens with respect to the health of our oceans. Surprisingly, the survey found very little regional difference in the perceived importance of each of the ten factors of the Ocean Health Index.

This measure is an approachable way to communicate the status of Canada's ocean health to the general public, but will require ongoing improvements in terms of the quantification of certain data, such as the biodiversity index.

CHALLENGES, LESSONS AND STRATEGIES FOR IMPROVING CHONE II INTEGRATION

Summary

DFO and CHONe researchers noted distinct challenges when seeking to collaborate on informing policy through scientific findings. However, lessons were learned through CHONe I and the development phase of CHONe II.

Challenges

- The Government must often examine and respond effectively to short-term and medium-term requirements. Effective incorporation of science advice into these requirements necessitates streamlined communication interfaces between scientists (internally and externally) and policy-makers/managers in order to ensure that restrictive timelines are met.
- The mechanisms by which CHONe scientists and DFO scientists and managers disseminate information regarding newly developed science and policy tools will inherently differ, because these two groups function within differing structures. These silos impede effective identification of meaningful management solutions.
- The responsibility of communicating science needs for the implementation of area-based management plans, to scientists (i.e., DFO and CHONe), will mainly lie with Oceans Management and the willingness of scientists to respond to requests for information and advice. This communication must be proactive, timely, and frequent to keep up with evolving program requirements. This has proven challenging in the past.
- Without an effective mechanism to communicate CHONe research developments and findings, researchers, practitioners, and managers within DFO may be left unaware of the diverse external capacity available to them in terms of data collection and assessment for informed decision-making.
- The high turnover rate of government employees, coupled with graduate students who finish their research and move on, can contribute to the communication challenges between all relevant groups. This can sometimes create problems with depth of understanding and operationalizing the DFO-CHONe partnership.

Lessons and Strategies

- Communication channels between all parties should be analyzed regularly for effectiveness and improved upon as required.
- The presentation and review of particular results of CHONe I at this meeting, including their potential application in marine conservation activities by DFO and others, was deemed very useful in setting the context for the vital need to create a means to disseminate the availability of these existing and new cutting-edge approaches and tools as they are developed within CHONe and beyond.
- The timely communication of science and policy needs from DFO to CHONe is vital to planning academic and collaborative research activities to produce results with applicability within various government management schemas.

- DFO anticipates capacity in the near-term to allocate funding for the creation of more opportunities for external scientists, including CHONe, to meet in person with DFO officials. This direct contact should increase the rate at which CHONe findings are discussed and will inform the creation and management of marine ecosystem protection strategies.
- Communication up, down and across all levels of the DFO-CHONe partnership is of significant value. Communication efforts should focus on crossing sectors and into regions. Theme Leaders, both from academia and DFO, have a role in acting as liaisons between DFO (including Science and Oceans) and academia.
- Increasing briefings within the Department on a regular basis will help to inform newly hired employees, and update existing employees regarding logistics around the DFO-CHONe partnership, including awareness of participants, specific research activities, and potential challenges requiring attention.
- The creation of an interface to match those on the ground with the most pertinent and cutting-edge information will allow expansion of research and management capabilities. Here, CHONe students may be able to create a frequently-updated online archive of information about available and developing research tools. Similarly, an archive of management needs could inform future and ongoing research plans.
- Offering CHONe researchers and students the opportunity to attend and contribute to peer-review and other meetings that address the science-policy interface may enhance communication over time. This strategy will foster a greater individual interest in and understanding of moving science into policy, including how to work within government procedure.
- The possibility of CHONe students acquiring DFO internships as an expansion of the DFO-CHONe relationship is seen as a positive opportunity for both government and academia.
- Third-party communication facilitators may be beneficial for future DFO-CHONe gatherings of a larger nature. This would allow for unbiased consideration and integration of the full diversity of interests attached to parties operational obligations to advance partnership discussions.
- DFO (i.e., Science and Oceans) participating in the Board of Directors and the Science Advisory Committee at the senior management and practitioner levels, respectively, brings significant benefits to the partnership. This strategy allows DFO to stay in touch with the evolving nature of CHONe II and to provide input to the research program as necessary.
- The specific challenges identified in the meeting extend to other partnerships, such as sister networks. Lessons learned and strategies developed here should be considered elsewhere.

Discussion

Consensus was reached between all participants in this meeting that improvement in communications, with the goal of effective and timely integration of CHONe II research across the science-policy interface, will be vital to advancing DFO marine protection initiatives leading up to 2020.

The experiences gained from the DFO partnership with CHONe I are crucial to informing the continued development of CHONe II and future interactions between government and academia.

MARINE CONSERVATION PROGRAMS (DFO OCEANS): CURRENT AND FUTURE

Presenter: Gina Sinclair

Summary

In 2010, Canada agreed to marine conservation targets established under the United Nations Convention on Biological Diversity to conserve 10% of coastal and marine areas through effectively managed networks of protected areas and other effective area-based conservation measures by 2020. Furthermore, to highlight these targets as a priority, the Government of Canada recently identified an interim target of 5% protection by 2017.

Currently, Canada protects 0.88% of its marine territory. Approximately 800 small provincial MPAs and several others that are federally managed comprise this 0.88% area. In order to reach the 10% target, Canada must expand on our options for the recognition and/or establishment of all types and sizes of MPAs.

The challenges faced by DFO relate to the logistical capacity of achieving these targets utilizing available resources, including partnerships.

Discussion

Unlike the United States and the United Kingdom, Canada has not yet implemented a single large-scale MPA in its waters. Discussions with First Nations, Provinces, Non-Governmental Organizations (NGOs) and other relevant foundations will be necessary to avoid potential conflicts and conduct an *all-in* approach. However, meeting the 2020 deadline of 10% protection will also require extremely timely discussions.

Researchers and policymakers broadly understand that the protection of large-scale MPAs, over great expanses of pristine areas relatively uninfluenced by anthropogenic stressors, has heightened benefits for biodiversity. This benefit could be expanded by increasing connectivity of MPAs into a larger conjoined area.

DFO recognizes increasing pressure from within the public sphere, and from other conservation foundations, for Canada to implement environmental protection measures in the Arctic that utilize MPAs. However, MPA development is a complicated procedure in the Arctic, given the intricacies around First Nations treaties, etc. Furthermore, offshore areas in this region with minimal human activity are generally very data-poor, at this time, and the capacity for further Arctic research is unclear given the costs involved and limited time to undertake such work.

Importantly, the Government of Canada must consider all stakeholder interests in the balance of creating MPAs. The balance between ecological protection and industry interests currently challenges MPA creation. Greater willingness to work together on the part of all those involved will only facilitate the implementation of the mandated large-scale protection.

The quantification of the benefits of MPAs (e.g., biodiversity, ecosystem services and function, and continuity) remains challenging, in part because current economic systems do not correctly account for the direct and indirect benefits that the natural environment provides nor do they account for the full cost of its loss. Such quantification facilitates clear communication of benefits to all stakeholders, and must be clarified as much as possible and as quickly as possible.

The concept of deliverability, namely, the capacity for certain projects to deliver on specified goals, was deemed important by the government. Deliverability must be measured and reported at regular intervals, including for marine conservation targets.

Challenges facing scientists' collaboration with Oceans Management include the ever-changing priorities, programs and personnel. Whether the 10% protection target will remain a focus for the next government remains uncertain. This uncertainty complicates long-term scientific planning, which is often required in order to successfully complete certain research objectives.

Looking at the international status of marine conservation will inform Canada's efforts regarding its current success relative to other countries. For example, Australia states that it has protected 30% of its marine areas, but on closer inspection, only a much smaller fragment of this area is actually currently implemented into a concrete protection plan. Therefore Canada may also learn from other nations' challenges and shortcomings and apply this knowledge to the betterment of the development of our own MPAs.

Given the great variability of marine ecosystems found in Canada's marine environment, representation will remain extremely important in establishing MPAs. While the protection of 525,000 km^2 of marine habitat is a promising and forward-thinking goal, representation must be ensured to protect as many of Canada's marine areas as possible, including those most sensitive. MPA networks may be one method to help ensure that final protection outcome reflects representation. Ensuring the highest level of representation among and within all marine regions requires effective coordination of provincial and regional efforts. The Pacific region team has already begun discussions with First Nations concerning representation guidance in determining MPA selection.

FORWARD-LOOKING NEEDS AND ANTICIPATED CHONE CONTRIBUTIONS

Presenter: All Participants

Summary

Participants discussed forward looking needs of DFO and particular examples of how CHONe II could contribute. CHONe II will contribute not only to marine conservation target planning, but also to Canadian marine science overall. The approaches taken jointly by DFO and CHONe researchers here may inform future science-policy undertakings nationally and internationally.

Discussion

The original CHONe II proposal focused largely on the implementation of the National Conservation Plan (NCP). Now, MPA planning networks and Marine Conservation Tools (MCTs) are also considered a top priority. There are, in fact, several CHONe II projects with broader framework components that could be modified to incorporate this work into an MPA network.

CHONe researchers strongly encouraged the idea of reconvening in a future meeting with government officials once the conservation plan is made public. The proposed purpose of this meeting is to revise, where possible, the working plan with the intent to re-align it with new MCTs that will be available and to reconsider the interests of the public and NGOs once they are aware of the plan. One challenge concerning such realignment is that some constraints within projects will preclude work at this stage.

In addition to inclusion of CHONe expertise at CSAS peer-review meetings, it may also be beneficial to invite DFO Policy and Economics practitioners. This inclusion would enhance engagement of different expertise to increase understanding and appreciation of the capacity gaps that exist between the science-advisory and policy-development stages.

The Fisheries and Oceans Minister's Mandate Letter specifies that Canada will "work with the provinces, territories, Indigenous Peoples, and other stakeholders to better co-manage our three oceans". Meeting participants noted that stakeholders and/or partners in some regions had voiced concerns over how the DFO CSAS process informs oceans management activities where those bodies have a conferred interest. Particularly, stakeholders and/or partners would like more influence around uniting ecological, social, and cultural data to inform all levels of planning. Additionally, they would like an enhanced level of objectivity incorporated into the CSAS process in this regard. Within the Department the logistics of obtaining a rigorous socio-economic analysis with careful evaluation remains unresolved. The Province of Quebec has begun the process of considering the inherent difficulties that exist when linking socio-economic analyses and scientific advice. DFO recognizes the inclusion of socio-economic expertise within CHONe II as a valuable contribution for moving the Department forward in this respect.

INCORPORATION OF CHONE II RESULTS INTO DFO MARINE CONSERVATION

Presenter: All Participants

Summary

Canadian marine conservation efforts could incorporate CHONe II research, including data collection and/or tool development in several ways. CHONe research findings can directly inform biodiversity considerations for the identification, development, and implementation of MPAs. In addition, CHONe research can contribute to the baseline knowledge or ongoing monitoring to evaluate the effects of protection on an ecosystem. Furthermore, CHONe research can provide guidance on optimal design of MPA networks. The challenge remains however in moving scientific findings into governmental policy and practice.

Discussion

Efficient incorporation of CHONe II results into DFO marine conservation activities requires generating and fostering connections beyond DFO Science to enhance links between CHONe II researchers and DFO Oceans practitioners and managers. Identification of Oceans' program priorities is very important to this process. Similarly, making CHONe II project timelines available to DFO Oceans will also clarify the ways in which the two may collaborate more effectively.

Effective incorporation of existing and future CHONe science into DFO marine conservation activities requires the presentation of biodiversity considerations (i.e., data and tools) in concrete terms with obvious and/or practical application. Even though biodiversity has been parsed into components of varying scales, systematic measurements at each of these scales across all marine regions of Canada remains challenging.

CHONe research to inform optimization of MPA networks is also of great interest. For example, incorporating the concept of connectivity directly into MPA network development could be of great value. In the future, DFO will seek guidance on the evaluation of MPA network effectiveness. Currently, the Pacific region has two PhD students working on the optimization of MPA networks with respect to connectivity.

MPAs are an important tool in improving or sustaining the ecological health of a marine area, while marine environmental quality (i.e., takes into account ecoregion characteristics, ecosystem processes, the state of the physical environment, and the scale of deleterious human activities) offers a useful measure of the status of cumulative stressors and impacts. The CHONe II port monitoring design framework at Sept-Îsles may inform the development of future MPA monitoring practices.

Finally, to move CHONe (and other) scientific findings into governmental policy and practice, DFO CSAS must be employed in reviewing data and/or research outcomes to determine applicability to general or specific client sector needs. In short, the translation of research results into application begins with the CSAS peer-review. Participants hope that DFO and CHONe can work together over the next year to optimize the inclusion of CHONe II expertise and outputs into DFO CSAS processes. Not all peer-reviewed science may be applied specifically to MPAs or MPA planning, but may be incorporated into the development or application of other management frameworks.

CONCLUSIONS

- The urgency of delivering on the Government of Canada's commitment to put in place a plan to reach its domestic and international marine conservation targets of protecting 5% of Canada's marine and coastal areas by 2017 and 10% by 2020 creates an opportunity for enhanced engagement with partners and subsequent meetings with CHONe.
- Partnerships that DFO has entered with CHONe have high perceived value to marine research and conservation activities in Canada. However, research partners often face distinct challenges when seeking to collaborate on informing policy from scientific findings. This challenge punctuates the need to foster open and ongoing discussions between DFO and CHONe and supports the development of recommendations for ensuring optimal integration of CHONe findings, as appropriate, into DFO marine conservation science and policy.
- Although the DFO Science advisory process is well established to provide the basis for policy and management options and decisions at DFO, demands for science advice have changed over time. These changes include an increase in the number of requests as well as requests from "newer" clients responsible for "non-traditional" approaches to ecosystem management. Therefore, short/medium/long-term work planning to inform the provision of science advice necessitates, more than ever, incorporating collaborative research plans and external expertise at peer-review meetings (e.g., CHONe research and expertise).
- A review of CHONe I ecological and research tool findings, relevant to DFO marine conservation, highlights the need for improvements in standard and novel methods of dissemination and transfer of CHONe research outcomes to DFO, and other relevant scientists. Web-based communication offers great potential for making updates on current and upcoming research available to DFO.
- DFO and CHONe researchers face distinct challenges when seeking to collaborate on informing policy from scientific findings. However, lessons have also been learned through experiences with CHONe I and the development phase of CHONe II.
- Key challenges to fully integrating CHONe scientific findings into government activities include those around timely communication between parties to identify and foster aligned interests, and incorporate CHONe expertise at the appropriate junctures for consideration in government policy development and decision-making.
- Key strategies for improving CHONe II integration into DFO undertakings include advancing regular inter-regional and inter-sectoral communication between DFO and CHONe (i.e., including CHONe researchers and students in scientific peer-review and other meetings that address the science-policy interface) and continuing participation by DFO in the CHONe Board of Directors and the Science Advisory Committee at the senior management and practitioner levels.
- Canada has agreed to marine conservation targets established under the United Nations Convention on Biological Diversity to conserve 10% of coastal and marine areas by 2020.

To highlight these targets as a priority, the Government of Canada recently identified an interim target of 5% protection by 2017. The challenges faced by DFO in meeting these ambitious targets relates to the logistical capacity of effectively utilizing the resources available, including partnerships such as CHONe.

- CHONe II will contribute not only to marine conservation targets, but also to Canadian marine science overall. The approaches taken jointly by DFO and CHONe researchers here may serve to inform future science-policy undertakings nationally and internationally.
- CHONe II research, including data collection and/or tools development, may be directly incorporated into Canadian marine conservation efforts through several strategies. CHONe research findings can directly inform biodiversity considerations for the identification, development, and implementation of MPAs. In addition, CHONe research can contribute to the baseline or ongoing monitoring to evaluate the effects of protection on an ecosystem. Furthermore, CHONe research can provide guidance on optimal design of MPA networks (e.g., incorporating connectivity into MPA network designs).
- Researchers recognize the essential need for the inclusion of social science to bridge the gap between science advice and policy formulation. This is a key component of decision making, however, such linkages remain in the development stage of advancing ecosystem approaches for management. CHONe's inclusion of social science in its research plan provides a step forward in this regard.

RECOMMENDATIONS

Through meeting discussions on the significance of CHONe research to marine conservation within DFO, the following recommendations emerged:

1. Ensure that general communication between DFO (i.e., Science and Oceans) and CHONe remains an ongoing and open priority that is reviewed regularly for effectiveness. Ensuring alignment between the interests of government and academic science and ensuring the partnership remains meaningful and productive requires oversight. A third-party communications facilitator may be an option for DFO-CHONe workshops where time and/or resources are deemed limiting.
2. The creation of a catalogue of new findings and tools from CHONe I and CHONe II, with regular updates at appropriate times, is recommended to facilitate the dissemination of information concerning the availability and applicability of scientific developments for marine conservation activities. Applicable findings will strengthen scientific arguments for MPA implementation and will offer highly accessible guidance for future research. Parties must work together in the short-term to provide a means to share this information.
3. Theme Leaders within DFO in each region may be able to assist in disseminating CHONe information (i.e., research plans and outcomes) through DFO Science seminars and presentations. Additionally, taking note of regional and National opportunities for CHONe participation, in DFO and other government events and seminars, would increase awareness of available CHONe expertise.
4. Activities to improve the marine science community's comprehension of challenges faced when mobilizing science into policy should be undertaken. Offering or attending conferences and workshops around the use of scientific findings in policy and management will assist researchers in obtaining a greater operational awareness around this topic and help to remove the gap between science and policy going forward.

APPENDIX I: MEETING AGENDA

DAY 1 – Tuesday, February 2nd

9:00	Opening Remarks/Introductions	P. Simon
9:20	Context and Objectives	P. Simon
9:40	Science in Government (DFO) – CSAS Science Advisory Process	N. Templeman
10:20	**BREAK**	
10:40	CHONe1 Ecological Findings Relevant to DFO Marine Conservation	CHONe (TBD)
12:00	**LUNCH**	
1:00	CHONe1 Assessment Tools Findings Relevant to DFO Marine Conservation Science and Management	CHONe (TBD)
2:20	**BREAK**	
2:40	Discussion – Challenges, Lessons and Strategies for Improving Integration for CHONe2	ALL
4:00	Integrating CHONe expertise into DFO Science Advisory Processes	N. Templeman
4:20	Meeting Closing (Day 1)	P. Simon

DAY 2 – February 3rd

9:00	Review of Day 1/ Planning of Day 2	P. Simon
9:30	Marine Conservation Programs (DFO Oceans) and Integrated Oceans Management (IOM) activities	G. Sinclair
10:20	**BREAK**	
10:40	DFO (Science and Oceans) Forward Looking Needs and Anticipated CHONe Contributions	ALL
12:00	**LUNCH**	
1:00	Incorporating CHONe2 results in DFO Marine Conservation Activities	ALL
2:50	Discussion – Meeting Conclusions and Recommendations	ALL
3:45	Next Steps and Meeting Closing	P. Simon

APPENDIX II: MEETING PARTICIPANTS

1.	Archambault, Philippe	Université du Québec
2.	Bailey, Megan	Dalhousie University
3.	Côté, Isabelle	Simon Fraser University
4.	Curtis, Janelle	DFO Science, PAC
5.	Daigle, Rémi	Université du Québec à Rimouski
6.	Devillers, Rodolphe	Memorial University of Newfoundland
7.	Janidlo, Alison	NSERC, NCR
8.	Lawton, Peter	DFO Science, MAR
9.	Marleau, Bradley	DFO Science, NCR
10.	Metaxas, Anna	Dalhousie University
11.	Morris, Corey	DFO Science, NL
12.	Pepin, Pierre	DFO Science, NL
13.	Peramaki, Liisa	DFO Science, NCR
14.	Powell, Shawna	DFO Oceans, NL
15.	Simon, Patrice	DFO Science, NCR
16.	Sinclair, Gina	DFO Oceans, NCR
17.	Snelgrove, Paul	Memorial University of Newfoundland
18.	Stanley, Ryan	Memorial University of Newfoundland
19.	Templeman, Nadine	DFO Science, NCR
20.	Therriault, Thomas	DFO Science, PAC
21.	Westhead, Maxine	DFO Oceans, MAR

APPENDIX III: TERMS OF REFERENCE

Significance of Canadian Healthy Oceans Network (CHONe) Research to Marine Conservation within Fisheries and Oceans Canada

National Peer Review – National Capital Region

February 2-3, 2016
Ottawa, ON

Chairperson: Patrice Simon

Context

The Canadian Healthy Oceans Network (CHONe; pronounced Ko-nee) is a Natural Sciences and Engineering Research Council of Canada (NSERC) strategic network. The network includes researchers from universities across Canada, Fisheries and Oceans Canada (DFO), and other organizations to carry out collaborative research projects across highly applicable and interrelated research themes. CHONe research has focused over time on producing research to foster a strong science base in Canada's marine conservation efforts.

DFO was the primary partner of CHONe in its first term (2008-14), providing significant in-kind contributions of DFO personnel, ship time and equipment, and associated operation and deployment costs. CHONe met its objective to align Canadian marine science capacities to respond to research challenges and knowledge gaps on biodiversity in Canada's three oceans, and succeeded in substantially increasing the Canadian marine science knowledge base through innovative research across a suite of topics.

CHONe has been renewed for a second term (2015-2020) and DFO is once again a major partner and provider of funded and in-kind resources. Research themes for the network, particularly those for marine conservation, were developed to align with DFO priorities over the short- to medium-term. Specifically, CHONe research over the next five years will build on the knowledge it previously acquired on biodiversity to focus on:

1. ecosystem attributes that define ocean resilience and capacity for recovery or response to management strategies; and
2. stressors, including cumulative impacts, that alter marine biodiversity and ecosystem functions and services in high use environments.

The CHONe network is intended to facilitate strong collaboration and communication among partners.

Relevant published and unpublished scientific information exists within CHONe that can assist in highlighting such things as significant species and/or areas for consideration in marine conservation. Further, expertise supporting current CHONe research can contribute to better understanding of best practices. CHONe research over the next 5 years will then provide the opportunity for more specific application of these best practices.

Objectives

The objectives of this meeting are to:

- Identify and discuss key findings from CHONe I relevant to identifying potential marine conservation priorities (e.g., geographic hotspots, key species, assessment tools, etc.).
- Identify and discuss foundational elements needed to define/establish best practices (theoretical and methodological) for consideration in CHONe II and in marine conservation.

- Determine next steps to ensure CHONe II results can be incorporated into marine conservation processes.

Expected Publication

- CSAS Proceedings

Expected Participation

- Fisheries and Oceans Canada (DFO) (Ecosystems and Oceans Science and Ecosystems and Fisheries Management (Oceans Program) sectors)
- Canadian Healthy Oceans Network