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Central and Arctic Region

Proceedings of the regional science advisory process on monitoring protocols and strategies for the Tarium Niryutait Marine Protected Area (MPA) priority indicators

February 9-10, 2012
Winnipeg, Manitoba

Chairperson: Kevin Hedges
Editors: Joclyn Paulic and Vanessa Grandmaison

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Canada

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

Under the Health of the Oceans Initiative, Fisheries and Oceans Canada (DFO) Science sector was asked to provide advice on protocols and strategies for monitoring the conservation objective for the Tarium Niryutait Marine Protected Area (TNMPA). The conservation objective developed for the TNMPA is 'to conserve and protect Beluga whales and other marine species (anadromous fish, waterfowl, and seabirds), their habitats and their supporting ecosystem'. A science advisory meeting was held February 9-10, 2012 to develop science advice on the protocols and strategies for five indicators selected by the DFO Oceans Program. Meeting participants were from DFO Science and Oceans Program, the Fisheries Joint Management Committee and two local consulting firms. Two draft working papers were distributed prior to the meeting. During the meeting, participants discussed current programs and protocols for monitoring the five selected indicators and identified knowledge gaps. On the basis of those discussions, protocols and strategies were recommended for each indicator. The draft working papers were revised to reflect the discussions and conclusions reached during the meeting.

This Proceedings report summarizes the relevant discussions and presents the key conclusions reached during the meeting. A Science Advisory Report and supporting Research Documents, resulting from this advisory meeting, were published on the DFO Canadian Science Advisory Secretariat website.

Compte rendu du processus régional de consultation scientifique sur les protocoles et stratégies de surveillance pour les indicateurs prioritaires de la zone de protection marine (ZPM) Tarium Niryutaite

SOMMAIRE

En vertu de l'Initiative Santé des océans, on a demandé au Secteur des sciences de Pêches et Océans Canada (MPO) de formuler un avis sur des protocoles et stratégies de surveillance de l'objectif de conservation établi pour la zone de protection marine Tarium Niryutait (ZPMTN). L'objectif de conservation fixé pour la ZPMTN est de « conserver et protéger les bélugas et d'autres espèces (poissons anadromes, sauvagine et oiseaux de mer), leurs habitats, ainsi que les écosystèmes dans lesquels ils vivent ». Une réunion de consultation scientifique a été organisée les 9 et 10 février 2012 en vue de préparer un avis scientifique sur les protocoles et stratégies pour cinq indicateurs sélectionnés par les responsables du Programme des océans du MPO. Les participants à la réunion représentaient le Secteur des sciences du MPO et le Programme des océans, ainsi que le Comité mixte de gestion de la pêche et deux sociétés d'experts-conseils locales. On a distribué deux documents de travail provisoires avant la réunion. Pendant la réunion, les participants ont discuté des programmes et protocoles actuels pouvant servir à la surveillance des cinq indicateurs sélectionnés. Ils ont également cerné des lacunes dans les connaissances. Ces discussions ont permis de recommander des protocoles et stratégies pour chaque indicateur. Les documents de travail ont été révisés pour rendre compte des discussions et des conclusions de la réunion.

Le présent compte rendu résume les discussions pertinentes et présente les principales conclusions de la réunion. L'avis scientifique et les deux documents de recherche à l'appui, découlant de la présente réunion de consultation, ont été publiés sur le site Web du Secrétariat canadien de consultation scientifique du ministère des MPO.

INTRODUCTION

Under the Health of the Oceans Initiative, Fisheries and Oceans Canada (DFO) Science sector provides advice to support the identification and development of Marine Protected Areas (MPAs). This includes the identification of indicators and monitoring protocols and strategies for inclusion in MPA monitoring plans. Indicators should be based on the Conservation Objectives (CO) set out for the MPA. The Tarium Niryutait Marine Protected Area (TNMPA) was officially designated as an MPA in August 2010. The MPA lies within the Inuvialuit Settlement Region (ISR) in the western Canadian Arctic on the Beaufort Shelf and consists of three separate and distinct sub-areas (Niaqunnaq, Okeevik and Kittigaryuit) within the nearshore region of the Mackenzie River Estuary. The CO developed for the TNMPA is:

"to conserve and protect Beluga whales and other marine species (anadromous fish, waterfowl, and seabirds), their habitats and their supporting ecosystem."

In 2010, regional science advisory meeting was held to identify indicators for monitoring the CO for the TNMPA (DFO 2010). During this meeting, participants developed a hierarchical framework that contained six categories, each of which had two or more elements. A total of 82 indicators appropriate for monitoring the Beluga (*Delphinapterus leucas*) population and ecosystem health were identified. The highest priority indicators identified for the TNMPA were those related to the ongoing Hendrickson Island Beluga Study, a proposed community-based fish sampling program, the physical and chemical environment and anthropogenic noise (DFO 2010). Based in part on this advice, DFO Oceans Program selected five indicators and requested Science advice on the protocols and strategies for each of the selected indicators.

A science advisory meeting was held on February 9-10, 2012. The purpose of the meeting, as described in the Terms of Reference (Appendix 1), was to provide advice on protocols and strategies for monitoring the five indicators identified by the DFO Oceans Program. Meeting participants (Appendix 2) included DFO Science and Oceans Program divisions, the Fisheries Joint Management Committee (FJMC), and the consulting firms hired to develop the working papers for this meeting. The meeting was held in Winnipeg, MB at the Freshwater Institute. The draft working papers and associated background materials were sent to participants prior to the meeting. The meeting generally followed the agenda outlined in Appendix 3.

This Proceedings report summarizes the relevant discussions and presents the key conclusions reached during the meeting. Science advice resulting from this meeting is published in the Canadian Science Advisory Secretariat (CSAS) Science Advisory Report series and the supporting technical information is published in the CSAS Research Document series.

PRESENTATIONS

The primary and secondary working papers discussed at this peer review were presented. Both are published as research documents.

Information in Support of Monitoring Protocols and Strategies for Selected Indicators in the Tarium Niryutait Marine Protected Area (TNMPA)

Author: J.W. Higdon and J.E. Paulic
Presenter: Jeff Higdon

Abstract

The Tarium Niryutait Marine Protected Area (TNMPA) includes three sub-areas located at the edge of the Mackenzie River Delta, in the Beaufort Sea Large Ocean Management Area

(LOMA). Fisheries and Oceans Canada (DFO) Science sector is required to support the *Health of the Oceans Initiative* by delivering scientifically defensible indicators, protocols and strategies for monitoring the conservation objective(s) (CO) of MPAs. The CO for the TNMPA is "to conserve and protect Beluga whales and other marine species (anadromous fish, waterfowl, and seabirds), their habitats and their supporting ecosystem." The Central and Arctic regional DFO Science sector has developed a hierarchal framework of 82 indicators for the TNMPACO. The regional DFO Oceans sector chose five of the 82 indicators and requested Science advice on protocols and strategies for each. The selected indicators relate to ecosystem structure and biodiversity (species lists and surveys), population structure and abundance of Beluga (sighting effort – distribution and abundance), and anthropogenic noise as an ecosystem stressor.

This report presents information on other monitoring programs that are relevant to the TNMPA and specific advice on the protocols and strategies for each of the five selected indicators. The level of development of the various protocols varies by indicator. For example, Beluga aerial survey techniques are well established and there is a wealth of internal DFO expertise and extensive baseline information available from past surveys, while there are little baseline data available for anthropogenic noise. Survey protocols will need additional development as indicators are evaluated and protocols are further refined based on the success of the indicator(s), management needs and stakeholder concerns (e.g., selection of focal species for surveys).

Species inhabiting the Tarium Niryutait Marine Protected Area in the Canadian Beaufort Sea – Mackenzie Delta.

Author: D.B. Stewart
Presenter: Jeff Higdon

Abstract

This report provides an inventory, current to March 2004, of species that have been reported from the Tarium Niryutait Marine Protected Area (MPA) in the Canadian Beaufort Sea – Mackenzie Delta. Species found outside the MPA but in water of the same depth (<5 m) nearby are also listed.

MEETING STRATEGY

Participants discussed protocols and strategies for monitoring the five indicators selected by Oceans: Species lists (Indicator 1.1.1), surveys (Indicator 1.1.2), sighting efforts (Indicators 3.1.1 and 3.2.1), and anthropogenic noise (Indicator 6.1.1). The goal was to comprehensively identify monitoring protocols and strategies that are currently being used in the TNMPA to monitor the selected priority indicators and to consider additional applicable methods from the literature. Data accumulated on the selected indicators should be compared with data collected prior to a documented ecosystem shift (1990-1998), although further investigation is needed to determine appropriate baseline periods for each indicator. In addition, monitoring frequency, methods, etc., should be comparable for similar indicators (e.g., collecting data during a similar time period for related indicators) to ensure that the acquired data are sensitive and representative of the TNMPA ecosystem.

ASSESSMENT

SPECIES LISTS

Species lists can provide information on community structure and biodiversity. A draft species list (current to 2004) was developed by Stewart (2012) and includes data from numerous research programs. This list includes species found within and outside the TNMPA. Species found outside the TNMPA were restricted to areas with a <5 m depth contour and all Northern Oil and Gas Action Program (NOGAP) stations regardless of depth. Species found outside the TNMPA but within a similar depth profile (i.e., <5 m) were included to cover areas that are biologically similar to the TNMPA (e.g., similar coastal type or depth) and to ensure the development of a representative species list.

Despite much effort, participants felt that the species list developed by Stewart (2012) is incomplete and when used on its own, is a 'rough' tool for monitoring the TNMPA CO. Participants agreed that species lists (and other biodiversity indicators, i.e., indicator 1.1.5) should be low priority indicators since it is often difficult to fully characterize biodiversity. Rather, their value is that they create a baseline of species that have been recorded in the TNMPA and they should be used in conjunction with other monitoring tools. Other caveats associated with the use of species lists for monitoring the TNMPA CO include the following:

- Species composition is temporally and spatially unstable in the TNMPA due to the influence of the Mackenzie River and the effect of ice (e.g., scoring, freeze-up).
- Research in the TNMPA is mainly conducted during the open-water season due to a harsh winter climate and inaccessibility to the area following sea-ice formation.
- A number of species that use the TNMPA are migratory and the presence/absence of these species in the TNMPA may be reflective of environmental changes outside the area, rather than within the TNMPA.
- An observed change in the species list for the TNMPA will be a response to changes that have already occurred in the TNMPA and will not provide warning of imminent changes in biodiversity.
- The completeness of the species list is dependent, in part, on the sampling method. New sampling methods may find novel species in the TNMPA, when they may have actually been present all along.
- With the exception of the Arctic Coastal Ecosystem Studies (ACES) program, there are no dedicated biodiversity monitoring programs within the TNMPA.

With these caveats in mind, participants discussed the best way to monitor this indicator so that the acquired data are relevant and representative of the TNMPA ecosystem. A participant suggested that the species list developed by Stewart (2012) could be expanded to incorporate a larger geographic area (e.g., Beaufort Sea) so that when a novel species is found in the TNMPA, the likelihood of its occurrence can be assessed more accurately. Monitoring parameters associated with the physical environment of the TNMPA in conjunction with the species composition in the related area was suggested to link causes to changes in biodiversity. Ultimately, participants decided it would be best to compile a list of expected, widely distributed, key species for monitoring the TNMPA CO, where the presence of a novel species could indicate a change in the TNMPA ecosystem.

Participants then discussed which key species should be incorporated into the species list for the TNMPA, to accurately assess whether the CO for the related area is being met. Marine mammals and birds were excluded from the list as a taxonomic list of marine mammals will be relatively insensitive to environmental change, and birds are both difficult to monitor and do not

fall within DFO's responsibility. Due to a lack of baseline data, participants felt that zooplankton and phytoplankton should only be incorporated into a species list for the TNMPA to monitor for invasive species. As there is a reasonable amount of baseline data on the biodiversity of fishes and summer benthos in the TNMPA and they are relatively sensitive to environmental change, participants recommended that these species be incorporated into a TNMPA species list.

A lengthy discussion took place with regard to which years should be used to identify change in the TNMPA. It was agreed that 1990 was a pivotal year for physical environmental change. Because 1990-2000 is used as the modern baseline for climate change, data accumulated in 1990 for the TNMPA can be used as a baseline for comparisons of fish and summer benthos biodiversity.

SURVEYS

Although surveys can provide important baseline information on ecosystem structure and biodiversity, participants considered this indicator low priority as it is often difficult to fully characterize biodiversity. Regardless, it should still be used in conjunction with other ecological indicators. Participants decided that the focus should be on key species when conducting surveys as it would be impossible to survey all plant and animal species within the TNMPA. Examples of key species within the TNMPA include Beluga, Arctic Cisco (*Coregonus autumnalis*), Least Cisco (*Coregonus sardinella*), Dolly Varden (*Salvelinus malma*), and Broad Whitefish (*Coregonus nasus*). It was decided that Arctic Cod (*Boreogadus saida*) would not be included as a key fish species for monitoring the TNMPA CO as this species does not exist in significant numbers in and around the MPA.

A number of different sampling methods were assessed for surveying key fish species in the TNMPA including Passive Acoustic Tracking (PAT), video sampling, and the use of trawls, trap nets, and gill nets. Although PAT can be a useful tool for sampling fish species, it is difficult to get PAT tags on small-bodied fish and once on, their survival rate is low. Video sampling and offshore trawls to monitor this indicator were also suggested although video sampling is likely not suitable due to poor under-water visibility in the TNMPA and offshore trawls would need to be combined with vessel use. Non-lethal techniques such as trap nets are important for monitoring nearshore species but this method should be used in conjunction with lethal techniques (i.e., gillnets) to sample offshore species. As no single survey design can efficiently collect data on the full variety of taxa in the TNMPA, it was decided that taxon-specific methods are required to survey each species. The number of fish needed for surveys would depend on the sampling design, location and gear type, and care should be taken to ensure that sampling is repeatable. Fish that are retained for sampling should be selected randomly. Since fish are widely distributed within the TNMPA, sampling should be conducted within a larger geographic area in order to understand species distribution, habitat use, and to provide an index of change over a broader area that can be compared to local patterns. Initially, monitoring for this indicator should occur annually, and a reassessment of the sampling interval could be conducted after five years, depending on survey outcomes.

A variety of long-term fish surveillance programs have been conducted outside the TNMPA, including sampling at Phillips Bay, Yukon North Slope, and Tuktoyaktuk Harbour. These programs provide important baseline data on fish community structure and biodiversity, and survey coverage could be increased by extending fish monitoring under the Integrated Fisheries Management Plan (IFMP) for Dolly Varden. Additionally, the Circumpolar Biodiversity Monitoring Program (CBMP) and the ACES program provide important information for the development of a biodiversity survey program for the TNMPA.

There was some discussion as to whether physical sampling (e.g., grabs or dredges) should be conducted to survey the benthos in the TNMPA as the benthic environment in some areas is

unstable (e.g., the Mackenzie River Estuary). For this reason, participants agreed that benthic sampling should only be conducted in key areas within the TNMPA (e.g., Barrier Islands) but care should be taken to include adequate spatial coverage. Sampling should also be taken as late in the season as possible as the benthic community would be well established for that year. Additionally, it would be beneficial to look at temporal changes in the benthic community as it differs depending on the time of year.

BELUGA SIGHTING EFFORTS

Participants voiced concerns regarding the use of Beluga sighting efforts (distribution and abundance) as indicators for monitoring the TNMPA CO, as these indicators are difficult to measure and explain ecosystem change. It was suggested that Beluga growth rates should be monitored rather than Beluga abundance and distributions and that preliminary results suggest a decrease in Beluga growth rates over the last 30 years. Monitoring Beluga health through a biopsy program was also suggested to monitor changes in the TNMPA ecosystem, although sampling would likely be difficult and re-capture rates of Beluga would probably be low. Although participants agreed that information on Beluga health and growth rates is important, it was not selected by the Oceans program as one of the indicators for monitoring in the TNMPA.

Participants assessed a variety of sampling methods for monitoring Beluga abundance and distribution to determine Beluga density, timing of migration and habitat use in the TNMPA sub-areas. These methods include the use of aerial surveys, shore-based and boat-based monitoring, and Passive Acoustic Monitoring (PAM). Participants were concerned with the accuracy of shore-based monitoring by local community members to measure Beluga abundance and distribution, as shallow water is very turbid and murky and the same animal is often counted twice. Boat-based surveys were suggested for documenting interesting/notable behaviours but were deemed an inferior method for monitoring these indicators, for the same reason as shore-based monitoring. In addition, boat-based surveys cannot cover as broad an area as an aerial survey. Although PAM can detect belugas by the distinctive sounds they emit during communication, foraging, and geolocation, it would be difficult to differentiate between individuals to measure abundance in areas where large numbers of Belugas aggregate. Similarly, instruments used for PAM are susceptible to waves and have difficulty picking up low frequency sounds in shallow waters. Despite these drawbacks, PAM is currently being tested in the TNMPA. Participants finally agreed that standardized aerial surveys would be the most effective method for monitoring these indicators as survey protocols already exists and there is an extensive history of survey coverage (see Loseto et al. 2010). Additionally, it is important to conduct ice-edge reconnaissance aerial surveys to monitor this indicator as they provide important information on the timing of entry into and use of the MPA sub-areas by belugas that concentrate at the ice-edge while they wait to access the Mackenzie River Estuary.

Following the discussion of sampling methods for monitoring Beluga sighting efforts, monitoring frequency was assessed. Participants agreed that aerial surveys could be conducted for 2-3 consecutive years and then every 10 years, assuming no significant stressors are recognized in or around the TNMPA. A negative change in this indicator would result in a decrease in the sampling interval. Beluga surveys could be analyzed along with environmental factors within/around the TNMPA such as sea-ice, ecosystem productivity from satellite images, and Sea Surface Temperature (SST), to compare trends in Beluga abundance and distribution with environmental change. Sampling should be extended outside the MPA boundaries to document Beluga seasonal distributions and provide information about the stability of the relative abundance of Beluga in the MPA. Previous studies (e.g., surveys conducted by industry) of Beluga abundance and distribution in the TNMPA have used similar sampling protocols; the results could also be extracted to provide further data and inform both indicators.

ANTHROPOGENIC NOISE

Participants discussed the difficulties associated with monitoring anthropogenic noise in the TNMPA. Monitoring this indicator requires knowledge of background noise caused by wind, waves, and ice movement. In addition, it is important to develop a baseline, as an increase in vessel traffic (i.e., anthropogenic noise) is expected with climate warming. Similarly, noise transmission increases during storms and with increased ocean acidification (which is predicted to increase 1 pH point by 2100). Currently, limited baseline data exist for anthropogenic noise in or near the TNMPA (see Loseto et al. 2010).

Due to the difficulties associated with monitoring anthropogenic noise, participants discussed the use of proxies for monitoring this indicator. It was suggested that vessel traffic could be used as a proxy for anthropogenic noise. However, vessel channels run mainly through the eastern portion of the TNMPA, and these data would not be representative of the entire MPA. Nevertheless, adequate information on vessel traffic is available from past reports which document the number and type of vessels that pass through the TNMPA. A participant suggested monitoring anthropogenic noise with a hydrophone in conjunction with bird monitoring. However, these surveys (especially from vessels) are not very clear or relevant to the TNMPA CO. Despite the difficulties with using vessel traffic as a proxy for monitoring anthropogenic noise, it would be beneficial to combine this information with developmental activities and other existing data on anthropogenic noise in/around the TNMPA (see Loseto et al. 2010) to establish a baseline.

Participants agreed that PAM would be the best method for monitoring anthropogenic noise. This information could be analyzed with Beluga distribution and abundance in the TNMPA. AURAL and handheld recording devices should monitor a broadband of at least 10 kHz to capture vessel noise and Beluga vocalizations. Baseline data exist for the Kittigaryuit and Niaqunnaq sub-areas of the TNMPA. Further acoustic monitoring in the TNMPA is planned for the ACES monitoring program, the Scientific Committee on Oceanic Research, and the International Quiet Ocean Experiment. Sound measurements should also be combined with actual observations.

DRAFTING THE SCIENCE ADVISORY REPORT

Summary bullets were drafted for the Science Advisory Report (SAR). Participants suggested they include a concise description of the monitoring protocols and strategies for the TNMPA priority indicators, as well as a description of the key components of an effective monitoring program for the TNMPA. Participants discussed the level of detail that should be incorporated into the SAR. They agreed that the SAR should only include concise summary information useful to managers, whereas the detailed scientific background relating to indicators, protocols and strategies should be reserved for the Research Documents.

OTHER CONSIDERATIONS

Participants agreed that data acquired on the five priority indicators should be compared with similar data obtained outside the scope of the TNMPA boundaries to effectively detect ecosystem change. Many key species that are found within the TNMPA are highly migratory and a broader investigation of their spatial patterns is necessary to understand their role in the TNMPA ecosystem.

It would be advantageous to include local community members from Aklavik, Inuvik, and Tuktoyaktuk when implementing a long-term monitoring plan for the TNMPA. Local community members use the MPA year-round and have extensive knowledge on ecosystem structure and

function. In addition, the incorporation of local community members into the TNMPA monitoring plan could reduce monitoring costs (e.g., by reducing travel cost) and would provide an opportunity for the inclusion of Traditional and Local Ecological Knowledge (TEK/LEK).

Although participants identified polar bears, seabirds, shorebirds, and waterfowl as important species within the TNMPA, they agreed to exclude them from the list of indicators as these species are not within DFO's responsibility and there were no subject matter experts at the meeting.

CONCLUDING REMARKS

Ecosystem monitoring via a suite of ecological indicators is an important tool that can be used to detect ecosystem trends/changes and to assess whether the COs for a given geographic area are being met. If ecosystem changes are detected, appropriate action can be taken to conserve and protect the affected ecosystem components. Participants agreed that each of the selected indicators should be monitored to ensure that the TNMPA CO is being met although biodiversity indicators (Indicators 1.1.1 and 1.1.5) should be low priority as it would be difficult to characterize ecosystem structure and function using them. Participants further agreed that the evaluation of the efficacy of the selected indicators should be an ongoing process, and protocols may need to be revised depending on the information acquired. Monitoring frequency and methodology should be comparable among indicators and monitoring should not be confined solely within the TNMPA.

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Stewart, D.B. 2012. Species inhabiting the Tarium Niryutait Marine Protected Area in the Canadian Beaufort Sea – Mackenzie Delta. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/091. iv + 82 p.

APPENDIX 1: TERMS OF REFERENCE

Monitoring protocols and strategies for the Tarium Niryutait Marine Protected Area (MPA) priority indicators

Central and Arctic Region - Science Advisory Meeting

February 9-10, 2012
Winnipeg, MB

Chair: Kevin Hedges

Context

Under the Health of the Oceans Initiative, Fisheries and Oceans Canada (DFO) Science sector provides advice to support the identification and development of Marine Protected Areas (MPAs). This includes the identification of indicators and monitoring protocols and strategies for inclusion in MPA monitoring plans. The identification of indicators, protocols and strategies are to be based on the conservation objectives set out for each MPA and are science-based and defensible on objective grounds. The conservation objective developed for the Tarium Niryutait (TN) MPA is:

"To conserve and protect Beluga whales and other marine species (anadromous fish, waterfowl, and seabirds), their habitats and their supporting ecosystem."

On March 30-31 and April 13, 2010 regional science advisory meetings were held to identify monitoring indicators for the TN-MPA. Subsequent advice was published on the Canadian Science Advisory Secretariat website. During those meetings, participants developed a new hierarchical framework which contains six categories, each of which has two or more elements. A total of 82 indicators appropriate to monitor the Beluga population and ecosystem health were identified within the elements. DFO Oceans chose five priority indicators and requested Science advice on protocols and strategies for them.

Objectives

The overall objectives of the meeting are to provide advice on protocols and/or strategies for monitoring the five priority indicators.

- Category: Ecosystem structure (1.0)
  Element: Biodiversity (1.1)
  Indicators: Species lists (1.1.1), Surveys (1.1.5)
- Category: Population structure of key species (3.0)
  Element: Beluga distribution (3.1)
  Indicator: Sighting effort (3.1.1)
- Category: Population structure of key species (3.0)
  Element: Beluga abundance (3.2)
  Indicator: Sighting effort (3.2.1)
- Category: Noise and other physical stressors (6.0)
  Element: Noise (6.1)
  Indicator: Anthropogenic noise (6.1.1)

This advice is to be provided to DFO Oceans Programs Division for the development of the TN-MPA monitoring plan.

Expected Publications

The Regional Advisory meeting will generate a Canadian Science Advisory Secretariat (CSAS) Proceedings Report, which will summarize the discussion at the meeting and a Science Advisory Report (SAR), which will summarize the resulting advice. In addition, one or more working papers will be reviewed at the meeting, to support the advice and will be published as CSAS Research Documents.

Participation

Experts from a variety of organizations will participate in the meeting including DFO Science and other sectors, stakeholder organizations (e.g., Fisheries Joint Management Committee) and academia.

APPENDIX 2: MEETING PARTICIPANTS

Name	Affiliation
Burton Ayles	Fisheries Joint Management Committee
Steve Ferguson	Fisheries and Oceans Canada – Science
Lois Harwood	Fisheries and Oceans Canada - Science
Kevin Hedges	Fisheries and Oceans Canada – Science
Jeff Higdon	Consulting Wildlife Biologist
Kim Howland	Fisheries and Oceans Canada – Science
Veronique Lesage	Fisheries and Oceans Canada – Science
Lisa Loseto	Fisheries and Oceans Canada – Science
Joclyn Paulic	Fisheries and Oceans Canada - Science
Lianne Postma	Fisheries and Oceans Canada – Science
Jim Reist	Fisheries and Oceans Canada – Science
Chantelle Sawatzky	Fisheries and Oceans Canada – Science
Tim Siferd	Fisheries and Oceans Canada – Science
Yvan Simard	Fisheries and Oceans Canada – Science
Bruce Stewart	Arctic Biological Consultants
Wojciech Walkusz	Fisheries and Oceans Canada – Science
Erica Wall	Fisheries and Oceans Canada – Oceans
Jill Watkins	Fisheries and Oceans Canada – Science

APPENDIX 3: AGENDA

Monitoring protocols and strategies for the Tarium Niryutait Marine Protected Area (MPA) priority indicators

Central and Arctic Regional Advisory Meeting

February 9-10, 2012

Large Seminar Room, Freshwater Institute, Winnipeg, MB

Chair: Kevin Hedges

DAY 1

8:30 Welcome & Introductions - All
9:00 Review Meeting Terms of Reference and Agenda – Kevin Hedges
9:15 Overview of Main Working Paper – Jeff Higdon
9:30 'Species List' Indicator Protocols and Strategies – Jeff Higdon
9:45 Species List Working Paper – Joclyn Paulic/Bruce Stewart
10:00 Open Discussion and Review of 'Species List' Indicator – All
10:30 – 10:45 Coffee
10:45 Open Discussion and Review of 'Species List' Indicator – All
11:30 – 12:30 Lunch (not provided)
12:30 'Survey' Indicator Protocols and Strategies – Jeff Higdon
1:30 Open Discussion and Review of 'Survey' Indictor – All
2:15 'Sighting Effort' Indicators Protocols and Strategies – Jeff Higdon
2:45 – 3:00 Coffee
3:00 Open Discussion and Review of 'Sighting Effort' Indictors – All
3:45 Concluding Remarks
4:00 Meeting Adjourns

DAY 2

9:00 Opening Remarks & Recap of Day 1 – Kevin Hedges
9:15 'Noise' Indicator Protocols and Strategies – Jeff Higdon
9:30 Open Discussion and Review of 'Noise' Indicator – All
10:30 – 10:45 Coffee
10:45 Drafting of the SAR – All
11:30 – 12:30 Lunch (not provided)
12:30 Drafting of the SAR - All
2:45 – 3:00 Coffee
3:00 Drafting of the SAR - All
4:00 Next Steps and Closing Remarks