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Proceedings of a Maritimes Science Advisory Process to Develop a Framework for Monitoring the Musquash Estuary Marine Protected Area (MPA) and Administered Intertidal Area (AIA)

9-10 December 2010
St. Andrews, New Brunswick

Eddy Kennedy
Meeting Chair

Kristian Curran
Editor

Compte rendu d'une réunion du Processus de consultation scientifique de la Région des Maritimes concernant l'établissement d'un cadre de surveillance de la zone de protection marine (ZPA) de l'estuaire du MPO et de la zone intertidale administrée par le MPO

Les 9 et 10 décembre 2010
St. Andrews (Nouveau-Brunswick)

Eddy Kennedy
Président de la réunion

Kristian Curran
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Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting. Proceedings 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.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenues dans le présent rapport puissent être inexactes ou propres à induire en erreur, elles sont quand même reproduites aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considérée en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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SUMMARY

The Fisheries and Oceans Canada (DFO) Centre for Science Advice (CSA), Maritimes Region, held a Regional Science Advisory Meeting in St. Andrews, New Brunswick, on December 9-10, 2010, to peer review a draft Musquash Estuary Marine Protected Area Monitoring Framework. Participants from DFO Science, DFO Fisheries and Aquaculture Management, DFO Oceans, Habitat and Species at Risk, as well as external participants from universities and environmental non-government agencies, attended the meeting. The meeting was held to review the proposed indicators, strategies, and protocols for monitoring the Musquash Estuary Marine Protected Area and intertidal area administered by DFO. Specifically, the meeting addressed the following questions: 1) are the proposed monitoring indicators, strategies, and protocols identified in the framework appropriate and feasible to monitor the conservation objectives of the Musquash Estuary protected area; 2) are there any outstanding sources of uncertainty that might influence the selection or implementation of the proposed monitoring indicators, strategies, and protocols; and 3) are there any other considerations that should be taken into account in the development of the proposed framework for monitoring the Musquash Estuary. In summary, the meeting participants concluded that the proposed monitoring indicators, strategies, and protocols were general in scope, and that this was due to the limited baseline information that exists in the estuary. It was felt that the monitoring framework would increase in detail over time as subsequent baseline information becomes available, and that limitations of the existing information should not impede advancement toward development of a monitoring plan for the area. In addition, participants concluded that despite the limitations in baseline data, the greatest threats to the state of the estuary are likely from human activities that occur on neighbouring lands, in the broader watershed, or in the waters of the adjacent Bay of Fundy. The importance of maintaining a list of known or potential threats from activities occurring in these areas, including the identification of indicators, strategies, and protocols for monitoring these threats, was emphasized. Results of the advisory meeting will be published in a CSA Science Advisory Report, Research Document, and meeting Proceedings. The Science Advisory Report reached consensus on February 4, 2011. All CSA documents associated with this meeting will be published on the national CSA website as they become available: http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

SOMMAIRE

Le Centre des avis scientifiques (CAS) de Pêches et Océans Canada (le MPO) dans la Région des Maritimes a tenu les 9 et 10 décembre 2010 une réunion de consultation scientifique à St. Andrews (Nouveau-Brunswick) afin de procéder à l'examen par les pairs d'une ébauche de cadre de surveillance de la zone de protection marine de l'estuaire de la Musquash. Y participaient des membres du personnel du MPO (Sciences, Pêches et Aquaculture, et Océans, Habitat et Espèces en péril) ainsi que des universitaires et des membres d'organisations non gouvernementales du domaine de l'environnement. La réunion avait pour but d'examiner les indicateurs, stratégies et protocoles proposés pour la surveillance de la zone de protection marine de l'estuaire de la Musquash et la zone intertidale administrée par le MPO. Il s'agissait plus précisément de répondre aux questions suivantes : 1) Les indicateurs, stratégies et protocoles de surveillance proposés dans le cadre sont-ils pertinents et concrètement applicables à la surveillance des objectifs de conservation de la zone de protection marine de l'estuaire de la Musquash? 2) Reste-t-il des sources d'incertitude qui pourraient influer sur le choix ou la mise en œuvre des indicateurs, stratégies et protocoles de surveillance proposés et 3) Y a-t-il d'autres éléments à prendre en considération dans le développement du cadre proposé pour la surveillance de l'estuaire de la Musquash? En résumé, les participants à la réunion ont conclu que les indicateurs de surveillance proposés revêtaient un caractère général, en raison des données de base limitées sur l'estuaire. À leur avis, le cadre de surveillance devrait devenir plus détaillé au fil du temps avec l'acquisition subséquente d'autres données de base, et les limites de celles dont on dispose actuellement ne devraient pas empêcher d'avancer dans la mise en place d'un plan de surveillance de la zone. Les participants ont aussi conclu qu'on peut considérer, malgré les données limitées, que la plus grande menace qui pèse sur l'estuaire est probablement celle qui vient des activités humaines ayant cours sur les terres avoisinantes, dans le bassin hydrographique ou dans les eaux de la baie de Fundy, qui est adjacente. Ils jugent important de tenir une liste des menaces connues ou possibles découlant des activités ayant cours dans la zone et de définir des indicateurs, des stratégies et des protocoles de surveillance de ces menaces. Les résultats de la réunion de consultation feront l'objet d'un Avis scientifique du CSA et également d'un Document de recherche et d'un Compte rendu de réunion. L'Avis scientifique a été approuvé par consensus le 4 février 2011. Tous les documents du CSA associés à cette réunion seront publiés dès qu'ils seront disponibles sur le site national du SCCS, à l'adresse suivante : http://www.dfo-mpo.gc.ca/csas-sccs/index-fra.htm

1. INTRODUCTION

1.1 Meeting Welcome

The meeting Chair, Eddy Kennedy, from the Maritimes Science Branch of Fisheries and Oceans Canada (DFO), welcomed participants to the science advisory meeting of the proposed framework for monitoring the Musquash Estuary Marine Protected Area (MPA) and Administered Intertidal Area (AIA) located in southwest New Brunswick. The Chair did a round table of introductions of meeting participants (Appendix 1) and reviewed safety procedures, meeting facilities, and expected meeting conduct (e.g. no cellular phones).

The Chair provided a brief overview of the DFO Centre for Science Advice (CSA) Science Advisory Process and the definition of consensus, which was used to guide meeting discussions towards agreed upon advisory conclusions. The Chair then reviewed the objectives of the meeting, Terms of Reference (Appendix 2), and Agenda (Appendix 3). In addition, the Chair reviewed the expected science advisory outputs of the meeting: CSA Science Advisory Report; CSA Proceedings; and CSA Research Document. Last, questions of clarity were addressed by the Chair and the CSA Coordinator Kristian Curran.

1.2 Meeting Background

The Musquash Estuary is located in southwest New Brunswick. It supports rich and productive habitat for many species of invertebrates, fish, and wildlife, as well as several different marine plants. On December 14, 2006, the lands and waters in the Musquash Estuary up to mean low water were designated a Marine Protected Area (MPA) through regulations pursuant to Canada's *Oceans Act*. The *Oceans Act*, however, does not apply to the lands and waters above mean low water and, as a result, the Musquash Estuary MPA Regulations do not apply to the intertidal area in the estuary that is administered by Fisheries and Oceans Canada (DFO). Activities in the Administered Intertidal Area (AIA) are managed pursuant to the *Fisheries Act* and *Federal Real Property and Federal Immovables Act*.

A draft management plan for the Musquash Estuary MPA and AIA identifies research and monitoring as actions required to advising effective management of the protected area. In support of the Health of the Oceans Initiative, DFO Science is to deliver indicators, strategies, and protocols for monitoring the individual conservation objectives of MPAs that have been established pursuant to the *Oceans Act*. The selection of indicators, and the strategies and protocols for collection and analysis of monitoring data, must be scientifically defensible. On December 9-10, 2010, a DFO Maritimes Region Science Advisory Process was held to review a range of proposed indicators, strategies, and protocols for monitoring the Musquash Estuary protected area.

The scope of the advisory meeting was on indicators, strategies, and protocols proposed for monitoring the entire Musquash Estuary. The discussion was not limited to the MPA and AIA boundaries. The implementation of monitoring, however, may not be undertaken on the scale of the estuary, and this is to be determined at a later date dependent on factors such as partnerships and the availability of resources, to name a few. Advice put forth from the advisory meeting is presented in a CSA Science Advisory Report, with further details provided in a CSA Research Document. Discussion at the meeting is summarized in this CSA Proceedings. All CSA documents associated with this meeting will be published on the national CSA website as they become available: http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

1.3 Meeting Objectives

The objective of the advisory meeting is to provide a scientific peer review of the proposed Musquash Estuary MPA and AIA monitoring framework, specifically to determine:

1. Are the proposed monitoring indicators, strategies, and protocols identified in the framework appropriate and feasible to monitor the conservation objectives of the Musquash Estuary MPA and AIA?

2. Are there any outstanding sources of uncertainty that might influence the selection or implementation of the proposed monitoring indicators, strategies, and protocols?

3. Are there any other considerations that should be taken into account in the development of the proposed monitoring framework for the Musquash Estuary MPA and AIA?

2. OVERVIEW OF MONITORING MUSQUASH ESTUARY

2.1 History of Monitoring Development

(Presenter: Rabindra Singh, DFO Oceans, Habitat and Species at Risk)

Presentation Overview

Rabindra Singh (DFO Oceans, Habitat, and Species at Risk Branch) presented a history of monitoring development for the Musquash Estuary. Rabindra's presentation first reviewed the history of designation of the Musquash Estuary as an MPA. The estuary was proposed as a candidate MPA in 1998, through joint support of the Conservation Council of New Brunswick, Fundy North Fisherman's Association, and local residents. The estuary was designated an MPA on December 14, 2006, pursuant to Canada's *Oceans Act*. Rabindra briefly reviewed the rationale for MPA designation and the regulations that govern human activities in the protected area.

Rabindra then provided a history of works that have contributed to thoughts on monitoring the Musquash Estuary. Rabindra was involved in much of this work during his previous employment with DFO Science.

- February 2000 – Rangeley and Singh (2000) published a framework for biological monitoring in the Musquash Estuary MPA;

- September 2003 – Parker and Rutherford (2003) published an approach for the development of an ecosystem framework for the Musquash Estuary;

- November 2004 – A workshop was held in Saint John, New Brunswick, to discuss the selection of indicator species and key/foundation species of the Musquash Estuary, as part of the process for developing an ecosystem framework for managing the estuary. The meeting consisted of a group of scientific experts.

- March 2007 – Singh and Buzeta (2007) published an ecosystem framework for managing the Musquash Estuary. It was consistent with DFO's objectives for managing ecosystems, with consideration of previous discussions on an ecosystem framework for the Musquash Estuary (as noted above)

- December 2007 – A workshop was held in St. Andrews, New Brunswick, to review the Musquash Estuary ecosystem framework of Singh and Buzeta (2007) and to evaluate proposed monitoring, which was based on previous discussions on monitoring the estuary (as noted above). The meeting consisted of a group of scientific experts. An overview of the discussions at the workshop was published by Davies et al. (2008).

In summary, Rabindra's presentation indicated that much discussion and thought has been given to the various methods for monitoring the Musquash Estuary ecosystem.

Presentation Discussion

Melisa Wong (DFO Science) asked if eel grass was listed as an ecotype in the ecosystem framework for the Musquash Estuary and if large populations are present. Rabindra indicated that eel grass was not mapped in the estuary and that the presence of eel grass in the estuary is unknown.

David Thompson (Conservation Council of New Brunswick and Fundy Baykeeper) raised concern over a proposed aquaculture site to be located at Little Musquash Cove, which is located just south of the Musquash Estuary. As a result, David identified a need to monitor the periphery of the Musquash Estuary MPA and AIA as, in his view, the greatest threats to MPA and AIA are likely from activities outside of the MPA and AIA and not from activities in the MPA and AIA.

Brent Law (DFO Science) asked if there was any expansion planned for Highway 1 located at the northern boundary of the MPA and AIA. Rabindra indicated that some minor re-alignment of the highway may occur, but that the major works associated with highway expansion have been completed.

No other questions or concerns were raised following the presentation.

3. PROPOSED MONITORING FRAMEWORK

3.1 Ecosystem Overview

(Presenter: Andrew Cooper, DFO Science)

Presentation Overview

Andrew Cooper provided an overview of the Musquash Estuary ecosystem and outlined necessary components of monitoring that may be included in a monitoring plan for the estuary. The presentation began with a brief overview of ecosystem based management and the objective of monitoring. GESAMP (1991) proposed that monitoring be designed to inform management actions that minimize the effects of human activities on an ecosystem.

An ecosystem-based monitoring plan establishes monitoring actions that are used to monitor ecological indicators. Ecological indicators are used to assess the condition of the ecosystem and evaluate the success of achieving a conservation objective. A robust ecological indicator describes the spatial and temporal scales of interest. A monitoring strategy and protocol is a parameter or test used to assess the state of an ecological indicator. Last, ecological reference

points define the outer limits of the optimum range, beyond which an ecological indicator may exhibit a diminished scope for growth or survival.

Andrew reviewed the steps in establishing a monitoring plan (as outlined by the USEPA, 2008) and the components of the monitoring framework for the Musquash Estuary (e.g. conservation objectives, identification of perceived threats, monitoring indicators, strategies, and protocols, etc.). Last, Andrew provided an overview of the Musquash Estuary ecosystem and a summary of existing sources of ecosystem data and information.

Presentation Discussion

David Thompson (Conservation Council of New Brunswick and Fundy Baykeeper) suggested that the acreage of wetland cited in Andrew's presentation may be incorrect. The meeting Chair cited the acreage outlined in Singh et al. (2000) and confirmed that Andrew's acreage was correct.

Melisa Wong (DFO Science) asked if there was much information on benthic invertebrates in the Musquash Estuary. Andrew indicated that Wildish (1977) did work on benthic invertebrates in the estuary, but that the work was done many years ago and was not comprehensive in its spatial and temporal resolution. Andrew, however, indicated that the work of Wildish (1977) provides a starting point for baseline knowledge of benthic invertebrates in the estuary, although the information is not adequate for the purpose of monitoring. Further to this point, Andrew indicated that a lot of studies currently exist, which provide a basis for beginning to understand the Musquash Estuary ecosystem. In many instances however the data is not at a high enough resolution to provide a comprehensive baseline understanding.

The meeting Chair, Eddy Kennedy (DFO Science), asked if any recent research was currently underway in the Musquash Estuary. Andrew indicated that Fred Page (DFO Science) was undertaking research on the physical oceanography of the estuary, Jennifer Martin (DFO Science) was undertaking research on marine invasive species, Brent Law (DFO Science) was undertaking research on sedimentation rates and metals history, Erinn Ipsen (University of New Brunswick, Saint John) was undertaking research on fish by beach seining and use of fyke netting, and that he (i.e. Andrew) was undertaking research on meiofauna diversity.

No other questions or concerns were raised following the presentation.

3.2 Managed Activities and Perceived Threats

(Presenter: Andrew Cooper, DFO Science)

Presentation Overview

Andrew Cooper provided an overview of the activities that are currently managed in the estuary, as well as the related perceived threats to the estuarine ecosystem from human activities. The focus of the presentation was on monitoring managed activities and perceived threats in the MPA and AIA. Pursuant to the Musquash Estuary MPA regulations, a range of human activities are excluded, permitted, or may require approval prior to being undertaken in the protected area. The regulations are in place to limit those activities that may have a significant negative impact on the estuarine ecosystem. Andrew reviewed the MPA regulations and the four zones of the protected area that dictate where various activities may occur in the estuary (refer to DFO, 2008, for an overview of proposed management of the MPA and AIA).

Andrew indicated that managed activities require monitoring in order to inform the effectiveness of management efforts. In addition, activities that occur outside of the estuary (e.g. on neighbouring lands, in the Musquash watershed, or in the adjacent waters of the Bay of Fundy) may also pose a threat to the conservation objectives for the protected area and, even though they are not managed pursuant to the MPA regulations, they still should be assessed for their zone of influence and monitored for their potential impact on the estuary, as appropriate.

Andrew provided an overview of how some of the activities permitted in the protected area may be monitored. Last, Andrew recommended the following actions to be included in a monitoring framework:

- regular review of managed activities, zones of influence, and perceived threats;
- identification of existing and emerging threats to the estuarine ecosystem;
- acquire data on managed activities (e.g. fishery landings, commercial recreational harvest, vessel traffic, and scientific activity requests) on time scales and periodicity that are compatible with environmental data;
- develop and implement a data management structure that facilitates use of information from multiple disciplines including management; and
- analyze and assess managed activities, as part of an iterative assessment cycle.

Presentation Discussion

Sarah Cheney (DFO Science) asked if the zones of influence of various perceived threats to the protected area have been identified. Andrew indicated that they have not, as perceived threats still need to be defined and may differ depending on nature of the threat or human activity. As a follow-up, Sarah asked why we need to measure activities that are allowed and determined not to have an impact on the protected area. Andrew indicated that it is still important to track permitted activities, in order to determine if changes in their nature and/or frequency result in unexpected impacts to the estuarine ecosystem. Similarly, Andrew indicated that a threat assessment of allowed activities needs to be undertaken. Brent Law (DFO Science) suggested that the first step would be to develop a baseline understanding of the nature and frequency of allowed activities, before their potential impacts can be determined.

Fred Page (DFO Science) indicated that the MPA and AIA is small, and outside events may happen quickly that can lead to significant changes to the state of the MPA and AIA ecosystem over a short period of time. David Thompson (Conservation Council of New Brunswick and Fundy Baykeeper) further suggested that few things in the MPA and AIA are of threat to the estuarine ecosystem, rather most threats likely come from natural events and activities that occur outside of the protected area. On this point, David indicated that a lot of the land that surrounds the estuary is under some form of management that limits human activities to those of low impact on the ecosystem. David also indicated, however, that other adjacent lands contain known mineral resources, and that mineral exploration and development may occur at some time in the future. Based on this, David indicated that any monitoring plan for the estuary should track the use of lands around the protected area. David suggested that a standing list be kept of activities that may cause significant change to the estuary, which are currently known or may emerge in the future.

David's points led to discussions on prioritizing activities that require the development of baseline information, so that management can respond in a timely manner as the activities proceed. The Chair, Eddy Kennedy (DFO Science), suggested that this could be part of the role of the Musquash Science and Monitoring Advisory Committee within the proposed governance structure for monitoring the protected area, as outlined in the monitoring framework. Andrew

indicated that this may not be a trivial task, as prioritizing activities for the development of baseline information may require much knowledge of the current functioning and predicted changes to the estuarine ecosystem, as well as the magnitude and frequency to which the activities are undertaken; a move towards research rather than monitoring.

Claudio Dibacco (DFO Science) indicated that consideration of perceived or emerging threats to the estuary from human activities should be a basis for identifying indicators of ecosystem change since it will be these threats that will result in changes to ecosystem components. Also, there needs to be flexibility in the monitoring framework/plan for identifying new indicators that can assess any new or emerging threats that may arise.

Fred Page (DFO Science) indicated that any monitoring framework must consider security of the equipment that is left in the field (e.g. webcams in field), in order to evaluate the practicality of the monitoring strategy. In addition, Jennifer Martin (DFO Science) asked about who was to do the monitoring. The meeting Chair indicated that implementation of monitoring activities is outside of the scope of the advisory meeting, but that it is the responsibility of the Oceans Sector. In short, the proposed framework being discussed at the meeting is to invoke consideration of how managed activities may be addressed through monitoring and not how the monitoring will get done.

Brent Law (DFO Science) suggested that a source-to-sink approach be considered for tracking potential impacts on the estuary from activities that may occur outside of the protected area.

The meeting Chair, Eddy Kennedy (DFO Science), asked if everyone was in agreement with Andrew's recommendations of how managed activities and perceived threats to the estuary should be considered in the monitoring framework. There was consensus by all participants that Andrew's recommendations are appropriate and should be included in the monitoring framework and science advisory report.

No other questions or concerns were raised following the presentation.

3.3 Conservation Objectives

(Presenter: Andrew Cooper, DFO Science)

Presentation Overview

Andrew Cooper presented an overview of the conservation objectives for the protected area. The conservation objectives that were presented at the meeting were:

- **Productivity,** so that each component (primary, community, population), can play its role in the functioning of the ecosystem. This objective implies that there is a contribution by the MPA and AIA to the productivity and health of species populations. Whether a target of a fishery or not, it may be of advantage for that species to spend a part of its life cycle (e.g. juvenile fish, nesting birds) within the MPA;

- **Biodiversity,** by maintaining enough components (ecotypes, communities, populations, species) in order to preserve the structure and natural resilience of the ecosystem. That is, to maintain the diversity of individual species, communities, and populations in the different ecotypes; and

- **Habitat,** in order to safeguard the physical and chemical properties of the ecosystem. This objective ensures the conservation and sustainable use of the marsh and estuary, by maintaining water and sediment quality in the MPA and AIA.

The conservation objectives presented by Andrew (those above) were older versions of the final conservation objectives outlined in the management plan for the MPA and AIA (DFO, 2008). Below are the up-to-date conservation objectives:

- **Productivity,** so that each component (primary, community, population) can play its role in the functioning of the ecosystem by maintaining abundance and health of harvested species;

- **Biodiversity,** by maintaining the diversity of individual species, communities, and populations within the different ecotypes; and

- **Habitat,** in order to safeguard the physical and chemical properties of the ecosystem by maintaining water and sediment quality.

Andrew indicated that the conservation objectives were important, as they set the tone for how human activities are managed in the protected area and the nature of indicators that are selected for monitoring the estuarine ecosystem, existing and potential human activities, and perceived threats.

Presentation Discussion

It was indicated that the set of conservation objectives that Andrew had worked from in the proposed monitoring framework were not in agreement with the final conservation objectives for the protected area. Both sets of conservation objectives were reviewed and the meeting participants reached consensus that the two sets of objectives were not significantly different to compromise the proposed monitoring indicators, strategies, and protocols that have been proposed for monitoring the estuary. Andrew agreed to update the proposed monitoring framework to include the updated conservation objectives.

No other questions or concerns were raised following the presentation.

3.4 Monitoring Indicators, Strategies, and Protocols

(Presenter: Andrew Cooper, DFO Science)

Presentation Overview

Andrew Cooper presented an overview of the proposed indicators, strategies, and protocols for monitoring the conservation objectives for the protected area. The basis for the proposed indicators were those identified in Davis et al. (2008). Andrew indicated that ecological indicators for the estuary should be linked to the conservation objectives: productivity, biodiversity, and habitat. Priority ecological indicators for each ecosystem component, as suggested by Davies et al. (2008), include:

- essential nutrient concentrations, water turbidity, phytoplankton concentration, and number of juvenile fish and bird hatchlings (Productivity);
- number and species in each trophic level and abundance of keystone species (Biodiversity); and

- historical and present physical features influencing the hydrological regime (Habitat).

Andrew worked through the proposed indicators, as well as the strategies and protocols for monitoring them. Andrew indicated that in deciding upon appropriate indicators, consideration must be given to their relevance to the conservation objectives, cost, and feasibility of implementation. Further, Andrew indicated that a successful indicator is supported by baseline data, can be linked both to the ecosystem and human activities, and permit over the long term a differentiation between spatial and temporal natural variation and human induced changes to the ecosystem. An iterative approach to evaluating the monitoring indicators was discussed. Last, Andrew worked through an example of the implementation of a monitoring indicator, which demonstrated the work that is required in developing baseline knowledge for only one small aspect of the Musquash Estuary ecosystem.

Presentation Discussion

Melisa Wong (DFO Science) suggested that the ultimate goal of monitoring is to understand the overall functioning of ecosystem. Thus, the monitoring framework should include a discussion on the flow of energy between the various ecosystem components and functions of the Musquash Estuary, in order to provide a big picture understanding of the whole ecosystem (e.g. how do productivity, biodiversity, and habitat interact). Further, Melisa felt that the proposed monitoring framework was component oriented and not holistic, and that a discussion on the flow of energy may strengthen the framework. Claudio Dibacco (DFO Science) indicated that a similar discussion was held at the Gully MPA advisory meeting on its proposed monitoring framework although, at that meeting, the participants concluded that developing the big picture should not hold back the monitoring framework. Participants of the Gully MPA advisory meeting concluded that the big picture could be developed as monitoring commenced and advanced through time. Last, Melisa asked if the proposed indicators are set in stone. Andrew indicated that they are only a starting point and need to be refined as baseline data is collected.

Claudio DiBacco (DFO Science) recommended that the link between indicators and perceived threats to the ecosystem be kept in mind. He also advised that all potential indicators be identified, without concern of cost or feasibility, in order to broaden the scope of possibility. At a point further in time, the most suitable indicators can each be given consideration to their suitability for monitoring purposes. On another note, Claudio suggested that the format of the proposed framework may be changed to threat oriented rather than the conservation objective approach that is currently used. Andrew indicated that a combination of both approaches would be valuable.

The meeting Chair, Eddy Kennedy (DFO Science), raised a comment on behalf of Alida Bundy, who could not attend the meeting and submitted her comments in writing. Alida indicated that there is not a good link between the conservation objectives and indicators in the proposed framework, and that some more ‘unpacking’ is required to clarify the linkages. Andrew indicated that without knowing how the Musquash Estuary ecosystem functions, it is difficult to move toward a higher level of an unpacking of indicators. Given the current level of baseline knowledge of the estuary, the indicators can only remain at a general scale. Andrew’s point was echoed in a written submission of comments by Glen Harrison (DFO Science).

The meeting Chair, Eddy Kennedy (DFO Science), asked if the indicators are suitable to meet the conservation objectives of the protected area. Claudio DiBacco (DFO Science) indicated that indicators, as proposed, are more reflective of a class of indicators, and that detailed indicators still need to be determined (similar to Alida Bundy’s point). For example, total biomass per ecotype is not achievable, so what specific indicators can be undertaken to achieve

a measure that is representative of total biomass. Again, Fred Page indicated that the baseline data currently does not exist to get to that level of detail for indicators, whereby there is confidence that they are effective for monitoring purposes.

To further the discussion, the Chair, Eddy Kennedy (DFO Science), asked if participants conclude that there is not enough baseline data to identify indicators or do participants agree that enough is known to propose an initial set of indicators. Erinn Ipsen, (University of New Brunswick, Saint John), indicated that she confronted the same issue in her research on fish abundance in the Musquash Estuary. Erinn indicated, in her case and for consideration in the proposed monitoring framework, that it is premature to determine the best indicator for fish species without having prior knowledge or baseline data of what species occupy the region. She re-iterated the conclusion that sufficient baseline data is needed prior to identifying detailed indicators. Claudio DiBacco (DFO Science) suggested a return to a threat oriented approach to the monitoring framework. Fred Page (DFO Science) raised a concern that if you focus on threats you may not develop an understanding of the ecosystem. Fred too re-iterated the need to build baseline data around indicators that are believed to be suitable for monitoring purposes. Maxine Westhead (DFO Oceans, Habitat, and Species at Risk) stated that the framework was almost like a baseline development protocol rather than a monitoring framework.

Brent Law (DFO Science) suggested that the framework be more explicit about threats and how they link to current indicators, as well as identify any missing indicators. The Chair, Eddy Kennedy (DFO Science), believed that this could be included in the section on uncertainty. Brent also indicated that there needs to be a list of baseline data to be collected to begin to develop an understanding of the ecosystem components and functions of the estuary, and to work towards identifying detailed indicators.

To further advance the discussion on monitoring indicators, the Chair, Eddy Kennedy (DFO Science), asked if there were any further considerations that should be taken into account to identify indicators. Rabindra indicated that Singh and Buzeta (2007) gave some thought to linking indicators with perceived threats, although Andrew suggested that the challenge remains to identifying detailed indicators. Sarah Cheney (DFO Science) asked if any attempt had been made to rank indicators in the monitoring framework. Rabindra indicated that indicators were prioritized in the Singh and Buzeta (2007) report, but that this was not done in the monitoring framework. Sarah suggested that threats may be prioritized, in order to prioritize monitoring indicators. The Chair, Eddy Kennedy (DFO Science), re-iterated that the main source of uncertainty is a lack of baseline data, which makes it difficult to identify and prioritize indicators.

Some specific questions and comments regarding the monitoring indicators, strategies, and protocols were then raised. Gary Bugden (DFO Science) indicated that the word ‘hydraulics’ is not correctly used in the framework and that the term ‘hydrographic’ is more appropriate. Gary also asked if fishery records were suitable for monitoring the estuary, since they are typically collected at much larger scales than the protected area. David Methven (University of New Brunswick, Saint John) indicated that it is difficult to distill fishery statistics down to the resolution of the protected area. He also inquired if it might be a requirement in the future for fishers to record any fishing effort in the MPA. Sarah Cheney (DFO Fisheries and Aquaculture Management) indicated that any fishery statistics are only as reliable as the fishermen log books from which the data comes.

Maxine Westhead (DFO Oceans, Habitat and Species at Risk) asked if phytoplankton, as an indicator, should be replaced with macrofauna. Jennifer Martin (DFO Science) suggested not removing phytoplankton as an indicator. Just because phytoplankton is not at high concentrations and of lower species diversity, this is not a good reason to remove. If

phytoplankton concentrations and species diversity increase these may be good indicators of change in the estuary, particularly in the water column. Melisa Wong (DFO Science) cited a need to monitor salt marsh grasses in some capacity. Rabindra Singh (DFO Oceans, Habitat and Species at Risk) indicated that the proposed indicator "total biomass per ecotype" captures salt marsh grasses.

Fred Page (DFO Science) cited the possible need to monitor sea level change and its potential impacts on the estuarine ecosystem. Fred indicated that both the sea level elevation and tidal elevations are changing and increasing in the estuary. Changes may also be event driven, so indicators must be able to capture this. Brent Law (DFO Science) asked if there were any indicators for freshwater monitoring. Andrew indicated that strategies and protocols for monitoring temperature and salinity in the estuary have been proposed, although other indicators for freshwater inputs may be considered.

Erinn Ipsen (University of New Brunswick, Saint John) cited the need to undertake 24 hour monitoring for select indicators, in order to look at the variability over a diurnal cycle. It should be noted that there are two 24 hour data series of beach seine collections (fish) done in September and October (MSc thesis, Department of Biology, University of New Brunswick, Saint John – Arens, 2007). Fred Page (DFO Science) indicated that sample frequency is dependent on the indicator, for example event based sampling for some indicators (e.g. sedimentation), 24 hour sampling for others (e.g. salinity), and seasonal sampling for others (e.g. benthos). Erinn indicated that the University of New Brunswick, Saint John, does some monitoring at the same site each year as part of a second year Ecology course and that the data has not been used outside of their class projects – there is an opportunity to link up this course work to carry out some of the monitoring of the Musquash Estuary.

Melisa Wong (DFO Science) suggested that 'keystone species' may not be the best term to use in the monitoring framework, and that 'dominant species' may be more appropriate; keystone and dominant species have different definitions. Claudio DiBacco (DFO Science) suggested that in the very least, the monitoring framework should provide a definition of keystone species in the context of its use, as well as how they are identified.

David Thompson (Conservation Council of New Brunswick and Fundy Baykeeper) suggested that if a bacterial problem exists in the Musquash Estuary, in regard to shellfish closures, this may require further inquiry as to the cause. Claudio DiBacco (DFO Science) suggested inclusion of an indicator to track bacteria in the absence of any Environment Canada sampling. The meeting Chair, Eddy Kennedy (DFO Science), asked if there should be a section on priority research needs, in order to move research and monitoring in the Musquash Estuary forward. Claudio DiBacco (DFO Science) indicated that this process is iterative, although tracking the effectiveness of such an exercise is important.

Last, David Thompson (Conservation Council of New Brunswick and Fundy Baykeeper) indicated that hidden and buried contaminated soils and wastes on lands adjacent to the protected area must be considered and located. Gary Bugden (DFO Science) indicated that measuring contaminants can be an important indicator that represents the industrial history surrounding the estuary. David also indicated that live webcams only capture a snapshot of the estuary as a whole, and can be of limited value in certain situations (e.g. in fog or darkness). In short, David pointed out that the monitoring framework must recognize the benefits and limitations of each monitoring strategy and protocol, in order to maximize the efficient use of resources. David indicated that the strategies and protocols that surround imaging and photography have potential, but need to be considered in context of their effectiveness. In addition, strategies and protocols surrounding illegal dumping may be dangerous and not

appropriate for people of all ages (e.g. Scouts and school groups) and, again, the practicality of all indicators, strategies, and protocols must be considered. In summary, David reminded that a monitoring plan should be practical; it should propose actions that are achievable.

No other questions or concerns were raised following the presentation.

3.5 Governance Structure and Data Management

Presentation Overview

Andrew Cooper presented an overview of a proposed monitoring governance structure and data management strategy for the estuary. The content of this presentation was outside of the objectives for the advisory meeting although, it was felt, that good governance and data management are important components of successful monitoring. The monitoring framework proposes a governance structure for monitoring managed activities in the estuary. It is based on an iterative approach to monitoring that ensures the systematic review of monitoring results in a timely manner. Good data management ensures that previously-collected data remains accessible through time.

Presentation Discussion

Maxine Westhead (DFO Oceans, Habitat and Species at Risk) recommended that data management be integrated into the governance figure in the research document. Andrew indicated that this could be done.

Sarah Cheney (DFO Science) indicated that DFO's data management of at-risk species may be a good model for how data could be archived and shared between multiple groups. Andrew indicated that his understanding of this data is that it needs to be vetted by DFO prior to its use in a decision. This can slow down the decision making process and release of data to stakeholders.

Claudio Dibacco (DFO Science) indicated that the Gully MPA data management is advancing, but has been slowed by the geo-referencing of existing data and the documentation of its metadata, which is to be consistent with DFO data policies and proprietary rights. Further, Claudio indicated that data management is costly and needs to be budgeted in advance of developing a monitoring plan for the Musquash Estuary. Because effective data management requires dedicated resources, DFO may want to move towards one MPA data management system.

David Thompson (Conservation Council of New Brunswick and Fundy Baykeeper) indicated that data used in management decisions needs to be made available to non-government organizations prior to a decision being made. He emphasized that this point be made clear in the meeting Proceedings and should be included in the monitoring framework. Last, David indicated that many activities in the MPA and AIA that may result in data collection (e.g. scientific research) require approval prior to being undertaken. As such, a condition of approval may be the release of data collected as part of the approved activity.

No other questions or concerns were raised following the presentation.

4. REVIEW OF THE SCIENCE ADVISORY REPORT

4.1 Discussion and Consensus

The second day of the advisory meeting, December 10, 2010, focused on the review and consensus of the draft CSA Science Advisory Report. The meeting Chair Eddy Kennedy (DFO Science) facilitated the discussion on the draft report by moving through its contents one section at a time. This section summarizes the discussion on the draft advisory report and provides an overview of the reaching of consensus. Prior to commencement of the advisory meeting, the meeting Chair Eddy Kennedy (DFO Science) indicated that only those participants that attended the entire two-day advisory meeting would be given opportunity to review and provide concurrence of consensus on the final CSA Science Advisory Report (Appendix 1).

In summary, the major additions to the Science Advisory Report were:

1. Add sentences to the 'Context' section on the scope of the framework; that is, it applies to the entire estuary, although the implementation of monitoring may occur at different scales and has yet to be determined;

2. Add draft summary bullets once the text of the report has been revised;

3. Add sentences to the 'Background' section indicating that the framework is based on an ecosystem approach to monitoring with linkages to current activities and perceived threats to the Musquash Estuary;

4. Revise the 'Conservation Objectives' section to include the up-to-date conservation objectives that have been established for the protected area (refer to DFO, 2008);

5. Clarify the description of the four management zones in the protected area: Zone 1, Zone 2, Zone 3, and the Administered Intertidal Area;

6. Add a couple of paragraphs to the 'Human Activities and Perceived Threats' section indicating the potential for threats to the protected area from adjacent lands, the Musquash Watershed, and adjacent waters of the Bay of Fundy. In addition, identify the need to determine zones of influence and potential indicators for existing or emerging threats to the estuary. Last, indicate that discussion on perceived threats to the estuary have occurred through time and there is a need for the discussion to continue, although such a discussion was not a focus of the advisory meeting;

7. Include in the report the recommendations of Andrew Cooper, which pertain to the monitoring of human activities and perceived threats in the estuary;

8. Use consistent terminology to describe monitoring indicators, strategies, and protocols. Include a table in the report that draws linkages and summarizes the relationship between the proposed monitoring indicators and the proposed monitoring strategies and protocols outlined in the appendix of the CSA Research Document;

9. Include sections in the report that summarize meeting recommendations on strategies for implementing the monitoring framework, as well as potential uncertainties in monitoring the estuary; and

10. Add sentences to the 'Other Considerations' section indicating that monitoring governance and data management was discussed in more detail in the CSA Research Document that accompanies the CSA Science Advisory Report. These topics were not discussed in detail in the advisory report, since they were not part of the advisory meeting Terms of Reference (Appendix 2).

The recommendations noted above were integrated into the revised Science Advisory Report following the advisory meeting. As a result, consensus on the CSA Science Advisory Report was not reached upon conclusion of the December 9-10 advisory meeting. The meeting Chair was asked to address the proposed revisions identified above and re-circulate the report for concurrence to those participants that attended the entire two-day meeting. The revised report was circulated by email and postage mail on January 12, 2011. Reports circulated by post included a stamped envelope for return of the peer review/concurrence form. Deadline for return of the peer/review concurrence form was January 26, 2011, for those receiving the report by email and January 28, 2011, for those receiving the report by postage mail. The timeline for review and concurrence was approximately two weeks.

Nine individuals were eligible to review the revised Science Advisory Report and provide concurrence, since they attended the entire two days of the regional advisory meeting. After three weeks for review, two individuals provided concurrence on the report as 'Acceptable', seven individuals provided concurrence on the report as 'Acceptable with Minor Revisions', and one individual did not reply despite two additional requests for submission. All minor revisions were incorporated into the final Science Advisory Report and it was considered to have reached consensus on February 4, 2011, given that no major concerns were raised by eight of the nine eligible peer reviewers.

SOURCES OF INFORMATION

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APPENDIX 1. Meeting Participants.

Musquash Estuary: A Proposed Monitoring Framework for the Marine Protected Area and Intertidal Area Administered by Fisheries and Oceans Canada

Maritimes Region Science Advisory Process

St. Andrews, New Brunswick

Date: December 9-10, 2010

ATTENDEES

DAY 1: December 9, 2010

NAME	AFFILIATION
Abbott, Mathew	Conservation Council of New Brunswick and Fundy Baykeeper
Bugden, Gary	DFO Science, Maritimes Region
Chang, Blythe	DFO Science, Maritimes Region
Cheney, Sarah	DFO Fisheries and Aquaculture Management, Maritimes Region
Cooper, Andrew	DFO Science, Maritimes Region
Curran, Kristian	DFO Science, Maritimes Region
DiBacco, Claudio	DFO Science, Maritimes Region
Ipsen, Erinn	University of New Brunswick, Saint John
Kennedy, Eddy	DFO Science, Maritimes Region
Law, Brent	DFO Science, Maritimes Region
Martin, Jennifer	DFO Science, Maritimes Region
Methven, David	University of New Brunswick, Saint John
Page, Fred	DFO Science, Maritimes Region
Singh, Rabindra	DFO Oceans, Habitat and Species at Risk, Maritimes Region
Thompson, David	Conservation Council of New Brunswick and Fundy Baykeeper
Westhead, Maxine	DFO Oceans, Habitat and Species at Risk, Maritimes Region
Wong, Melisa	DFO Science, Maritimes Region

DAY 2: December 10, 2010

NAME	AFFILIATION
Bugden, Gary	DFO Science, Maritimes Region
Chang, Blythe	DFO Science, Maritimes Region
Cheney, Sarah	DFO Fisheries and Aquaculture Management, Maritimes Region
Cooper, Andrew	DFO Science, Maritimes Region
Curran, Kristian	DFO Science, Maritimes Region
DiBacco, Claudio	DFO Science, Maritimes Region
Kennedy, Eddy	DFO Science, Maritimes Region
Law, Brent	DFO Science, Maritimes Region
Martin, Jennifer	DFO Science, Maritimes Region
Singh, Rabindra	DFO Oceans, Habitat and Species at Risk, Maritimes Region
Thompson, David	Conservation Council of New Brunswick and Fundy Baykeeper
Westhead, Maxine	DFO Oceans, Habitat and Species at Risk, Maritimes Region
Wong, Melisa	DFO Science, Maritimes Region

APPENDIX 2. Meeting Terms of Reference.

Review of the Draft Musquash Estuary Marine Protected Area (MPA) and Administered Intertidal Area (AIA) Monitoring Framework

Maritimes Region Science Advisory Process

Location: St. Andrews, New Brunswick

Date: December 9-10, 2010

TERMS OF REFERENCE

Context

The Musquash Estuary in southwest New Brunswick is unique in the region due to its size, expansive salt marshes, and relatively undisturbed natural condition. It is the largest ecologically-intact estuary in the Bay of Fundy. It exhibits a diverse number of habitat types and related biological communities. On December 14, 2006, the lands and waters in the Musquash Estuary, up to the ordinary water level at low tide, were designated a Marine Protected Area (MPA) through regulations made pursuant to Canada's *Oceans Act*. A marine protected area is a coastal or marine area given special status to conserve and protect its natural habitat and marine life. Certain intertidal areas adjacent to the MPA are also administered and protected by Fisheries and Oceans Canada (DFO) (i.e. Administered Intertidal Areas or AIA).

In support of the Health of the Oceans Initiative, Fisheries and Oceans Canada's (DFO) Science Branch is required to deliver indicators, strategies, and protocols for monitoring MPAs that have been designated pursuant to the *Oceans Act*. Monitoring of biological and ecological indicators (and related threats) is essential for: A) incorporating an ecological component into broader MPA monitoring 'frameworks', 'plans', or 'programs'; B) tracking status, condition, and trends to determine if MPAs are effective in achieving their conservation objectives; and C) aiding managers in the adjustment of MPA management plans to achieve conservation objectives, in support of reporting to Parliament and Canadians. Thus, the selection of indicators, strategies, and protocols

Examen de l'ébauche de cadre de surveillance de la zone de protection marine (ZPM) de l'estuaire de la Musquash et de la zone intertidale connexe administrée par le MPO

Processus de consultation scientifique de la Région des Maritimes

Lieu : St. Andrews (Nouveau-Brunswick)

Date : Du 9 au 10 décembre 2010

CADRE DE RÉFÉRENCE

Contexte

L'estuaire de la Musquash, dans le sud-ouest du Nouveau-Brunswick, est un estuaire unique dans la région de par sa grandeur, ses vastes marais salés et le fait qu'il est resté relativement inchangé, dans son état naturel. C'est le plus grand estuaire encore intact sur le plan écologique dans la baie de Fundy. Il présente une diversité de types d'habitat et de communautés biologiques y vivant. Le 14 décembre 2006, les terrains et les eaux de l'estuaire de la Musquash, jusqu'à la laisse ordinaire de basse mer, ont été désignés zone de protection marine (ZPM) en vertu d'un règlement découlant de la *Loi sur les océans.* Une zone de protection marine est une zone maritime ou côtière à laquelle est conféré un statut spécial dans le but de conserver et de protéger son habitat naturel et les organismes marins qui y vivent. Certaines parties de la zone intertidale adjacente à cette ZPM sont aussi administrées et protégées par Pêches et Océans Canada (le MPO).

Dans le cadre de l'initiative sur la Santé des océans, la Direction des sciences du MPO est tenue de présenter des indicateurs, des protocoles et des stratégies de surveillance des ZPM, établis conformément à la *Loi sur les océans.* La surveillance d'indicateurs biologiques et écologiques (et des menaces connexes) est essentielle pour : A) intégrer une composante écologique aux « cadres », « plans » ou « programmes » généraux de contrôle des ZPM; B) observer la situation, les conditions et les tendances dans les ZPM afin de déterminer si ces zones parviennent à atteindre leurs objectifs de conservation et C) aider les gestionnaires à rajuster les plans de gestion des ZPM pour atteindre les objectifs de conservation afin qu'ils puissent en rendre compte au Parlement et aux

for the collection and analysis of data must be scientifically defensible.

A Maritimes Region Science Advisory Process will be conducted to review proposed indicators, strategies, and protocols for monitoring the Musquash Estuary MPA and AIA.

Objectives

The objective of this meeting is to provide a scientific peer review of the proposed Musquash Estuary MPA and AIA monitoring framework, specifically to determine:

1. Are the proposed monitoring indicators, strategies, and protocols identified in the framework appropriate and feasible to monitor the conservation objectives of the Musquash Estuary MPA and AIA?

2. Are there any outstanding sources of uncertainty that might influence the selection or implementation of the proposed monitoring indicators, strategies, and protocols?

3. Are there any other considerations that should be taken into account in the development of the proposed monitoring framework for the Musquash Estuary MPA and AIA?

Outputs

CSAS Science Advisory Report
CSAS Proceedings
CSAS Research Document

Participation

DFO Science Branch
DFO Oceans, Habitat and Species at Risk Branch
DFO Fisheries and Aquaculture Management Branch
Parks Canada
Environment Canada
Universities

Canadiens. Par conséquent, le choix des indicateurs, stratégies et protocoles utilisés pour la collecte et l'analyse des données doit être défendable sur le plan scientifique.

Une réunion aura lieu dans le cadre du Processus de consultation scientifique de la Région des Maritimes afin d'examiner les indicateurs, stratégies et protocoles proposés pour la surveillance de la ZPM de l'estuaire de la Musquash et de la zone intertidale connexe administrée par le MPO.

Objectifs

Cette réunion a pour but de procéder à un examen scientifique par les pairs du projet de cadre de surveillance de la ZPM de l'estuaire de la Musquash et de la zone intertidale connexe administrée par le MPO. Il s'agira en particulier de répondre aux questions suivantes :

1. Les indicateurs, protocoles et stratégies proposés dans le cadre de surveillance sont-ils des moyens pertinents et pratiques de déterminer si les objectifs de conservation de la ZPM de l'estuaire de la Musquash et de la zone intertidale connexe administrée par le MPO seront atteints?

2. Y a-t-il des sources extérieures d'incertitude qui pourraient influer sur le choix ou la mise en œuvre des indicateurs, stratégies et protocoles de surveillance proposés?

3. Y a-t-il d'autres éléments qui devraient être pris en considération dans l'établissement du cadre proposé pour la surveillance de la ZPM de l'estuaire de la Musquash et de la zone intertidale connexe administrée par le MPO?

Produits

Avis scientifique du SCCS
Compte rendu du SCCS
Documents de recherche du SCCS

Participation

Direction des sciences du MPO
Direction des océans, de l'habitat et des espèces en péril du MPO
Direction de la gestion des pêches et de l'aquaculture du MPO
Parcs Canada
Environnement Canada
Universités

Non-Government Organizations	Organisations non gouvernementales
Industry	Industrie
New Brunswick Provincial Representatives	Représentants de la province du Nouveau-Brunswick
Aboriginal Communities / Organizations	Communautés ou organisations autochtones

APPENDIX 3. Meeting Agenda.

Review of the Draft Musquash Estuary Marine Protected Area (MPA) and Administered Intertidal Area (AIA) Monitoring Framework

Maritimes Region Science Advisory Process

St. Andrews, New Brunswick
Date: December 9-10, 2010

AGENDA

Day One:

10:30–11:00 Welcome and Introduction (E. Kennedy, Chairperson)

11:00–11:20 Overview of Musquash Estuary monitoring discussions to date (R. Singh)

11:30–12:30 Present draft Musquash Estuary Monitoring Framework document (A. Cooper)
- Introduction
- Musquash Estuary Ecosystem
- Managed Activities and Perceived Threats
- Conservation Objectives

Discussion

12:30–13:30 Lunch

13:30–15:00 Present draft Musquash Estuary Monitoring Framework document (cont'd)
- Indicators and Protocols

Discussion

15:00–15:15 Health Break

15:15–16:00 Strategies for Monitoring

Discussion

16:00 – 17:00 Review of the draft Science Advisory Report and Discussion

Day Two:

09:00–09:30 Review from the previous day (E. Kennedy)

09:30–10:30 Review of the draft Science Advisory Report and Discussion (cont'd)

10:30–10:45 Health Break

10:45–12:00 Review of the draft Science Advisory Report and Discussion (cont'd)