

# **Application of the Maritimes Ecosystem Based Management (EBM) Framework to an Oceans Act Marine Protected Area Case Study: St. Anns Bank Marine Protected Area**

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## ABSTRACT

Eger, S.L. and Bundy, A. 2024. Application of the Maritimes Ecosystem Based Management (EBM) Framework to an *Oceans Act* Marine Protected Area Case Study: St. Anns Bank Marine Protected Area. Can. Tech. Rep. Fish. Aquat. Sci. 3558: vii + 47 p.

The Maritimes Ecosystem Based Management (EBM) Framework offers a management and decision-support tool for consideration of a holistic suite of objectives across Ecological, Economic, Social/Cultural and Governance Pillars to better align with current overarching departmental priorities such as reconciliation, sustainable management, marine spatial planning and a blue economy. To demonstrate its utility in a practical DFO context, the EBM Framework was applied to the establishment of St. Anns Bank *Oceans Act* Marine Protected Area (MPA). Using qualitative and quantitative approaches, key documents were analysed to determine the degree to which the four Pillars of the EBM Framework and their Main Objectives were reflected in the St. Anns Bank MPA establishment process. The results showed that the degree to which the EBM Framework was aligned with the St. Anns Banks MPA establishment process varied across the four Pillars, and Main Objectives. Main Objectives from all four Pillars were reflected throughout all stages of MPA establishment, Ecological Pillar objectives were the most strongly reflected, and areas that were weakly reflected, included the Economic and Social/Culture Pillar objectives.

This exercise successfully tested the Maritimes EBM Framework and highlights the potential value of further applications of the EBM Framework, which could include application to other conservation-based case studies, departmental programs, and priority areas to aid the transition towards a more effective, holistic approach to coastal and marine governance and management.

## RÉSUMÉ

Eger, S.L. and Bundy, A. 2024. Application of the Maritimes Ecosystem Based Management (EBM) Framework to an *Oceans Act* Marine Protected Area Case Study: St. Anns Bank Marine Protected Area. Can. Tech. Rep. Fish. Aquat. Sci. 3558: vii + 47 p.

Le cadre de gestion écosystémique de la région des Maritimes (ci-après appelé « cadre de gestion ») est un outil d'aide à la prise de décisions permettant de tenir compte d'une série holistique d'objectifs liés aux piliers de l'écologie, de l'économie, de la société et culture, et de la gouvernance afin de mieux respecter les grandes priorités actuelles de Pêches et Océans Canada (MPO), comme la réconciliation, la gestion durable, la planification spatiale marine et l'économie bleue. Pour montrer l'utilité de ce cadre dans un contexte pratique lié au MPO, on l'a appliqué à l'établissement de la zone de protection marine (ZPM) du banc de Sainte-Anne en vertu de la *Loi sur les océans*. Au moyen d'approches qualitatives et quantitatives, on a analysé des documents clés pour déterminer dans quelle mesure les quatre piliers du cadre de gestion et les objectifs principaux connexes se sont traduits dans le processus d'établissement de la ZPM du banc de Sainte-Anne. Les résultats ont montré que lors de ce processus, le respect du cadre de gestion a varié en fonction des quatre piliers et des objectifs principaux. Les objectifs principaux des quatre piliers ont transparu à toutes les étapes du processus d'établissement de la ZPM, les objectifs du pilier de l'écologie sont ceux qui sont ressortis le plus; et les domaines qui ont été peu illustrés sont les objectifs des piliers de l'économie et de la société et culture.

Grâce à l'étude de cas réalisée, on a pu mettre à l'essai le cadre de gestion pour obtenir un aperçu de son utilisation et de son élaboration, et orienter ses futures applications liées à la conservation, programmes ministériels et secteurs prioritaires, en vue de faciliter la transition vers une approche holistique plus efficace en matière de gouvernance et de gestion des milieux côtiers et marins



## PREFACE

This report demonstrates a test case study of the Maritimes Ecosystem-based Management (EBM) Framework and builds off previous reports (Bundy et al., 2021; Daly et al., 2020).

## INTRODUCTION

Coastal and marine social-ecological systems have traditionally been governed and managed in siloes and the shortcomings of current governance and management have been widely reported, and accepted, in practice (Stephenson et al., 2018). Ecosystem-based management (EBM) is a well-accepted concept and approach to move towards holistic management (Link & Browman, 2017; Long et al., 2015). In Canada, Fisheries and Oceans Canada (DFO) has been slowly moving towards more holistic management across its Sectors through ecosystem-based principles, strategies and tools throughout the past decade (Curran et al., 2012). In support of this goal, DFO Maritimes Region has developed a draft Ecosystem Based Management (EBM) Framework to support DFO decision-making (Bundy, *In Prep*; Daly et al., 2020). It builds on an earlier DFO framework described in Curran et al. (2012) and further developed by Stephenson et al. (2020). Following Stephenson et al., (2020) it is organized across “the four pillars of sustainability”; Ecological, Economic, Social/Cultural and Governance (Bundy et al., 2021). The new draft EBM Framework has been developed and tailored for DFO use through a collaborative, interdisciplinary and intersectoral process. It is supported by Canadian Government policy, DFO policy and international commitments (Bundy et al., *in prep*). For example, the *Fisheries Act* (2019) and the *Oceans Act* (1997) both include reference to the application and/or basis of an ecosystem approach, inclusive of each of the four pillars, for maintaining biological diversity and productivity in the marine environment. Thus, the EBM Framework is based on national and international policies and will support decision-making across all DFO sectors within a consistent, structured framework to support transparent, evidence-based decision-making.

In addition to broad policy support for EBM, the relevance of an EBM approach is evidenced in recent Mandate Letters to the Minister of Fisheries, Oceans and the Canadian Coast Guard (Office of the Prime Minister of Canada, 2021a, 2021b), the subsequent DFO Departmental Plan 2022-2023 (Fisheries and Oceans Canada (DFO), 2022a), as well as in the Regional Areas of Focus for DFO Maritimes Region (Fisheries and Oceans Canada (DFO), 2022c). The EBM Framework offers a holistic, structured and practical way to address the growing need for an intersectoral, interdisciplinary approach to DFO’s mandate, policies and programs, including Integrated Fisheries Management Plans (IFMP), Ecosystem Approach to Fisheries Management (EAFM), marine spatial planning, the blue economy and marine conservation network planning.

As with any tool development process, a necessary step is to test the tool in a practical context, such has been done with an earlier version of this framework (e.g., Barnett, 2018; Jones & Stephenson, 2019; Parlee et al., 2021). This study tests the draft EBM Framework for the first time and applies it to the *Oceans Act* Marine Protected Area (MPA) establishment process. MPAs are an important tool that contributes towards EBM (Halpern et al., 2010; Eger et al., 2021). Further application of the EBM Framework will assist in determining its utility to map, measure and track which EBM objectives are practically considered across various DFO activities. The purpose of this work was to test the utility of the EBM Framework, to explore the

St. Anns Bank MPA establishment process through an EBM lens, to record lessons learned, and to further inform the development and future application of the EBM Framework.

The following report summarizes the approach taken as well as the results and insights gained from applying the EBM Framework to the St. Anns Bank MPA case study. First, the EBM Framework is briefly described, then Canada's *Oceans Act* MPA program and approach is presented, followed by the introduction of the St. Anns Bank MPA case study context. Next, the materials and methods section explain the mixed methods approach taken to apply and score the EBM Framework. The results section includes each of the qualitative and quantitative data and finally these results are discussed by presenting lessons for the Maritime EBM Framework as well as lessons from the analysis and insights for the St. Anns Bank MPA. The report concludes with a recommendation for future application of the EBM Framework including the next steps.

### Disclosure

This work is not an attempt to evaluate the success or effectiveness of a management activity, program, or intervention but is part of a process to explore potential utility of the EBM Framework across various case study and sectoral contexts as well as to gain insight on the breadth of possible application methods. The EBM Framework provides a lens to look at various initiatives to understand the suite of objectives that may or may not be relevant in different contexts and activities to expand understanding of and connections with holistic decision-making and management approaches such as EBM.

### DFO Maritimes EBM Framework

The EBM Framework reflects DFO's broad mandate to govern and manage Canadian coastal and marine social-ecological systems through an integrated and holistic approach. It is intended to support DFO decision-making across sectors by providing a broad range of objectives and indicators within a consistent, structured framework to support transparent, evidence-based decision-making. Objectives were developed from current DFO and Canadian policies, international commitments as well as from recent practical and academic guidance and trends.

The basic structure of the EBM Framework is outlined in Figure 1 and depicts the general hierarchy of the framework. It consists of four Pillars each with 3-4 Main Objectives. Moving to the right of Figure 1, these Main Objectives are unpacked into further sub-objectives to provide greater detail and specificity and to be actionable (not shown). In the full working version of the framework, specific objectives have been developed under each candidate objective in support of DFO's mandate to apply an ecosystem approach to oceans, estuarine, and freshwater management in the region. At the time of this analysis, these more detailed sub-objectives were still in development, therefore the 22.1. 2022 version of the framework was used, and was later updated with the January 9, 2023 version (9.1.23, Figure 1). This version of the framework is informed by DFO, Government of Canada and key international policies relating to Indigenous Peoples. Consideration and inclusion of regional Indigenous perspectives, values and knowledge is ongoing through a collaborative process is ongoing.

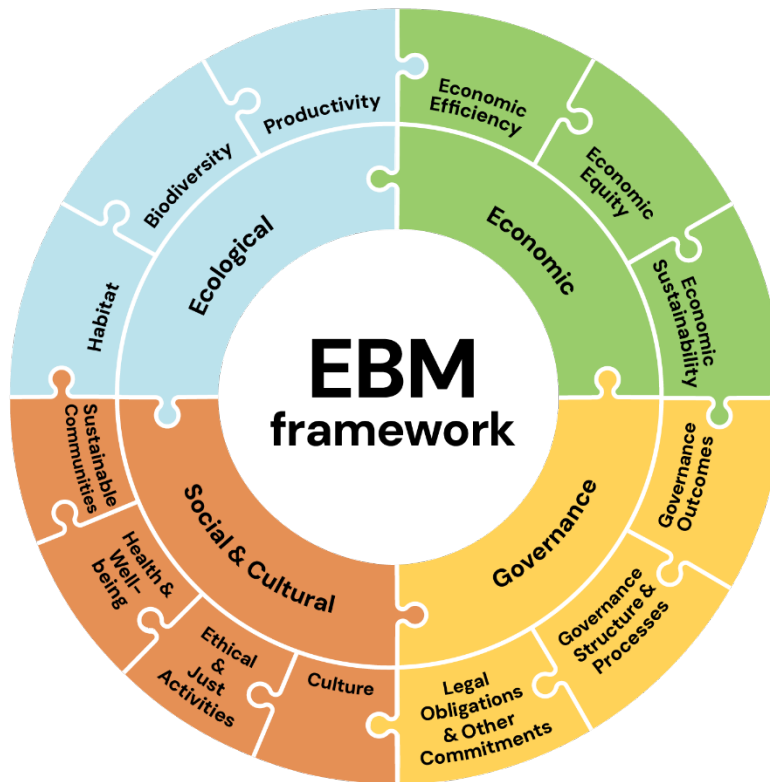


Figure 1 Structure of EBM Framework (Version 9.1.23)

The following potential practical applications of the EBM Framework have been identified: (Bundy et al., *in preparation*):

1. Checklist of objectives
2. Evaluating and implementing policies and management approaches
3. Scenario comparison
4. Management report card
5. Assessing cumulative effects and evaluate trade-offs

This analysis focusses on the second of these applications to evaluate, retrospectively, the extent to which the EBM Pillars and Main Objectives are reflected in the development of the St. Anns Bank MPA establishment process.

#### *Oceans Act* Marine Protected Areas Context

MPAs are used worldwide to achieve the long-term conservation of nature which requires the consideration of ecological objectives together with economic, social, cultural, and governance objectives. The Government of Canada (2011) acknowledges the definitions of MPAs to be that of the International Union for Conservation of Nature/ World Commission of Protected Areas

A clearly defined geographical space recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.

MPAs are the main tool that nations are using as they strive to increase protection of their coastal and marine waters to 30% by 2030 (United Nations Environment Program (UNEP), 2022). As of May 2023, 8.16% of the global ocean is protected by MPAs, with 14.66% of Canadian waters being protected (DFO, 2023a; Protected Planet, 2023). These conservation targets are a part of the overarching strategic conservation and sustainable development objectives along with integrated management and marine spatial planning (Government of Canada, 2011).

As the Government of Canada continues to expand its conservation network to protect oceans for present and future generations MPAs are used among a variety of conservation tools (Government of Canada, 2019). For example, the Canadian network of MPAs encompasses strategically linked MPAs (including National Marine Conservation Areas created by Parks Canada, marine National Wildlife Areas created by Environment and Climate Change Canada, and *Oceans Act* MPAs created by DFO) as well as Other Effective Area-based Conservation Measures (OECMs), and other spatial conservation tools (e.g., marine refuges, species at risk critical habitat, marine mammal management areas, etc.) with the primary goal of conserving nature (Government of Canada, 2011a). These geographically defined areas aim to conserve marine biodiversity, ecosystem function and preserve natural features that often correspond to important life history phases of species such as breeding, nursing and feeding grounds as well as for connectivity between the sites while other activities can continue to occur around (Government of Canada, 2022b).

In Canada, *Oceans Act* MPAs are a legal tool for preserving and protecting ocean health as well as advancing an integrated management approach which is closely aligned with EBM (Fisheries and Oceans Canada (DFO), 2021). Other pieces of legislation such as the *Fisheries Act* (1985) and *Species At Risk Act* (SARA) (2002) contribute towards the broader conservation of aquatic species. However, the legislative authority for *Oceans Act* MPAs that directs their objectives and desired outcomes are designed primarily for ecological conservation (Government of Canada, 1996, sec. 35.1). An *Oceans Act* MPA “is an area of the sea that forms part of the internal waters of Canada, the territorial sea of Canada or the exclusive economic zone of Canada” (1996, s.35.1) and has been established to conserve and protect one or more of the following:

- commercial and non-commercial fishery resources, including marine mammals and their habitats;
- endangered or threatened marine species and their habitats;
- unique habitats;

- marine areas of high biodiversity or biological productivity;
- any other marine resource or habitat as is necessary to fulfil the mandate of the Minister of Fisheries and Oceans; and
- marine areas for the purpose of maintaining ecological integrity.

In addition to the core purpose outlined in S. 35, all Oceans Act MPAs also have overarching conservation objectives that guide the entire MPA establishment and management process and are developed through engagement with relevant rightsholders and stakeholders. These conservation objectives tend to not be included in the regulations, but rather identified and elaborated on in the RIAS (Regulatory Impact Analysis Statement) and further unpacked in the management plans. From a practitioner perspective, the history of the *Oceans Act* MPA establishment process has been iterative and led to many resources and guidelines over the years (Table 1).

*Table 1 Various iterations of Oceans Act MPA Guidance Resources (From 1999-2017)*

<b>Resource</b>	<b>Year</b>	<b>Contribution/ Scope</b>
<i>Marine Protected Area Policy</i>	(1999a)	<ul style="list-style-type: none"> <li>• Provides general program overview, objectives and goals.</li> </ul>
<i>National Framework for Establishing and Managing Marine Protected Areas</i>	(1999b)	<ul style="list-style-type: none"> <li>• Presents the general approach to establishing and managing <i>Oceans Act</i> MPAs across Canada</li> <li>• To be implemented at the regional level</li> </ul>
<i>Oceans Act Marine Protected Areas Policy and Operational Framework A Practitioner's Guide (Version 1)</i>	(2009)	<ul style="list-style-type: none"> <li>• Primarily intended as an internal working document for DFO practitioners and guided by initial MPA work</li> <li>• Replaces previous MPA program policies, directives and procedural documents</li> <li>• A living document that will be updated regularly to incorporate any policy and legislative revisions to the MPA Program</li> <li>• At the time, an integrated EBM approach was being taken in 5 LOMAS (Large Ocean Management Areas)</li> </ul>
<i>Framework for integrating socio-economic analysis in the Marine Protected Areas designation process.</i>	(2016)	<ul style="list-style-type: none"> <li>• National guidance for assessing the socio-economic impact of designating <i>Oceans Act</i> MPA</li> <li>• Based on 2009 document</li> <li>• Incorporates regional experiences</li> <li>• Adheres to basic principles of cost-benefit analysis (CBA)</li> </ul>
<i>Guidance on incorporating economic use information into marine protected area network design.</i>	(2017a)	<ul style="list-style-type: none"> <li>• Guidance on incorporating socio-economic data from EAS (Economics, Analysis and Statistics)</li> <li>• Developed for regional practitioners working on bioregional MPA development (not an intended public document)</li> <li>• Flexible enough to be used across bioregions and to provide a basis for national consistency</li> <li>• Provides insights into various types of analyses</li> </ul>

DFO has a stepwise process that guides *Oceans Act* MPA establishment (Fisheries and Oceans Canada (DFO), 2022b). In general, the process for establishing *Oceans Act* MPAs can take many years, and includes the following steps:

- Step 1: Pre-planning- Begins with the identification of ecologically significant species and community properties (ESS-CP) (DFO, 2009). When an area is under consideration for long-term protection under the *Oceans Act*, it is referred to as an Area of Interest (AOI). AOIs are geographically defined areas that are selected through a regional network planning effort (Fisheries and Oceans Canada (DFO), 2022b).
- Step 2: Feasibility Assessment and Policy Development- Once an AOI is selected, the next step is to collect and synthesize ecological, social, cultural and economic information into an overview for the selected AOI. For example, biophysical and ecological overviews, traditional use studies, and socio- economic assessments (as needed), among others are completed. An advisory committee was also established.
- Step 3: Regulatory Development - The outputs in Step 2 are used in the development of the Regulatory Impact Analysis Statement (RIAS). In addition, further inter-sectoral collaboration occurs once each of the sectors has provided information/ documents leading into the RIAS (Step 3).
- Step 4: MPA Management - This includes adjusting the Advisory committee as necessary and creating monitoring and management plans.
- Step 5: Continuous Ongoing and Adaptive Management – This involves monitoring, evaluation and iterative edits to the management plan after an agreed number of years, often 5-10 years, or as needed depending on changing site-specific circumstances (Fisheries and Oceans Canada (DFO), 2021). There is an opportunity to understand how holistic MPA objectives are as relative to the draft EBM Framework. Currently, the St. Anns Bank MPA management plan is under development and provides an appropriate selection as a case study to investigate the utility of the EBM Framework within a DFO relevant context.

**Figure 2: Interdisciplinary Bridging**

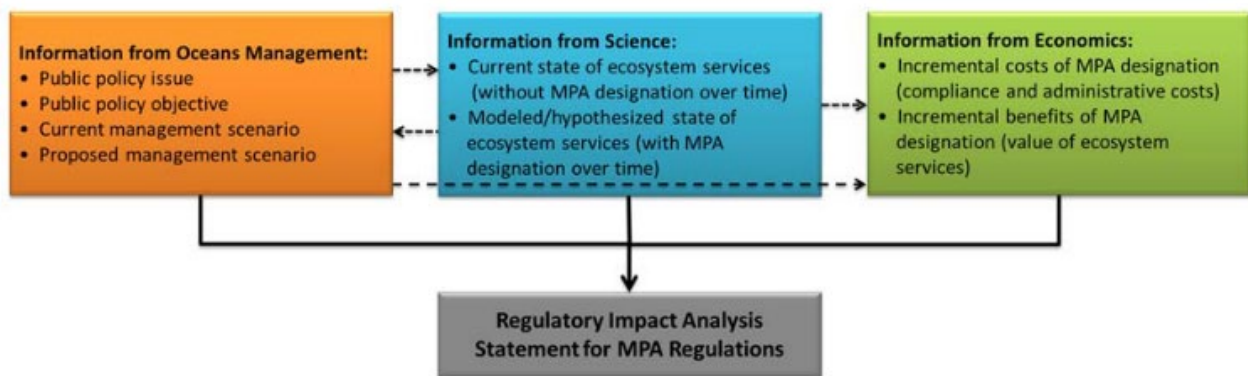


Figure 2 Interdisciplinary bridging in the *Oceans Act* MPA Establishment process (Fisheries and Oceans Canada (DFO), 2016)

## The St. Anns Bank Case Study

The St. Anns Bank MPA was selected as a case study for the following reasons:

- The St. Anns Bank team was preparing the management plan which afforded an opportunity for feedback;
- The St. Anns Bank team was supportive of the exercise and available to engage as needed; and,
- The St. Anns Bank Management Plan (i.e., the initial draft and subsequent updated versions) and other documents in earlier steps of the *Oceans Act* MPA establishment process were made available.

### *St. Anns Bank MPA*

Following public consultation in 2009-2010, St. Anns Bank was identified through a regional planning effort to address bioregional conservation objectives. In June 2011, St. Anns Bank was announced as an Area of Interest (AOI) and on June 14, 2017 it was established as an MPA under the *Oceans Act* to provide long-term comprehensive protection of biodiversity, including endangered and threatened species. The diversity of species, unique habitats and important systems are of significant importance to local, including Mi'kmaq, communities for sustenance, livelihood, and spiritual reasons. The primary activities that occur in the St. Anns Bank MPA are marine transportation, research surveys and both commercial and non-commercial fisheries (Fisheries and Oceans Canada (DFO), 2017b). St. Anns Bank is the first MPA in the Maritimes Region that undertook a Traditional Use Study, a process which then evolved into what is now the Mi'kmaq Ecological Knowledge Study Protocol (MEKS) (Kwilmu'kw Maw-klusuaqn Negotiation Office, 2007).

St. Anns Bank is located off the east coast of Cape Breton, Nova Scotia, also known as Unama'ki, the unceded ancestral territory of the Mi'kmaq. St. Anns Bank extends from the “inner continental shelf to the outer slope of the Laurentian Channel” covering 4,364 km<sup>2</sup> of Northwest Atlantic waters or 0.08% of Canada's oceans (Fisheries and Oceans Canada, 2017, p. 4; Figure 3). Scatarie Bank is included in St. Anns Bank MPA which is a prominent geomorphic feature with a shallow volcanic ridge with strong tidal currents. Governance and management activities in the MPA are currently led by DFO in partnership with various groups including St. Anns Bank Advisory Committee and Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO). Some traditional and commercial activities were deemed to be compatible with the conservation objectives of the MPA and are permitted to continue in some zones of the MPA (Fisheries and Oceans Canada (DFO), 2017b). Conservation objectives are stated as follows (Fisheries and Oceans Canada (DFO), 2017b, pp. 1211–1212):

1. *“Conserve and protect all major benthic demersal (i.e., close to the sea floor) and pelagic (i.e., in the water column) habitats within the St. Anns Bank MPA, along with their associated physical, chemical, geological and biological properties and processes*
2. *Conserve and protect areas of high biodiversity at the community, species, population and genetic levels within the St. Anns Bank MPA, including priority species and their*



habitats (including leatherback turtle, Atlantic wolffish, Atlantic cod and American plaice.

3. Conserve and protect biological productivity across all trophic levels so that they are able to fulfill their ecological role in the ecosystems of the St. Anns Bank MPA.”

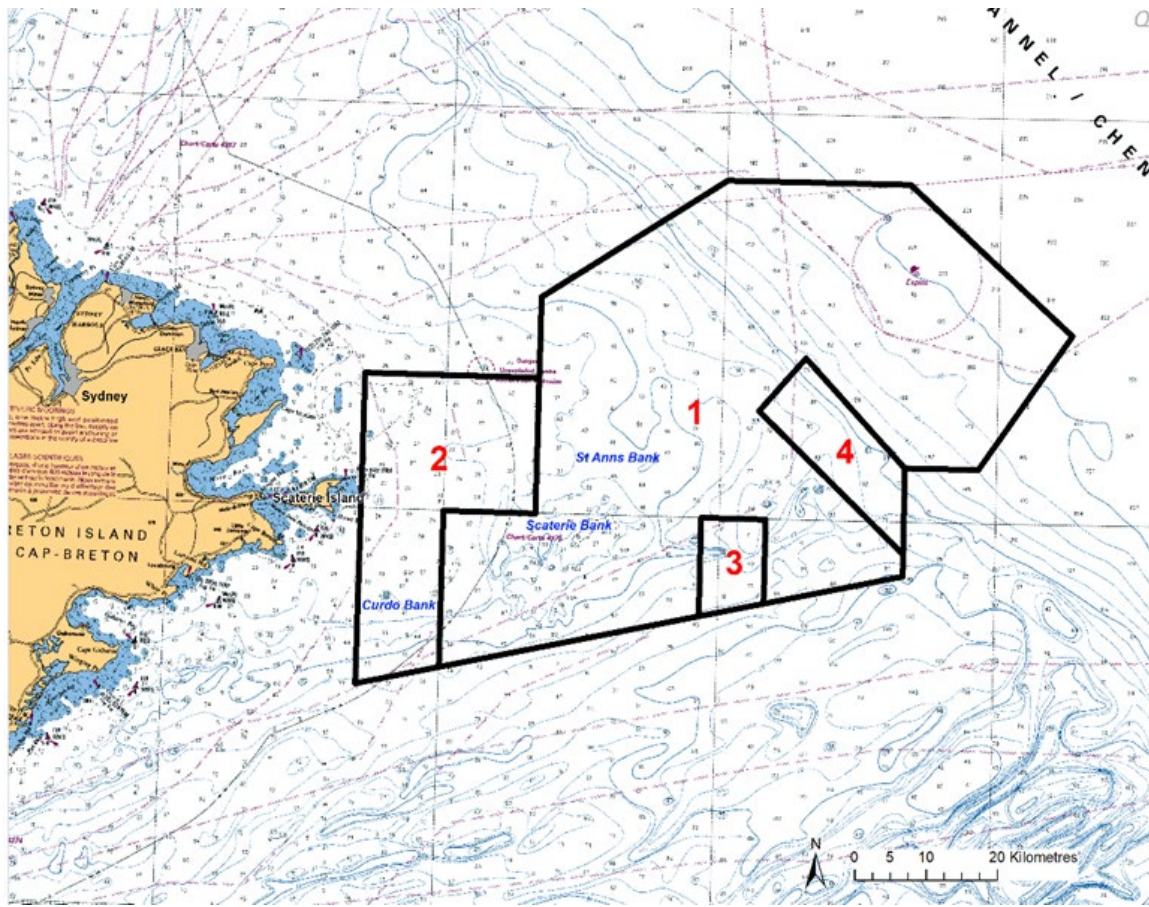


Figure 3 St. Anns Bank MPA boundaries (Fisheries and Oceans Canada (DFO), 2017b)

## MATERIALS AND METHODS

### Materials

This exercise was specifically interested in the degree to which the EBM Framework Objectives are reflected, or included, into the establishment and management of St. Anns Bank MPA. To assess the degree to which the St. Anns Bank MPA Case Study includes the four pillars and objectives of the EBM Framework, the Framework was retroactively applied across key materials. Two separate analyses were conducted (Figure 4), analysis 1 focused on documents created during Steps 1-3 of the MPA establishment process and are referred to as “Pre-plan documents”. Analysis 2 focused on the Management Plan that was being prepared as a part of

Step 4 and included relevant sections that explicitly referred to MPA objectives. These “Plan Sections” included relevant sections of the management plan relating to objectives. Therefore, only Section 2 of the plan was included in this analysis as: 1) the general interest was on the explicitly stated objectives in the MPA management plan and 2) the St. Anns Bank Team was still making edits to the plan and content in Section 2 was not anticipated to change.

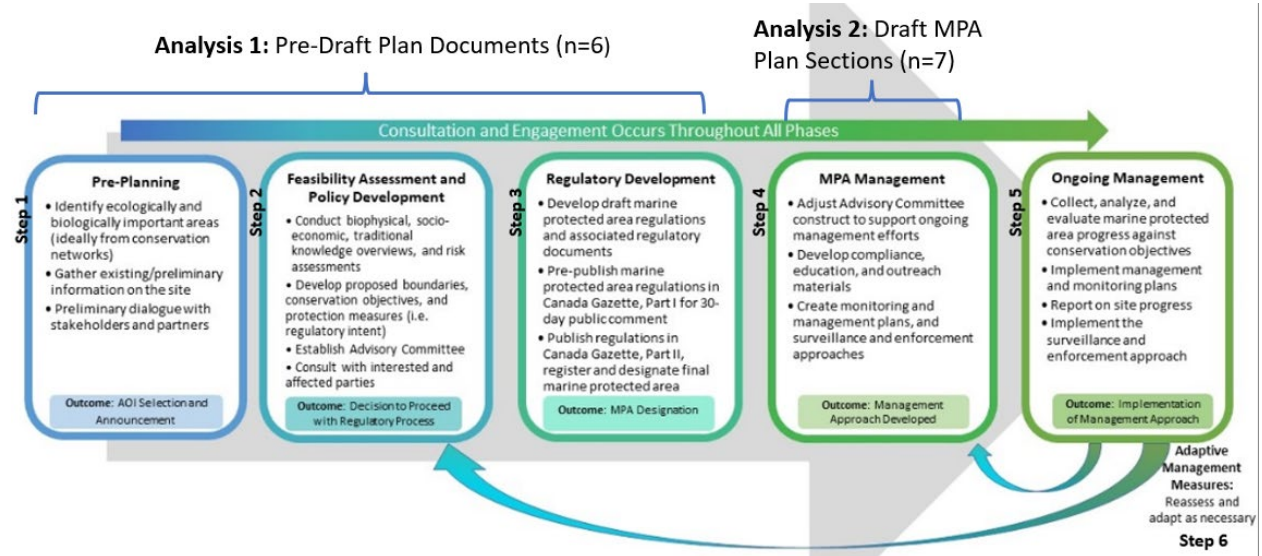


Figure 4 Analysis as per the Oceans Act MPA establishment process (Adapted from DFO, 2022a)

Seven key documents relating to the St. Anns Bank MPA establishment process were selected and provided by the DFO Maritimes Marine Planning and Conservation team to support this work (Table 2). Due to the scope of the work and time constraints, other related materials that emerged throughout the analysis were not included. Data for analysis 1, the pre-plan analysis, included information from six documents produced between 2012-2017 and analysis 2 included sections relating to objectives from the recent St. Anns MPA management plan.

Table 2 St Anns Bank MPA documents used for Analyses 1 and 2

Analysis	Short Reference	Document Reference
Analysis 1	Squires, 2012	Squires, K. 2012. Extent and Importance of Commercial Fishing Activity in the vicinity of St Anns Bank Area of Interest (AOI), as described by selected traditional sources. Oceans Section, DFO
	DFO, 2012a	DFO. 2012a. Conservation priorities, objectives, and ecosystem assessment approach for the St. Anns bank area of interest (AOI). CSAS advisory report
	DFO, 2012b	DFO. 2012b. Overview of fishing Activities in the St. Anns Bank Area of Interest, CSAS, Policy and Economics Branch.
	UINR and Membertou Geomatic Solutions, 2013	Unama’ki Institute of Natural Resources (UINR) and Membertou Geomatic Solutions. 2013. Mi’kmaq Traditional use study St. Anns Bank Area of Interest

Table 2 *Continued*

Analysis	Short Reference	Document Reference
Analysis 1	Kennington, 2014	Gadus Associates (Kennington). 2014. A monitoring framework for the St. Anns Bank Area of Interest. CSAS Maritimes
	DFO, 2017b	DFO. 2017. Regulatory Impact Analysis Statement. Canada Gazette Part II, Vol. 151, No. 12
Analysis 2	DFO, 2023	DFO. 2023. St. Anns Bank Marine Protected Area Management Plan (Version 1.2023; <i>in prep</i> )  Sections: <ul style="list-style-type: none"> <li>2.1 Vision</li> <li>2.2 Mi’kmaq Guiding Principles</li> <li>2.3 MPA Guiding Principles</li> <li>2.4 MPA Goals</li> <li>2.5 Conservation Objectives</li> <li>2.6 Management and Stewardship Objectives</li> <li>2.7 Research and Monitoring Objectives</li> </ul>

## Methods

A mixed methods approach using both qualitative content analysis and quantitative content analysis was used to apply and analyse the EBM Framework to the St. Anns Bank case study. Qualitative content analysis is a systematic and objective observational research method commonly used to make inferences from data to their context that are valid and replicable (Krippendorff, 1980; Neuendorf, 2002). This approach is beneficial when using and testing conceptual models and frameworks in new contexts (Kyngäs & Kaakinen, 2020). Here, qualitative content analysis was first used deductively to explore patterns of qualitative data used, or not used, relating to each of the four Pillars and Main Objectives of the EBM Framework (Figure 1). Quantitative content analysis is a systematic way to quantify content, in this case qualitative data (i.e., text passages) (Huxley, 2020). Each coded text passage was given a numerical score and contribute to average calculations for an overall EBM score to show the degree of inclusion of the Framework in the St. Anns Bank MPA documents. Qualitative

### Qualitative Content Analysis

The St. Anns Bank MPA documents were analysed deductively using the current EBM Framework (Pillars and Main Objectives) to organize, understand and describe qualitative data into categories or sub themes of interest (Marshall and Rossman, 1995; Lyles and Stevens, 2014). The following steps were followed to apply the EBM Framework to the St. Anns Bank case study. First, each of the St. Anns Bank MPA process documents (Table 3) were reviewed to determine their relevance to the scope and purpose of the EBM Framework pillars and objectives. The abstract, introduction and/or purpose statement, as appropriate, of each document were reviewed to determine whether it was reasonable to consider various aspects

of the EBM Framework as part of the scope of the document. Each pillar and/or objective within the EBM Framework was noted as relevant or not, if they were found to be relevant then they were assessed (Appendix 1). Documents and/or sections that were not relevant were noted and did not contribute towards overall score calculations. For example, in analysis 2, *Management and Stewardship Objectives* (Fisheries and Oceans Canada (DFO), 2023b) were scoped to include governance elements and considerations. Therefore, it was noted that this section was not relevant to the Ecological, Economic or Social/Cultural Pillar objectives as it was not expected that those objectives would be included in this section of the document.

Next, text passages from the six documents (analysis 1) and 7 sections of the St. Anns Bank MPA management plan (analysis 2) were sorted using the pre-determined codes or categories which in this case were the two top hierarchies of the EBM Framework, i.e., the four Pillars and their Main Objectives (Table 3). Relevant text passages were copied, pasted and organized in a series of Excel spreadsheets structured by the EBM Framework as a record and in preparation for scoring.

*Table 3 EBM Framework used to structure the deductive analysis (Version 9.1.2023)*

<b>Pillar</b>	<b>Main Objective</b>	<b>Description</b>
<b>Ecological</b>	<b>A. Productivity</b>	Productivity is conserved, protected, maintained, and restored so that components can play their role in the functioning of aquatic ecosystems.
	<b>B. Biodiversity</b>	Biodiversity is conserved, maintained, and restored to preserve the structure and natural resilience of aquatic ecosystems.
	<b>C. Habitat</b>	Habitat and habitat features, including the chemical biological, physical, ecological integrity of aquatic ecosystems, are conserved, protected, maintained, and restored.
<b>Economics</b>	<b>A. Economic Efficiency</b>	Aquatic activities and resources are governed and managed to enhance economic output and benefit for all users
	<b>B. Economic Sustainability</b>	Aquatic activities and resources are governed and managed to foster long term, viable, prosperous and sustainable livelihoods for all users and uses
	<b>C. Economic Equity</b>	Aquatic activities and resources are governed and managed to promote an equitable distribution of opportunities across all users and uses (or activities)
<b>Social/Cultural</b>	<b>A. Sustainable Communities</b>	Thriving communities are supported over the long term through the governance and management of aquatic activities.
	<b>B. Health and Wellbeing</b>	The health and well-being of individuals, households and communities are fostered through the governance and management of aquatic activities

Table 3 *Continued*

Pillar	Main Objective	Description
Social/Cultural	<b>C. Ethical &amp; Just Activities</b>	Historic inequities and injustices are acknowledged, and all aquatic activities are undertaken in a respectful, ethical and just manner, including the consideration of Reconciliation with Indigenous Peoples and Gender Based Analysis (GBA) +
	<b>D. Culture</b>	Significant, diverse, historical and living aspects of heritage and culture, related to aquatic systems are recognised and considered in governance and management.
Governance	<b>A. Legal Obligations and Other Commitments</b>	Legal obligations and other commitments related to aquatic systems, including to Indigenous Peoples, are recognised and implemented in governance and management
	<b>B. Governance Structures and Processes</b>	Appropriate governance structures are in place to enable effective decision making
	<b>C. Governance Outcomes</b>	Key governance principles guide evidence informed decisions and result in the effective and sustainable management of aquatic ecosystems

#### Quantitative Content Analysis

After text passages were coded and organized, a pre-defined scale was used to assign numeric codes to more easily assess patterns with averages and to communicate results (Table 4). These scores indicate whether and to what degree, a particular unit of analysis (i.e., document or document section) reflected the EBM Framework objectives. Quantitative coding of qualitative data enables consistency, avoids bias/subjectivity of the coder, improves comparability, and allows for more direct interpretation (Coe & Scacco, 2017). A four-point Likert-type scale was considered appropriate as there was no need for a neutral response option. The resulting numerical score offers an entry point that indicates where to focus further investigation and does not intend to assume that a score of three is necessarily the desired or appropriate score in the *Oceans Act* MPA context.

Table 4 *Likert scale criteria to quantify the inclusion of EBM Framework objectives from qualitative data*

Score	Description
X	<b>Not relevant/ applicable</b> - dependent on context, case study, purview, department, jurisdiction, etc.

Table 4 *Continued*

Score	Description
0	<b>No mention</b> - the objective of the EBM Framework is not present within this unit of analysis
1	<b>Implicit content mention</b> - the phrase/terms used in the unit of analysis generally or vaguely aligns with, or alludes to the intended meaning in the EBM Framework (e.g., high-level concepts)
2	<b>Explicit content mention</b> - the phrase/ terms used in the unit of analysis has a different meaning than that intended in the EBM Framework
3	<b>Content and context alignment</b> - the phrase/terms used in the unit of analysis explicitly states the intended content as well as matches the context of the EBM Framework objectives)

Coding was conducted by the primary author, with subsequent consultation with a project advisory team (see below in Feedback Mechanisms). The scores were attributed based on the information present, not the quality or degree to which information was collected, considered or utilized. Simply put, the score reflects if there was record of conversation, thought, data collection, etc. of a particular EBM objective within a unit of analysis (i.e., documents and sections). An X was recorded, and no score was given to a passage that was not relevant or applicable to a given unit of analysis (Table 5). If there was no mention nor evidence of the EBM objective in a relevant document or objective statement, then a score of 0 was given. In the case where there was implicit content mention including phrases or terms alluding to what the general meaning was in the Framework then a score of 1 was given. A score of 2 was given if there was explicit mention of content from the EBM Framework, for example if the meaning or intent wasn't exactly the same or was slightly different. A score of 3 was recorded when the coded passage explicitly included both content and context of the EBM Framework objectives. For example, the following text passage received a score of 3 as the content significantly overlapped with Ecological Pillar C. Habitat Main Objectives: “many ecologically and biologically significant features including unique habitats, areas of high biodiversity, both endangered and threatened species and their habitats” (Analysis 1, DFO, 2017, pp.1206).

In the case that subsequent passages were added from the same document/section to the EBM objective, then a decision was taken whether the added text passage/data indicated a higher degree of context or content. Therefore, the maximum score found was used. Periodically during the content analysis and coding, decisions were reviewed with a small advisory group to achieve a common understanding and agreement. This practice assisted in reducing subjectivity as well as avoiding unintentional bias of the primary coder.

*EBM score calculation*

An average EBM score was calculated to provide an overall assessment of the degree to which the St Anns Bank establishment process reflects the EBM Framework. The EBM score was calculated as a simple average of the scores of the 6 documents examined in analysis 1 and the 7 sections of the management plan in analysis 2 for each Pillar and Main Objective, and for Analyses 1 and 2 (Table 5). Note that if an objective was not considered relevant (i.e., marked with an X, Table 4) it was not included in the calculation of the average EBM score.

EBM scores provide an additional perspective to interpret the results as well as provide an overall understanding of potential trends and patterns across the EBM Framework within each analysis (Table 5). A comparison of these scores between each of the two analyses stimulates further research questions, for example, which documents and sections of the EBM Framework objectives were weakly or strongly reflected? In addition to an EBM score, the minimum and maximum scores were also recorded to note the range of variation within each unit of analysis (i.e., documents in analysis 1 and sections in analysis 2), to highlight the prevalence or trends of scores. Similarly, if there was a particularly interesting result or pattern that emerged, further investigation into the qualitative data was performed by reading back the phrases and codes/ evidence for further context and detail.

*Table 5 Demonstration of how average EBM scores were calculated*

Pillar		Ecological			Economic			Social/Cultural			Governance			Total EBM Value (Per Analysis)	Legend
Main Objectives		A. Productivity	B. Biodiversity	C. Habitat	A. Economic Prosperity	B. Economic Sustainability	C. Economic Equity	A. Sustainable Communities	B. Health and Wellbeing	C. Ethical and Just Activities	D. Culture	A. Legal Obligations and Other Commitments	B. Governance Structure and Processes		
Analysis 1 (Pre-Draft Plan, 2012-2017)	Main Objective Average	2.7	2.7	3	1.3	1.2	1.5	1.3	0.8	0.2	1	0.8	1.8	1.2	1.5
	Pillar Average	2.8			1.3			0.8			1.3			1.6	
Analysis 2 (Draft Plan 2.1-2.7, 2017-2022)	Main Objective Average	1.9	2	2	0.3	0.3	0.3	0.5	0.5	0	1	1.2	2	1.2	1
	Pillar Average	2			0.3			0.5			1.5			1.1	

Analysis 1 – EBM value for Ecological Primary Objective A.: Average

Analysis 1 – EBM value for Ecological Pillar : Average of Ecological Primary Objective scores for A, B, C

Analysis 1 EBM Value: Average across all pillar/ objective scores

EBM Score (range)	Degree of inclusion of Maritimes EBM Framework
X	Not relevant/ applicable
0	Absent
0.1-1.0	Weak
1.1-2.0	Partial, Moderate
2.1-3.0	Complete, Strong

**Feedback Mechanisms**

In parallel to content analysis and scoring, iterative discussions with colleagues from multiple DFO sectors including Science, Ecosystems and Oceans Management (now Marine Planning and

Conservation), as well as with other social scientists within the department, informed the development and guided the focus of this work. A small group of individuals working on the EBM Framework served as an advisory team who supported and validated coding choices throughout the analysis. Additionally, key individuals from the St. Anns Bank MPA team were also involved throughout this work to ensure an accurate understanding of the *Oceans Act* MPA establishment process and the context within which the materials included in the analysis were created. These feedback mechanisms helped to ensure the legitimacy and accuracy of decisions taken as well as to understand the range of potential uses/ benefits of the framework in the MPA context. Additionally, these communications supplemented information included in *Oceans Act* MPA relevant documents (Table 1) to better understand the overall process of *Oceans Act* MPA establishment and information about St. Anns Bank MPA from those who were involved.

## RESULTS

### Overall Results

The average EBM scores varied from 0 to 3 across the EBM Pillars and Main Objectives, and between analysis 1 and 2. Table 6 shows the range of scores across the documents for each analysis. Highest scores were recorded for the Ecological Pillar in both analysis 1 and 2 (Pillar averages = 2.8 and 2.0 respectively), and lowest scores for the Economic and Social/Cultural Pillars (Pillar averages = 0.3 and 0.5 respectively) in analysis 2. Analysis 1 had an overall EBM score of 1.6 while analysis 2 had an overall EBM score of 1.1. The more detailed scores on which these averages are based, i.e., the scores for each document analysed, are provided in Appendix 2 (analysis 1) and Appendix 3 (analysis 2).

Table 6 Summary of Analyses including Total EBM Score

Pillar		Ecological			Economic			Social/Cultural				Governance			Total EBM Score
Main Objectives		A. Productivity	B. Biodiversity	C. Habitat	A. Economic Prosperity	B. Economic Sustainability	C. Economic Equity	A. Sustainable Communities	B. Health and Wellbeing	C. Ethical and Just Activities	D. Culture	A. Legal Obligations and Other Commitments	B. Governance Structure and Processes	C. Governance Outcomes	
Analysis 1 (Pre-Draft Plan, 2012-2017)	Main Objective Average	2.7	2.7	3	1.3	1.2	1.5	1.3	0.8	0.2	1	0.8	1.8	1.2	1.5
	Pillar Average	2.8			1.3			0.8				1.3			1.6
Analysis 2 (Draft Plan 2.1-2.7, 2017-2022)	Main Objective Average	1.9	2	2	0.3	0.3	0.3	0.5	0.5	0	1	1.2	2	1.2	1
	Pillar Average	2			0.3			0.5				1.5			1.1



The most strongly reflected Main Objectives was *C. Habitat* (EBM score = 3) within the Ecological pillar in analysis 1 and *B. Biodiversity and C. Habitat* again within the *Ecological Pillar* and *C. Governance Outcomes* within the *Governance Pillar* in analysis 2, all with an EBM score of 2. Main Objectives that were weakly included were *C. Ethical and Just Activities* under the *Social/Cultural Pillar*, which scored a 0.2 for analysis 1 and was absent in analysis 2. Figure 5 shows EBM scores for Main Objectives in a box and whisker plot across each analysis.

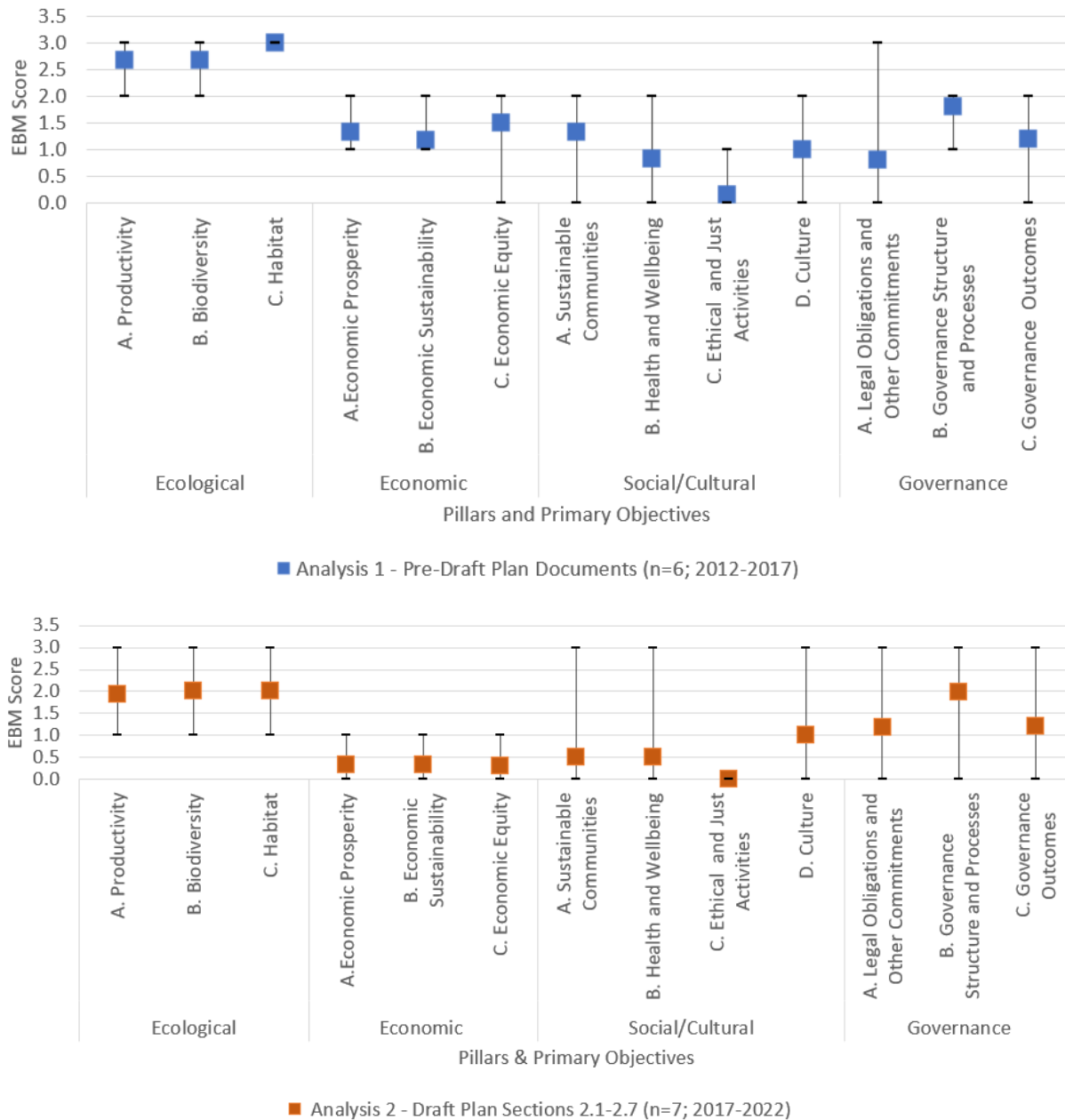


Figure 5 Box and whisker plot showing the range of raw EBM Scores for the Main Objective in Analyses 1 and 2 (Top/Blue: Analysis 1; Bottom/ Orange: Analysis 2)

## Results for Each Pillar

The results for each Pillar, based on the average EBM scores are presented below. Illustrative quotations with associated scores are provided as examples of content across analysis 1 and 2.

### Ecological

Analysis 1 resulted in high scores for each of the Main Objectives, with a high of 3 for *C. Habitat* and an average of 2.8 across the Ecological pillar. While analysis 1 included 6 documents, not all documents scored equally: two documents had high scores (DFO, 2012a, Kenchington, 2014, Table 2) and DFO (2017b) had the lowest score. The other three documents (Fisheries and Oceans Canada (DFO), 2012b; Squires, 2012; Unama'ki Institute of Natural Resources & Membertou Geomatics Solutions, 2013) were deemed irrelevant for ecological objectives. It was observed that the elements directly from the regulatory rationale in the *Oceans Act* (1997, S. 35.1) were referred to in a number of the documents from analysis 1 that informed the management plan including the RIAS (DFO, 2017b). These objectives were also explicitly stated verbatim, or very similarly, in analysis 2 (Fisheries and Oceans Canada (DFO), 2023b). In some cases (e.g., DFO, 2012a; Kenchington, 2014) these objectives received a high score, but were among only a few passages throughout the document that related to Main Objectives in the Ecological Pillar.

Analysis 2 showed that many sections of the St. Anns Bank Management Plan (2023) had a moderate to high mention of ecological objectives, especially in the sections *MPA Goals* and *Conservation Objectives* (Fisheries and Oceans Canada (DFO), 2023b). For example, multiple main EBM Framework Ecological Objectives were reflected in the following St. Anns Bank *MPA Goals* section: 'To conserve living marine resources in the MPA and ensure that any use of those resources is ecologically sustainable' and 'To help maintain ecosystem health and resilience, and support the ecologically sustainable use of living marine resources beyond the boundaries of the St. Anns Bank MPA' (Fisheries and Oceans Canada (DFO), 2023b, p. 21).

As it relates to Ecological Objectives, many of the plan sections included objectives, concepts and principles that were general, vague and often had implicit meaning. For example in the *Vision* section, 'Protect the marine ecosystem of St. Anns Bank for future generations', and 'Monitor the impacts of a changing climate in the MPA and determine how it contributes to resiliency in the face of anthropogenic pressures' (Fisheries and Oceans Canada (DFO), 2023b, p. 18). One section of the St. Anns Bank MPA management plan, *2.6 Management and stewardship objectives* (Fisheries and Oceans Canada (DFO), 2023b), was considered irrelevant for ecological objectives. See Table 7 for more examples of quotations.

Table 7 Illustrative quotations and scoring examples from the Ecological Pillar

Pillar	Ecological		
Main Objective	A. Productivity	B. Biodiversity	C. Habitat
Analysis 1 (Pre- Plan, 2012-2017)	Score = 3: "Conserve, protect and, where appropriate, enhance the productivity of the ecosystems in the St. Anns Bank MPA across all trophic levels, including the key trophic groups and the services they provide, so that they are able to fulfil their ecological role within the ecosystem" (Kenchington, 2014, p. 5)	Score = 2: "increase knowledge of the biodiversity or the bio-logical productivity of the Marine Protected Area or the habitat of any living marine organism in the Marine Protected Area, or..."(Fisheries and Oceans Canada (DFO), 2017b, p. 1216)  Score = 3: "Conservation priorities, including representative, important, and sensitive habitats or features; biodiversity hotspots; depleted species; and important functional groups were identified for the St Anns Bank Area of Interest" (Fisheries and Oceans Canada (DFO), 2012a, p. 2)	(Fisheries and Oceans Canada (DFO), 2012a, p. 8)  Score = 3: "Conserve and protect: All major benthic, demersal (i.e., close to the sea floor) and pelagic (i.e., in the water column) habitats within the St. Anns Bank MPA, along with their associated physical, chemical, geological and biological properties and processes; distinctive physical features and their associated ecological characteristics; and the structural habitat provided by sea pen and sponge concentrations" (Fisheries and Oceans Canada (DFO), 2017b, pp. 1211–1212)
Analysis 2 (Plan Sections 2.1-2.7, 2017-2022)	Score = 3: "Conserve and protect biological productivity across all trophic levels so that they are able to fulfill their ecological role in the ecosystems of the MPA" (Fisheries and Oceans Canada (DFO), 2023b, p. 21)	Score = 3: Conserve and protect marine areas of high biodiversity at the community, species, population and genetic levels within the MPA, including: Priority species and their habitats (including leatherback turtle, Atlantic wolffish, Atlantic cod, and American plaice) (Fisheries and Oceans Canada (DFO), 2023b, p. 21)	Score = 3: "Conserve and protect: All major benthic, demersal (i.e., close to the sea floor) and pelagic (i.e., in the water column); Distinctive physical features and their associated ecological characteristics; and properties and processes; habitats within the MPA, along with their associated physical, chemical, geological and biological; The structural habitat provided by sea pen and sponge concentrations" (Fisheries and Oceans Canada (DFO), 2023b, p. 21)

### Economic

Expression of the Economic Pillar Main Objectives was less evident in the St. Anns Bank MPA documents. Results of the six documents included in analysis 1 shows that the Economic Pillar Main Objectives were weakly to moderately reflected (Average Pillar Score = 1.3), while

Analysis 2 showed that the MPA Management Plan weakly reflected the objectives (Average Pillar Score = 0.3; Table 6) as defined in Table 3 & 4. EBM scores ranged from 1.2 to 1.5 across the three Main Objectives, with *C. Equity* being most aligned with the documents from analysis 1 (EBM Score = 1.5). Analysis 1 documents referred to landings data, specific socio-economic indicators that were recommended, as well as objectives relating to employment and access to fisheries. For example, recommended indicators for monitoring included “Costs and benefits of exclusion of fishing and other economic activities from the MPA” and “Socio-economic characteristics of MPA users and other stakeholders” (Kenchington, 2014, pp. 58–59).

Overall, the average scores from analysis 2 were low, with an overall EBM score of 0.3. One section, *Management and Stewardship Objectives*, was not relevant to the Economic objectives and therefore was excluded. Four sections resulted in a score of zero and only two sections were scored positively: *Vision* (EBM score = 1) and *Mi’kmaq Guiding Principles* (EBM score = 1). The latter low scores were due to the language being vague and general (Appendix 3). For example, “provide opportunities for sustainable livelihoods, including commercial and recreational fishing, recreational boating, and tourism” (Fisheries and Oceans Canada (DFO), 2023b, p. 18) was scored as 1 for each of the Economic Pillar Main Objectives as the statement was general and could relate to all. See Table 8 for more examples of quotations.

*Table 8 Illustrative quotations and scoring examples from the Economic Pillar*

Pillar	Economic		
Main Objective	A. Economic Prosperity	B. Economic Sustainability	C. Economic Equity
<b>Analysis 1 (Pre- Plan, 2012-2017)</b>	<p>Score = 1: A list of "Human Activities to be Considered in the St Anns Bank AOI Assessment" include Fishing (various), Oil and gas (i.e., seismic and drilling), shipping, and other (recreation and tourism (Fisheries and Oceans Canada (DFO), 2012a, p. 10)</p> <p>Score = 2: There are a number of socio-economic indicators that suggest the consideration of such information; Indicators 60, 61, 68 : Social and economic dependence on marine activities; Indicator about recreational and tourism activities relating to the MPA - including Spillover benefits; Costs and benefits of</p>	<p>Score = 1: "Contribute to the recovery and sustainability of commercial fisheries" (Fisheries and Oceans Canada (DFO), 2012a, p. 3)</p> <p>Score = 2: "Particularly for locally-based, small-boat fisheries, in which the operating range from home ports can be very limited, it will not be sufficient to map where people work at sea but also which on-shore communities are linked to which sea areas"; "Territorial User Rights in Fisheries" (TURFs) - access</p>	<p>Score = 1: "Given that less than one percent of the county's total landed value came from fisheries operating in the St Anns Bank AOI, it can be assumed that only a small number of these individuals were employed due to fishing in the St Anns Bank AOI." (Fisheries and Oceans Canada (DFO), 2012b, p. 18)</p> <p>Score = 2: "The picture that emerged as this project proceeded suggests that recent and current, rather than more historic fishing activity will be given more weight by commercial harvesters as boundary and management decisions are taken. The weighting of access to currently valuable:</p>

Table 8 *Continued*

Pillars	Economic		
Main Objective	A. Economic Prosperity	B. Economic Sustainability	C. Economic Equity
<b>Analysis 1 (Pre- Plan, 2012-2017)</b>	exclusion of fishing and other economic activities from the MPA (Kenchington, 2014, pp. 57–58); "Current Mi'kmaq commercial harvest methods pose known potential for interaction between conservation priorities identified by DFO." (Unama'ki Institute of Natural Resources & Membertou Geomatics Solutions, 2013, p. 4)	to inshore fishery resources by Nova Scotian small-boat fishermen to be controlled not only by governmental regulations but also by traditional, local rules" (Kenchington, 2014, p. 58)	grounds versus access to traditional, currently "unused" grounds will involve values not necessarily captured by ecological and economic measurements." (Squires, 2012, p. 4); "Indicator 68 Costs and benefits of exclusion of fishing and other economic activities from the MPA" (Kenchington et al., 2014, p.42)
<b>Analysis 2 (Plan Sections 2.1-2.7, 2017-2022)</b>	Score = 1: "Provide opportunities for sustainable livelihoods, including commercial and recreational fishing, recreational boating, and tourism" (Fisheries and Oceans Canada (DFO), 2023b)(Fisheries and Oceans Canada (DFO), 2023b, p. 18)		

Social / Cultural

Analysis 1 had an average score of 0.8 and analysis 2 an average score of 0.5. *A. Sustainable Communities* was the Main Objective with the highest EBM score of 1.3 in analysis 1 and *D. Culture* was the highest in analysis 2 with a score of 1. Examples from analysis 1 included indicators linking social and economic dependence to marine activities and text passages, such as: "Particularly for locally based, small-boat fisheries, in which the operating range from home ports can be very limited, it will not be sufficient to map where people work at sea but also which on-shore communities are linked to which sea areas" (Kenchington, 2014, p. 58). As described by selected traditional sources, information on the "great value and importance [of the St. Anns Bank area] to both their communities and their own livelihoods" (Squires, 2012, p. 1) were also included. Text passages mentioning Food Social and Ceremonial (FSC) harvesting were cross-cutting across Social – Cultural Main Objectives; however, there was little or no detail, nor explicit context-related information. For example, it was stated that, "It is not known whether any harvesting is done in the St. Anns Bank AOI for food, social or ceremonial purposes" (Fisheries and Oceans Canada (DFO), 2012b, p. 9). See Table 9 for more examples of quotations.

Table 9 Illustrative quotations and scoring examples from the Social/Cultural Pillar

Pillar	Social/Cultural			
Main Objective	A. Sustainable Communities	B. Health and Wellbeing	C. Ethical & Just Activities	D. Culture
<p><b>Analysis 1 (Pre-Plan, 2012-2017)</b></p>	<p>Score = 1: "Fishing and related occupations have historically been a major source of employment for many residing in coastal communities in Nova Scotia"; "Given that less than one percent of the county's total landed value came from fisheries operating in the St Anns Bank AOI, it can be assumed that only a small number of these individuals were employed due to fishing in the St Anns Bank AOI" (Fisheries and Oceans Canada (DFO), 2012b, p. 18); there is great value and importance, to both their communities and their own livelihoods, of the St Anns Bank area (Unama'ki Institute of Natural Resources &amp; Membertou Geomatics Solutions, 2013, p. 20)</p> <p>Score = 2: "The final boundaries for Zones 1 and 2 were modified following the Canada Gazette, Part I, public comment period to address concerns raised about fisheries access. The Regulations include exceptions to the</p>	<p>Score = 1: "Throughout the MPA, activities for the purpose of public safety, law enforcement, national security or emergency response (e.g. vessel search and rescue operations or responding to an incident resulting in the release of deleterious substances) will be allowed" (Fisheries and Oceans Canada (DFO), 2017b, p. 1215)</p> <p>Score = 2: " The area provides important habitat for commercial and non-commercial fishery resources" (Unama'ki Institute of Natural Resources &amp; Membertou Geomatics Solutions, 2013, p. 5)</p>	<p>Score = 1: "Modern Canadian society displays less distinction between the genders, but an understanding of gender-based patterns in marine activities, in the use of an MPA, and in perceptions about MPAs remains important" (Kenchington, 2014, p. 59)</p>	<p>Score = 1: "Although there is little archaeological evidence of the peoples who came and went through the region in the period 12 000 to 6 000 years ago or if any occupied portions of St. Anns Bank in particular, the coastal zone, whether it was the coast of 12 000 years ago or present-day, was a very important food source to all peoples as well as the fish and animals that gathered there"(Unama'ki Institute of Natural Resources &amp; Membertou Geomatics Solutions, 2013, p. 15)</p> <p>Score = 2: " The importance of this area is in the means by which it connects other ecosystems, such as the Bras d'Or Lakes and the Gulf of St. Lawrence, for which culturally significant species such as salmon, eels, mackerel, and striped bass migrate through" (Unama'ki Institute of Natural Resources &amp; Membertou Geomatics Solutions, 2013, p. 4)</p> <p>Score = 3: "The Mi'kmaq view the world and all that was in it as having spirit. All life is equal and treated with respect. By developing an intimate understanding of the relationships between</p>

Table 9 Continued

Pillars	Social/ Cultural			
Main Objective	A. Sustainable Communities	B. Health and Wellbeing	C. Ethical & Just Activities	D. Culture
<p><b>Analysis 1 (Pre-Plan, 2012-2017)</b></p>	<p>prohibition to allow specific activities to occur within the MPA. Some of these activities will require the approval of an activity plan by the Minister of Fisheries, Oceans and the Canadian Coast Guard (the Minister) in order to be carried out in the MPA." (Fisheries and Oceans Canada (DFO), 2017b, pp. 1213–1214)</p>			<p>the living and non-living, each plant, animal, constellation, full moon or red sky told a story to guide the Mi'kmaq so they could survive " (Unama'ki Institute of Natural Resources &amp; Membertou Geomatics Solutions, 2013, p. 13)</p>
<p><b>Analysis 2 (Plan Sections 2.1-2.7, 2017-2022)</b></p>	<p>Score = 1: "Invest in scientific and local knowledge generation, particularly from local communities " (Fisheries and Oceans Canada (DFO), 2023b, p. 18)</p> <p>Score = 3: "Protect the marine ecosystem of St. Anns Bank for future generations " (Fisheries and Oceans Canada (DFO), 2023b, p. 18)</p>	<p>Score = 3: "Netukilimk is the use of the natural bounty provided by the Creator for the self-support and well-being of the individual and the community. Netukulimk is achieving standards of community nutrition and economic well-being without jeopardizing the integrity, diversity, or productivity of our environment" (Fisheries and Oceans Canada (DFO), 2023b, p. 19)</p>	<p>Absent</p>	<p>Score = 2: "Stewardship refers to the wide range of actions that can be taken by individuals, groups, and communities to raise awareness of St. Anns Bank, and to monitor and conserve the ecosystem. DFO encourages and will actively pursue collaboration, partnership, and stewardship opportunities for St. Anns Bank" (Fisheries and Oceans Canada (DFO), 2023b, p. 20)</p> <p>Score = 3: " Two-Eyed Seeing or Etuaptmumk (Mi'kmaq word for Two-Eyed Seeing) approach is a balanced respect, appreciation, and consideration for Indigenous and Western knowledge. Two-Eyed seeing is learning to see from one eye with the strengths of Indigenous knowledge and ways of knowing, and from the other eye with the strengths of Western knowledge and ways of knowing... and learning to use both eyes together for the benefit of all" (Fisheries and Oceans Canada (DFO), 2023b, p. 19)</p>

## Governance

Analysis 1 had an average score of 1.3 and analysis 2 an average score of 1.5. Scoring of the Governance Main Objectives in analysis 1 ranged from 0.8-1.8 (Table 4). Returning results of decision making back to stakeholders and rightsholders, engaging with stakeholder early and often and learning from other MPA experiences were among the most aligned themes with Main Objective B. *Governance Structures and Processes* (EBM Score = 1.8). For example, “monitoring and managing the MPA as a partnership with stakeholders and local communities, rather than something imposed from outside” (Kenchington, 2014, p. 67). Further, it is stated that adaptive management and continuous learning be integrated into practices, “The conservation objectives that result from the advice generated at this advisory meeting should be re-evaluated periodically to ensure that new knowledge on ecosystem functions and the significance of areas and/or species can be appropriately considered” (Fisheries and Oceans Canada (DFO), 2012a, p. 9). Further, a stakeholder advisory committee was established shortly after St. Anns Bank AOI was identified and regulations have since been developed through multiple rounds of consultation with affected stakeholders, lead agencies in Government of Nova Scotia, Indigenous peoples and communities (Fisheries and Oceans Canada (DFO), 2017b).

In the St. Anns Bank Management Plan (2023), *B. Governance Structures and Processes* was also the Main Objective that strongly included EBM objectives (EBM Score = 2; Table 4). Like analysis 1, analysis 2 had significant reference to participation and collaboration within governance objectives across multiple sections. For instance, “Support actions and mechanisms for moving towards a Nation to Nation relationship with the Mi’kmaq, encourage collaboration with and among governments, stakeholders and interested parties, and foster local approaches to conservation, stewardship and monitoring” the inclusion of Etuaptmumk as a Mi’kmaq principle; and the presence of collaboration and stewardship, integrated management, and knowledge-based decision making opposed to science-based decision making as MPA Guiding Principles (Fisheries and Oceans Canada (DFO), 2023b, p. 9). Illustrative quotations with associated scores are provided in Table 11 as examples of content across analysis 1 and 2.

*Table 10 Illustrative quotations and scoring examples from the Governance Pillar*

Pillar	Governance		
Main Objective	A. Legal and other Obligations, including to Indigenous Peoples	B. Governance Structures and Processes	C. Governance Outcomes
<b>Analysis 1 (Pre- Plan, 2012-2017)</b>	Score = 1: Statutory objectives for MPAs designated under the <i>Oceans Act</i> are recognized (Kenchington, 2014, p. 4)	Score = 2: "While data collection for some indicators would require surveys aboard Departmental research ships, others offer opportunities for collaborative monitoring work with local communities and institutes" (Kenchington, 2014, p. v); "As work on planning and establishing	Score = 1: "The regulatory proposal was refined over time, DFO continued to share updated information with the fishing industry and to seek input" (Fisheries and Oceans Canada (DFO), 2017b, p. 1226)  Score = 2: "Effective, adaptive



Pillar	Governance		
Main Objective	A. Legal and other Obligations, including to Indigenous Peoples	B. Governance Structures and Processes	C. Governance Outcomes
<b>Analysis 1 (Pre- Plan, 2012-2017)</b>	<p>Score = 3: DFO (2017b) listed many legal obligations, including: Oceans Initiative (2007) (p.1211); National Conservation plan (p.1211); Aboriginal Communal Fishing Licenses Regulations and authorized under marine mammal regulations were accommodated in Zone 1 (p. 1219); mentions domestic and international coordination and cooperation - e.g., CBD and Aichi Target 11 specifically (p.1207, 1242).</p>	<p>a Marine Protected Area (MPA) on the Eastern Scotian Shelf proceeds, particular attention is being paid to developing effective working relationships with stakeholder groups, key among them being the commercial fishing industry" (Squires, 2012, p. 1); "Regulations have been developed through multiple rounds of consultation with affected stakeholders, lead agencies in Government of NS, Indigenous peoples and communities" (Fisheries and Oceans Canada (DFO), 2017b, p. 1222)</p>	<p>management of any MPA requires an extensive monitoring program to provide the information base for decision making" (Kennington, 2014, p. v)</p>
<b>Analysis 2 (Plan Sections 2.1-2.7, 2017-2022)</b>	<p>Score = 1: "While DFO has the lead jurisdictional responsibility, the vision and objectives for St. Anns Bank can only be achieved through coordination, cooperation, and partnership among all organizations and interests" (Fisheries and Oceans Canada (DFO), 2023b, p. 20)</p> <p>Score = 2: "Support actions and mechanisms for moving towards a Nation-to-Nation relationship with the Mi'kmaq" (Fisheries and Oceans Canada (DFO), 2023b, p. 18)</p>	<p>Score = 2: "Establish and maintain cooperative arrangements with responsible regulatory authorities, Indigenous groups and/ Mi'kmaq partners/ stakeholders to meet objectives for the MPA" (Fisheries and Oceans Canada (DFO), 2023b, p. 23)</p> <p>Score = 3: "Encourage collaboration with and among governments, stakeholders and interested parties" (p. 18); "Management actions will be based on the best available scientific information and traditional ecological knowledge. Studies and research in and around the MPA will be encouraged to improve upon and add to existing information " (p. 20) (Fisheries and Oceans Canada (DFO), 2023b)</p>	<p>Score = 1: "Pressures on the St. Anns Bank ecosystem may change over time as a result of shifting social, environmental, and economic conditions. At the same time, knowledge of the ecosystem will continue to improve. Planning and management must be adaptive to respond to these changes. The design, management, and effectiveness of the St. Anns Bank MPA will be monitored, and conservation measures adapted as necessary to ensure the objectives for the site are being met" (Fisheries and Oceans Canada (DFO), 2023b, p. 20)</p> <p>Score = 2: "Management actions will be based on the best available scientific information and traditional ecological knowledge. Studies and research in and around the MPA will be encouraged to improve upon and add to existing information" (Fisheries and Oceans Canada (DFO), 2023b, p. 20)</p>

Finally, the degree to which the EBM Framework is reflected in the St. Anns Banks MPA across the four pillars was also calculated for each document in analysis 1 and document section in analysis 2 (Appendix 2 & 3). Two documents in analysis 1 had the highest scores, although these were only moderately reflected (Kenchington, 2014: EBM Score = 1.9; DFO, 2017b: EBM Score =1.8). The documents that reflected the EBM Framework the least in analysis 1 were DFO (2012b) and UNIR and Membertou Geomatic Solutions (2013), both with an EBM score of 0.6. Calculating EBM scores for each section of the St. Anns Bank MPA management plan (2023) was not found to be useful, as each section of the plan is specific and not expected to be applicable to all aspects of EBM. Analysis 2 indicated that the section with the strongest reflection of the EBM Framework was *Management and Stewardship Objectives* (EBM Score = 1.7) followed by *Mi'kmaq Guiding Principles* (EBM Score = 1.5); the sections with the weakest reflection were *Conservation Objectives* (EBM Score = 0.8) followed by *Research and Monitoring Objectives* (EBM Score =0.6) with many of the Main Objectives not being relevant (Appendix 1).

## DISCUSSION

This exercise successfully tested the EBM Framework in a practical context providing the first demonstration of the utility of the EBM Framework as a prospective tool for the exploration of DFO policies and management approaches from a holistic lens with the potential to support decision-making in the future. Through the application of the EBM Framework, many lessons were also learned about the *Oceans Act* MPA establishment process. Firstly, DFO's Conservation priorities broadly reflect the four DFO Maritimes EBM Pillars, as expected given the scope of the *Oceans Act* and other legislation related to conservation. Secondly, this specific application to the St. Anns Banks MPA indicated that the degree to which the EBM Framework was reflected across the four Pillars and the Main Objectives varied both across the four Pillars and throughout the establishment process, represented by the two analyses, the Pre- plan documents, analysis 1 and analysis 2, the Management Plan. Thirdly, some EBM objectives were not reflected as strongly as others, which raises some interesting questions about the scope of considerations in the *Oceans Act* MPA establishment process and prompts further discussion.

The application of the EBM Framework showed that EBM scores were different between the two analyses and across the four Pillars and their Main objectives (Figure 6). Additional questions emerged from the test application and are important to answer to truly understand the implications of these results:

- What is the desired degree of inclusion of EBM objectives in the *Oceans Act* MPA establishment process? Is there an expected or baseline EBM Score for *Oceans Act* MPAs?
- Are EBM scores expected to be consistent across Pillars and Main Objectives? If not, can the priority or importance of various objectives be determined?

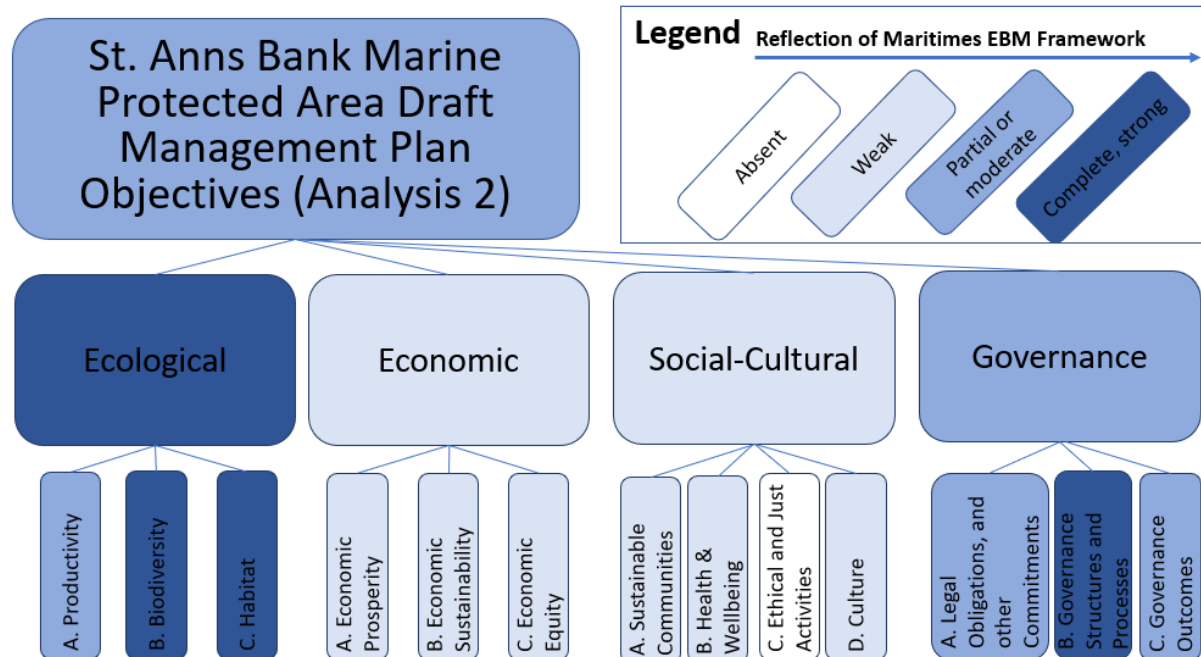


Figure 6 Results from the application of the EBM Framework to St. Anns Bank MPA plan objectives (analysis 2)

### Interpretation of EBM Scores

What are expected EBM Scores for Oceans Act MPAs?

To understand the implications of this work, it is important to acknowledge the degree to which EBM objectives would be expected to be considered within the *Oceans Act* MPA establishment process. We briefly revisit the results from each analysis to understand if they are consistent with what might be expected throughout the *Oceans Act* MPA establishment process.

The application of the Maritimes EBM Framework demonstrated that the four EBM Pillars and their Main Objectives were reflected throughout MPA establishment, confirming that multiple and diverse objectives can be considered in parallel (Bennett et al., 2018; Stephenson et al., 2017). Overall, both analysis 1 and 2 moderately reflected the EBM Framework (analysis 1 EBM Score = 1.6; analysis 2 EBM Score = 1.1). Since analysis 1 and 2 relate to different parts of the establishment process that have different purposes, the difference in score between analysis 1 and 2 is likely due to various objectives being considered at different steps of the *Oceans Act* MPA establishment process (Figure 4). Analysis 1, or Steps 1-3 in *Oceans Act* MPA process, gather and evaluate information to determine the feasibility and suitability of the AOI as a prospective MPA. The information from these steps informs the regulatory phase and designation of the MPA where all previous discipline specific materials/outputs are considered. The MPA management plan used in analysis 2 represents Step 4 of the designation process - MPA Management, which includes monitoring and ongoing management of the site, as outlined in the St. Anns Bank MPA management plan (2023). Therefore, it is logical that a

broader suite of objectives was represented in Steps 1-3 as the purpose of these steps are to gather a breadth of information about the AOI to feed into the RIAS. The RIAS, which summarizes the collected information to help inform the assessment of expected impacts, had the second highest EBM Score of documents included in the analysis (Score = 1.8, Appendix 2). Ultimately, Analysis 1 reflected a slightly stronger EBM score than analysis 2. Although it could be speculated that higher scores, i.e., the inclusion of more objectives or a deeper reflection of relevant objectives, is preferable to lower scores, conclusions cannot be made without understanding the degree to which each objective is needed to achieve success and effectively reach their individual MPA objectives. This analysis has flagged areas that might warrant greater consideration in future *Oceans Act* MPA establishment processes.

Since *Oceans Act* MPAs are conservation tools, ecological objectives were strongly reflected, likely as a direct response to their explicit expression in MPA legislation (Government of Canada, 1996, sec. 35.1), it was not surprising that the Ecological Pillar objectives were the most aligned with the materials and information included in the analysis. Further, objectives that were not strongly reflected in the analysis offer an opportunity for further reflection and action. For example, if EBM Scores of 1.6 and 1.1 are not expected, the following critical questions could assist in taking a critical view on the scope of materials generated in Steps 1-3:

- *Are any key sources of information missing?* Future analyses using the EBM Framework, within and beyond MPA processes, may benefit by moving beyond explicitly stated objectives in written materials and include other sections (e.g., the full management plan document instead of only section 2) to allow for a more accurate understanding of the alignment of DFO EBM Framework objectives and the informational considerations that fed into the St. Anns Bank MPA establishment process. During the analysis, three other potentially relevant documents came to the fore: a presentation providing an update on the establishment process, an initial ecological overview with data on ecological indicators, and an earlier version of the socio-economics report (i.e., DFO, 2012b). Although time constraints prevented these materials from being included in this exercise, it is suggested that future analyses could include such documents as they may contribute to understanding the reflection and consideration of EBM objectives included in MPA establishment.
- *What other areas of expertise or data could help inform the initial steps of the MPA establishment process and enhance the reflection of a broader suite of EBM objectives?* As conservation objectives are the top priority under the *Oceans Act* MPA, secondary objectives relating to other considerations including economic, social/cultural and governance may occur after the MPA is established (Personal Communications, 2023). In order to enhance the reflection of a broader suite of EBM objectives, for example there is an opportunity to further understand if and how the current scope of social-economic analyses could be broadened as the scope of the EBM Framework objectives go beyond the scope of current DFO socio-economic analyses (see Appendix 5 for further areas of inquiry).

The literature shows that there are a number of recorded benefits from the consideration of a broad spectrum of objectives in coastal and oceans management (Bennett et al., 2018; Stephenson et al., 2017). Additionally, there is an abundance of literature on the need to consider and include social science and humanities (SSH) dimensions in order to have successful and effective conservation efforts, such as MPAs. SSH considerations may include: a diversity of knowledge sources; the use of worldviews, ways of being and frameworks that consider the connectedness between social and ecological system dimensions; SSH indicators that provide advice into the process; enhanced engagement and relationships with local communities, and; buy-in, support and compliance from local and adjacent communities (Ban et al., 2013; Bennett et al., 2017; Pomeroy et al., 2004). Within DFO there is also mounting evidence and support for the consideration of a broad suite of objectives within the MPA context. For example, it has been identified that an MPA evaluation framework will include indicators for social, economic and cultural outcomes of MPAs and will guide national progress reporting every five years (DFO, 2021). Additionally, there have been recent efforts to hire, contract and engage with SSH experts to explore how these indicators could be developed and what should be included (Fisheries and Oceans Canada (DFO), 2023c).

Perhaps future MPA establishment processes might even use the EBM Framework as a basis for gathering materials and information to help enhance the consideration and reflection of a broad suit of objectives early on in *Oceans Act* MPA establishment and increase the benefits from the MPA process. The shift to considering a broader suite of objectives is shown through initiatives such as [the Lobster Research Pilot Project](#) by the Blue Economy Lobster Team. More broadly, DFO has established a Community of Practice on SSH to enhance the capacity and consideration of social and cultural factors in decision-making processes as well as to promote coordinated and collaborative approaches that advance the integration of SSH research within the department.

#### *Are EBM Scores expected to be consistent across Pillars and Main Objectives?*

EBM Scores varied across the Pillars and Main Objectives of the EBM Framework in both Analyses. This is likely due to the Canadian Legislation that creates *Oceans Act* MPAs. For instance, the highest scores were recorded for the Ecological Pillar in both analysis 1 and 2 (EBM Score = 2.8 and 2.0 respectively), and lowest scores for the Economic and Social/Cultural Pillars (EBM Score = 0.3 and 0.5 respectively) in analysis 2 (Table 6). As section 35.1 of the *Oceans Act* (Government of Canada, 1996) explicitly requires that MPAs are established for an ecological purpose, it was therefore unsurprising that higher scores were reflected for the Ecological Pillar objectives. It was also unsurprising that Economics and Social/Cultural had low EBM Scores, perhaps as there is no requirement in the *Oceans Act* for MPAs to have explicit economic or Social/Cultural objectives or that reference to these areas were implicit. However, such objectives may have been included earlier in the establishment process or may be

included as MPA conservation objectives in the RIAS, the management plan and other future products.

Although the *Oceans Act* does not explicitly reflect the full scope of EBM, other pieces of legislation that relate to environmental protection, including SARA (2002), the Fisheries Act (2019) and the Federal Sustainable Development Act (2008) do include social considerations that also broadly relate to MPAs. For example, SARA preamble (2002) states that traditional knowledge of Indigenous peoples, community knowledge and interests, including socio-economic interests, should be considered in the assessment of species at risk and in the development and implementation of recovery measures. Policy guidance and best practices are available in the context of how conservation might include social and cultural considerations (Table 1), such as sources of knowledge, data and information, and there is an opportunity for future work to further unpack implications of the EBM Framework to day-to-day operations and decision making.

Another area that was weakly reflected in the analysis of the St. Anns Bank MPA establishment process documents was the reflection of C. Ethical and Just activities under the Social/Cultural pillar. While many policies do allude to Ethical and Just activities, such as the application of Reconciliation and GBA+ <sup>1</sup> considerations into decision making (Departmental Plan, 2019-2020), fair treatment, processes and procedures (Fisheries and Oceans Canada (DFO), 2002b; Nations, 2015; Secretariat of the Convention on Biological Diversity, 2004) and towards equitable distribution of benefits from decision making (Fisheries and Oceans Canada (DFO), 2002a, 2002b; United Nations Environment Program (UNEP), 2022), many of these do not directly apply to the MPA establishment process or were created after the St. Anns Bank MPA was established. In particular, the requirement to include GBA+ as a consideration in MPA development occurred after the establishment of St. Anns Bank MPA but could be included in future MPA establishment processes.

Conservation literature highlights equity as being critical to delivering conservation outcomes in protected areas as inequitable protected areas can undermine conservation goals and lead to higher costs (Zafra-calvo et al., 2017). Three main dimensions of equity are widely acknowledged as being necessary: recognition, procedure and distribution (Schreckenberget al., 2016). Therefore, this particular area would be useful to explore for more explicit inclusion in *Oceans Act* MPA establishment processes and the documentation that goes along with it. Note that consideration of ethical and just objectives may have been more apparent in other aspects of the St. Anns Bank MPA establishment process that were not assessed here, such as in meetings and communications, engagement and consultation processes.

### Lessons Learned

Application of the EBM Framework led to lessons and insights for the EBM Framework, the future application and analysis of the EBM Framework, the St. Anns Bank MPA and the *Oceans Act* MPA establishment process.

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<sup>1</sup> <https://women-gender-equality.canada.ca/en/gender-based-analysis-plus.html>

*1) The organization of objectives across the four Pillars was effective and complete.* Based on its ability to show a variation in the consideration of EBM Pillars and Main Objectives throughout the establishment process, the EBM Framework served as a useful, structured way to analyse information throughout the *Oceans Act* MPA establishment process from a holistic lens. The hierarchical and holistic four Pillar structure of the EBM Framework facilitated the evaluation of the case study, by providing clear Main Objectives against which the *Oceans Act* MPA establishment process could be explored. This builds on earlier work demonstrating the utility of such hierarchical approaches to exploring EBM in practical contexts (Barnett, 2018; Jones & Stephenson, 2019; Mussells & Stephenson, 2020; Parlee & Wiber, 2018). During the qualitative content analysis, the scope of objectives across the four pillars seemed to adequately capture the breadth of information being presented in the documents. Based on the materials reviewed, the scope of Pillars and Main Objectives appeared to be robust and complete and as a result, provided a rich qualitative data set that showed a variation in the degree to which EBM Pillars and Main Objectives were reflected throughout the establishment process.

*2) Strong and weak reflections of EBM objectives were highlighted.* Case study documents were mapped out across EBM Objectives Pillars and main objectives which proved useful in demonstrating the degree to which each objective was reflected from weak to strong. The varied result across Pillars raises questions with respect to why some objectives were reflected more or less than others, and if certain Pillars or Main Objectives were more important (Appendix 5). As current legislation, regulations and policies are generally narrower than EBM and directly scope the actions and objectives of DFO tools, programs, initiatives, and plans, it was expected that the reflection of EBM objectives would vary across Pillars.

*3) Deductive application of the EBM Framework was effective.* This study demonstrated the value of the EBM Framework when used deductively to map out the degree to which objectives were included in a case study context. This work included both qualitative and quantitative content analysis to apply and analyse the EBM Framework. As a result, the deductive application of the qualitative content analysis demonstrated the degree to which EBM objectives were included in the retrospective context of the St. Anns Bank MPA establishment. The hierarchical structure of the framework was a simple and straightforward way to guide coding during initial qualitative content analysis. A result of the deductive application was a rich and organized qualitative data set that included detailed text passages, numerical scores, and colored figures, which was used in a number of ways to understand patterns and trends.

*4) Analyses should adapt to each specific case study context.* Early on in this work, it was apparent that a number of steps are involved in the *Oceans Act* MPA establishment process, as indicated in policy guidance (Fisheries and Oceans Canada (DFO), 2009, 2016) (Figure 4). To ensure that this temporal aspect of the *Oceans Act* MPA establishment process steps was accounted for, a two-step approach was developed where two separate analyses captured the differences and distinguished various stages of the *Oceans Act* MPA establishment process. This enabled a more detailed understanding of the breadth of objectives considered throughout the

process and the degree to which the EBM Framework was reflected in the St. Anns Bank MPA across time.

*5) EBM Scores were used to highlight areas for further exploration and discussion.* As a part of the mixed methods approach, quantitative content analysis resulted in numerical scores which assisted in interpreting the extent to which the EBM Framework Pillars and Objectives were reflected within written materials from the St. Anns Bank MPA establishment process. For instance, this work shows that overall, St. Anns Bank MPA moderately reflects the EBM Framework and demonstrates where further exploration or elaboration is required. Low scores that represented weakly reflected EBM Objectives indicated an entry point for further exploration (e.g., Economic and Social/Cultural objectives).

A potential risk of scoring is over dependence on the numerical scores and the oversimplification of results. For example, scoring and averaging have inherent limitations and distills the nuance of qualitative information. Solely looking at EBM scores will not provide a full understanding of the application of the EBM Framework to the St. Anns Bank MPA case study. Conversely, if only qualitative methods were used, the findings of this work may also be misunderstood or not considered relevant to the readers. Therefore, a combination of qualitative and quantitative results is presented in the results to lessen the dependence, and potential simplification of results with quantitative values.

*6) Multiple and Integrative methods are needed.* A broad scope of expertise and skills (in particular Social Sciences and Humanities) are needed to approach the application of the EBM Framework to overcome the limitations, biases and assumptions of the use of a single perspective or method. Using only a desk-based analysis will not likely produce an accurate understanding of the context and therefore risks ineffective findings. Inaccurate and less effective as non-written insights and personal experiences allow for a more effective assessment. The triangulation of multiple, mixed methods and inter and multi-disciplinary approaches are critical to ensure appropriate documents, methods, and coding are all fit to context and that the results are appropriately interpreted. For example, meetings and discussions with the St. Anns Bank MPA management team ensured the approach taken was relevant for the case study context.

### Recommended Next Steps

The flexibility of the EBM Framework enables its adaptation to a diverse range of case studies and application methods within and beyond an MPA context. Therefore, to continue to explore the insights and the potential implications of this work to support a broader suite of objectives in the *Oceans Act* MPA establishment process as well as for future applications, the following suggestions are made:

*1) Expand the data included in the analysis.* If more sources of information had been included in the analysis it is possible that the result would have been a more nuanced reflection of EBM



objectives. For example, not all the materials that informed the RIAS were used in this analysis as some emerged later and could not be included, e.g., earlier socio-economic analyses materials and the biological overview and information from other methods. Also, after the exercise was complete the St. Anns Bank Team reflected that in addition to the written reports and documents produced in Steps 1-3 there were a significant number of meetings and consultations that also fed into the MPA establishment process that weren't necessarily formally documented in written reports. For instance, continuous input from the Advisory Committee and the Mi'kmaq and Kwilmu'kw Maw-klusuaqn as well as other input from DFO sectors, such as Science and Conservation and Protection also impact MPA management plan contents. Additionally, it is possible that reflection of EBM may not have only been explicitly framed as objectives or included in sections of the plan that were not included in this exercise and some documents were summaries or distillations of other more detailed documents and therefore may have lacked detail. Future applications of the EBM Framework could expand methods beyond review of explicit objectives and include additional sections and documents, other types of outputs such as meeting minutes and/or notes as well as observational methods (e.g., attending meetings), and key informant interviews and other in-person communications to supplement and complete the information from written documents. Additional research questions and suggestions can also be found in Appendix 5.

*2) Include lower-level objectives in analysis to enhance nuance.* Due to the ongoing development of the EBM Framework Objectives, this exercise simply used its high-level elements, the Pillars and Main Objectives. As a result, a more general understanding was gained of the EBM Objectives reflected in the St. Anns Bank MPA establishment process. A full draft of the EBM Framework, developed in parallel to this analysis, has since been completed and includes the further articulation of sub-objectives. Further application of the EBM Framework could use these sub-objectives to provide a richer nuance and allow for a deeper understanding and enhanced ability to compare results across pillars and case studies moving forwards.

3) *Reflect on the degree to which objectives are included in the Oceans Act MPA establishment process and enhance weakly reflected objectives.* The use of the EBM Framework provides a comprehensive foundation to critically reflect on the scope of objectives included in a given context or case study and act on opportunities to enhance the use of the EBM Framework in the establishment and management of *Oceans Act* MPAs. Implications of EBM scores and patterns that stand out provide a starting point for further exploration, such as understanding weakly reflected objectives and to consider, where appropriate, if or how they could be enhanced. Thus, next steps could explore the degree to which EBM Framework objectives are and should be included in the *Oceans Act* MPA establishment process, in particular Social/Cultural and Economic objectives.

The ecological objectives were strongly reflected in St. Anns Bank MPA establishment process for reasons given above. However, based on the Government of Canada's conservation strategy (Fisheries and Oceans Canada (DFO), 2021; Government of Canada, 2011) as well as the overwhelming evidence for the need to consider social and cultural dimensions to achieve effective conservation efforts (Bennett et al., 2017, 2021; Kaplan-Hallam & Bennett, 2018; Sandbrook et al., 2023), there is scope for growth and expansion of objectives in *Oceans Act* MPAs. A current opportunity is to dive deeper into the qualitative data and case study context from this work to further understand how a broader range of considerations could contribute a more holistic approach for establishing *Oceans Act* MPAs. Additional questions that could be further explored to improve the reflection of the EBM Framework in the *Oceans Act* MPA establishment process can be found in Appendix 5.

4) *Compare with and learn from other types of conservation initiatives.* The application of the EBM Framework in an *Oceans Act* MPA context provides a basis to monitor and learn from other *Oceans Act* MPAs as well as other conservation initiatives including, marine reserves, National Marine Conservation Areas and other tools with different mandates and legal requirements. These may be administered by other Government of Canada departments and could offer insights into the consideration of objectives beyond those currently included in *Oceans Act* MPAs. For example, National Marine Conservation Areas are administered by Parks Canada and are mandated to include cultural components such as historical and archaeological resources and designed for different activities and uses (Parks Canada, 2022a, 2022b).

In particular, it was suggested by a practitioner at the DFO led MPA Practitioner Workshop (DFO 2022), that it would be interesting to compare examples of conservation initiatives throughout Canada for the purposes of understanding how other conservation efforts align and reflect diverse objectives. For example, this might include conservation efforts that are well-known for addressing holistic objectives related to social and cultural dimensions such as Tarium Niryutait MPA and Anguniaqvia niqiqyuam MPA in the Arctic and Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site in the Pacific. Through this type of comparative case study application, lessons on how tools and approaches consider various objectives can be taken where relevant. For example, as it relates to a socio-economic analysis, “a qualitative evaluation of the potential ecological, social and cultural benefits” of the designation of the Anguniaqvia niqiqyuam MPA was conducted, and it was determined that the incremental benefits would outweigh the incremental costs (Government of Canada, 2016). Perhaps this qualitative approach could complement existing quantitative approaches currently used in Oceans Act MPA establishment as an additional tool for socio-economic analyses and determining a broader suite of potential benefits.

*5) Strengthen and modernize existing legislation.* As it relates to EBM, guidance and legislation could more strongly reflect current science, knowledge and experience of achieving conservation objectives. This includes updating legislation to be more coordinated with overarching conservation objectives and recent guidance to take an integrated management focus (Fisheries and Oceans Canada (DFO), 2021; Government of Canada, 2011). This update could clarify the connection of *Oceans Act* MPAs to a broader suite of objectives resulting in more effectively reaching ecological objectives and with fewer negative impacts on other dimensions (e.g., Social/Cultural, economic). Strengthening and modernizing the *Oceans Act* could also provide a stronger legal basis for globally recognized integrated management tools such as marine spatial planning (Government of Canada, 2022a).

*6) Apply the EBM Framework across other Oceans Act MPAs, DFO programs, activities, and sectors in other ways.* This exercise was one approach to the application of the EBM Framework. However, there are many ways to approach and apply the EBM Framework within a conservation initiative context for example as a checklist for forming management objectives, as a basis for engaging rightsholders and stakeholders (Parlee et al., 2023), for implementing the management plan, and for subsequent monitoring and evaluation of MPA objectives (Appendix 6).

Continuing to apply and test the EBM Framework in other contexts will also provide further demonstration of its relevance, value and flexibility across a range of contexts beyond conservation initiatives and across other DFO sectors. Further exploration and understanding where and how the EBM Framework can enhance existing sectoral and departmental programs, plans, processes and decision-making (e.g., integrated fisheries management plans marine spatial planning, species at risk recovery planning and implementation, and the blue economy) is needed.

## CONCLUSION

The EBM Framework has been developed as a multipurpose management and decision-support tool. Here, it was demonstrated that it can be used to evaluate policies and management approaches against EBM objectives, by mapping, measuring and tracking a holistic suite of objectives across departmental priorities such as marine conservation targets. It could also be applied to other Department priorities such as reconciliation, sustainable development, marine spatial planning and the blue economy (Bundy et al., 2021; Daly et al., 2020).

This work tested the EBM Framework in the context of an *Oceans Act* MPA establishment through a retrospective exercise. Both qualitative and quantitative methods were used to understand the degree to which the St. Anns Bank MPA reflects the collaborative and multi-disciplinary EBM Framework. Insights were gained from the exercise and the degree to which EBM considerations were reflected in the St. Anns Bank MPA thus far were identified. Overall, this work verified the potential of the EBM Framework and that it is recommended to further apply to other diverse case studies to continue to learn, refine and expand utility.

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## Appendices

### Appendix 2 Non-relevant documents and sections

Analysis	#	Document / Section	Ecological			Economic			Social/Cultural				Governance			
			A. Productivity	B. Biodiversity	C. Habitat	A. Economic Prosperity	B. Economic Sustainability	C. Economic Equity	A. Sustainable Communities	B. Health and Wellbeing	C. Ethical & Just Activities	D. Culture	A. Legal Obligations and Other Commitments	B. Governance Structures and Processes	C. Governance Outcomes	
Analysis 1	1	Squires, K. 2012. Extent and Importance of Commercial Fishing Activity in the vicinity of St Anns Bank Area of Interest (AOI), as described by selected traditional sources. Oceans Section, DFO	X	X	X											
	2	DFO Maritimes. 2012. Conservation priorities, objectives, and ecosystem assessment approach for the St. Anns bank area of interest (AOI). CSAS advisory report														
	3	Policy and Economics Branch. 2012. Overview of fishing Activities in the St. Anns Bank Area of Interest. CSAS.	X	X	X								X	X	X	
	4	Unama'ki Institute of Natural Resources and Membertou Geomatic Solutions. 2013. Mi'kmaq Traditional use study St. Anns Bank Area of Interest	X	X	X											
	5	Gadus Associates (Kenchington). 2014. A monitoring framework for the St. Anns Bank Area of Interest. CSAS Maritimes														
	6	Fisheries and Oceans Canada. 2017. Regulatory Impact Analysis Statement. Canada Gazette Part II, Vol. 151, No. 12														
Analysis 2	7	DFO. 2023. St. Anns Bank Marine Protected Area Management Plan (Version 1.2023). Sections:														
		2.1 Vision														
		2.2 Mi'kmaq Guiding Principles														
		2.3 MPA Guiding Principles														
		2.4 MPA Goals														
		2.5 Conservation Objectives														
		2.6 Management and Stewardship Objectives	X	X	X	X	X	X	X	X	X	X				
2.7 Research and Monitoring Objectives																

Appendix 3 Results of Analysis 1 for each document

Analysis	#	Document	Ecological			Economic			Social/Cultural				Governance			EBM Score
			A. Productivity	B. Biodiversity	C. Habitat	A. Economic Prosperity	B. Economic Sustainability	C. Economic Equity	A. Sustainable Communities	B. Health and Wellbeing	C. Ethical & Just Activities	D. Culture	A. Legal Obligations and Other Commitments	B. Governance Structures and Processes	C. Governance Outcomes	
Analysis 1	Squires, 2012	Squires, K. 2012. Extent and Importance of Commercial Fishing Activity in the vicinity of St Anns Bank Area of Interest (AOI), as described by selected traditional sources. Oceans Section, DFO Maritimes. 2012. Conservation priorities, objectives, and ecosystem assessment approach for the St. Anns bank area of interest (AOI). CSAS advisory report	x	x	x	1	1	2	1	0	0	0	0	2	0	0.6
	DFO, 2012a	Policy and Economics Branch. 2012. Overview of fishing Activities in the St. Anns Bank Area of Interest. CSAS.	3	3	3	1	1	0	0	0	0	0	0	2	2	1.1
	DFO, 2012b	Unama'ki Institute of Natural Resources and Membertou Geomatic Solutions. 2013. Mi'kmaq Traditional use study St. Anns Bank Area of Interest	x	x	x	1	1	1	1	0	0	1	x	x	x	0.6
	UINR and Membertou Geomatic Solutions, 2013	Gadus Associates (Kenchington). 2014. A monitoring framework for the St. Anns Bank Area of Interest. CSAS Maritimes	x	x	x	2	1	2	2	2	0	2	0	1	0	1.3
	Kenchington, 2014	Fisheries and Oceans Canada. 2017. Regulatory Impact Analysis Statement. Canada Gazette Part II, Vol. 151, No. 12	3	3	3	2	2	2	2	2	1	1	1	2	2	1.9
	DFO, 2017b	<b>Main Objective Average</b>	2	2	3	1	1	2	2	1	0	2	3	2	2	1.8
		<b>Total Pillar Score (EBM Score)</b>	2.7	2.7	3	1.3	1.2	1.5	1.3	0.8	0.2	1	0.8	1.8	1.2	
			2.8			1.3			0.8				1.3			

Appendix 4 Analysis 2 Raw Data

Pillar		Ecological			Economic			Social/Cultural				Governance			Total EBM Score	
		A. Productivity	B. Biodiversity	C. Habitat	A. Economic Prosperity	B. Economic Sustainability	C. Economic Equity	A. Sustainable Communities	B. Health and Wellbeing	C. Ethical and Just Activities	D. Culture	A. Legal Obligations and Other Commitments	B. Governance Structure and Processes	C. Governance Outcomes		
SAB MPA Draft Management Plan	2.1 Vision	1.5	1.5	1.5	1	1	1	2.3	0	0	0.8	1.5	2	1	1.2	
	2.2 Mi'kmaq Guiding Principles	1	1	1	1	1	1	3	3	0	3	0	3	1	1.5	
	2.3 MPA Guiding Principles	2	2	2	0	0	0	0	0	0	1.5	2.3	2.7	1.3	1.1	
	2.4 MPA Goals	3	3	3	0	0	0	0	0	0	0	3	2.5	1	1.2	
	2.5 Conservation Objectives	3	3	3	0	0	0	0	0	0	0	0	0	0	0.8	
	2.6 Management and Stewardship Objectives	x	x	x	x	x	x	x	x	x	x	1.5	1.5	2.8	1	1.7
	2.7 Research and Monitoring Objectives	1	1	1.5	0	0	0	0	0	0	0	0	0	1	3	0.6
	Total Main Objective Average	1.9	2.0	2.0	0.3	0.3	0.3	0.5	0.5	0.0	1.0	1.2	2.0	1.2		
	Total Pillar Objective	2.0			0.3			0.5				1.5				

Appendix 5 Average EBM Score for each Unit of Analysis

Analysis	Document	Pillar				EBM Score	
		Ecological	Economic	Social-Cultural	Governance		
Analysis 1	Squires, K. 2012. Extent and Importance of Commercial Fishing Activity in the vicinity of St Anns Bank Area of Interest (AOI), as described by selected traditional sources. Oceans Section, DFO	X	1	0.3	0.7	0.6	1.2
	DFO Maritimes. 2012. Conservation priorities, objectives, and ecosystem assessment approach for the St. Anns bank area of interest (AOI). CSAS advisory report	0.3	0.7	0	1.3	1.1	
	Policy and Economics Branch. 2012. Overview of fishing Activities in the St. Anns Bank Area of Interest. CSAS.	X	1	0.5	X	0.6	
	Unama'ki Institute of Natural Resources and Membertou Geomatic Solutions. 2013. Mi'kmaq Traditional use study St. Anns Bank Area of Interest	X	1.7	1.5	1.3	1.3	
	Gadus Associates (Kenchington). 2014. A monitoring framework for the St. Anns Bank Area of Interest. CSAS Maritimes	3	2	1.5	1.7	1.9	
	Fisheries and Oceans Canada. 2017. Regulatory Impact Analysis Statement. Canada Gazette Part II, Vol. 151, No. 12	2.3	1.3	1.3	2.3	1.8	
Analysis 2	DFO. 2023. St. Anns Bank Marine Protected Area Management Plan (Version 1.2023). Sections:						
	2.1 Vision	1.5	1	1.2	1.5	1.2	1.1
	2.2 Mi'kmaq Guiding Principles	1	0.5	2.3	1.3	1.5	
	2.3 MPA Guiding Principles	2	0	0.4	2.1	1.1	
	2.4 MPA Goals	3	0	0	2.2	1.2	
	2.5 Conservation Objectives	3	0	0	0	0.8	
	2.6 Management and Stewardship Objectives	x	x	1.5	1.8	1.7	
	2.7 Research and Monitoring Objectives	1.2	0	0.3	1.2	0.6	

*Appendix 6 Considerations to further explore, and improve the reflection of EBM Framework objectives in the Oceans Act MPA establishment process context*

Consideration	Questions that emerged
The degree to which objectives are needed to achieve success	<ul style="list-style-type: none"> <li>-What objectives need to be consider and/or reflected in order to achieve success?</li> <li>- Is there legal basis for including non-ecological objectives in an <i>Oceans Act</i> MPA?</li> <li>-Would stakeholder and rightsholder buy-in and/or support with implementation of the MPA be more effective if a broader suite of objectives were considered?</li> <li>-How does the suite of objectives considered for St. Anns Bank compare to other <i>Oceans Act</i> MPAs?</li> </ul>
Moderate - Strongly included objectives offer insights into influence of policy	<ul style="list-style-type: none"> <li>- In the case of St. Anns Bank, the inclusion of Traditional Use Study, now considered to be an Mi'kmaq Ecological Knowledge Study, directly contributed to being one of the main sources of Social/Cultural objectives. Is this required for all <i>Oceans Act</i> MPAs?</li> <li>Are there other informational inputs that would further enhance the consideration and inclusion of Indigenous aspects into future <i>Oceans Act</i> Management Plans?</li> <li>-Is MEKS, or other similar regional study, required for all future <i>Oceans Act</i> MPAs as an input to all RIAS's?</li> </ul>
Weakly considered objectives offer an opportunity for reflection and action (i.e., Social/Cultural and economic)	<ul style="list-style-type: none"> <li>-How can the suite of Indicators in the monitoring framework for St. Anns Bank (Step 4) be expanded upon to strengthen the reflection of Social/Cultural and Economic objectives?</li> <li>-What other types of data/information, tools, strategies and methods could be used as a part of MPA development to facilitate a more comprehensive understanding on anticipated impacts across a broader suite of social and economic objectives?</li> <li>-What are the implications of reflecting a broader suite of Social/Cultural and economic objectives, beyond the current degree as facilitated through socio-economic analysis?</li> </ul>
Conceptualize and consider the term socio-economic separately	<ul style="list-style-type: none"> <li>-How can social and economic dimensions be defined in order consider the scope of each independent concept more completely?</li> <li>-As there may be a limited or narrow focus on what is being considered with regard to Social/Cultural aspects within the social-economic analyses, is there an opportunity to inform existing policy processes surrounding social-economic analyses in order to better support a regional EBM approach?</li> <li>-Potential ways to achieve this would be to further understand how the term 'socio-economic' is conceptualized in practice (within DFO), and what tools are being used currently and whether others could offer or facilitate the consideration of a broader scope of objectives? For example, the documents included in this analysis tended to include social aspects but only as it related to certain aspects of economics rather than the broader more holistic field of humanities.</li> </ul>

*Appendix 5 continued*

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Consideration	Questions that emerged
The scope of social-economic analysis	<hr/> <ul style="list-style-type: none"><li data-bbox="431 300 1421 363">-What other materials are needed to expand the considerations of social-economic analyses?</li><li data-bbox="431 394 1396 464">-How can a broader scope of information relating to relevant economic and non-economic activities be included in Ocean Act MPA establishment?</li><li data-bbox="431 495 1404 636">-How does the Cost Benefit Analysis (CBA-MPA) and other related exercises of the social-economic analysis that occur in Steps 1-3 align with the Economic and Social/Cultural Pillar objectives of the EBM Framework? Are cumulative effects considered?</li><li data-bbox="431 646 1464 756">-What goes into the decision of whether the two subsequent social-economic products are needed (i.e., i. CBA (required); ii. Phase I (not-required); iii. Phase II (not-required) (Figure 5))?</li><li data-bbox="431 766 1446 833">- Could the EBM Framework be used to inform/structure the guidance documents for <i>Oceans Act</i> MPA socio-economic analysis?</li></ul> <hr/>

*Appendix 7 Potential areas of research interest with regards to the EBM Framework and applying to the Oceans Act MPA establishment context (Based on five application methods as per Stephenson et al., 2018 and Bundy et al., 2021; and Steps 1-6 as per DFO, 2016).*

Potential Application	Step 1: Pre- Planning	Step 2: Feasibility Assessment and Policy Development	Step 3: AOI Regulatory Development	Step 4: MPA Management	Step 5: Ongoing Management
1. Checklist of Objectives	To understand the broad suite of potential objectives across potential AOIs			To be used as a guide for holistic planning	To evaluate/ audit the scope of the plan; to monitor progress over time
2. Evaluating and implementing policies and management approaches				To guide development of strategies and indicators for implementation of the plan	To monitor and evaluate objectives achieved at different stages of plan implementation
3. Scenario comparison	To explore the implications of various boundaries through scenarios				
4. Management Report Card					To assess and evaluate MPAs/ management plans in a standardized way
5. Assessing cumulative effects and evaluate trade-offs					